A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010041

6.7 Environmental Statement – Appendix 9.8 Bat Activity Survey Report

Part A

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

June 2020

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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CONTENTS

EXECUTIVE SUMMARY

This report presents the findings of bat activity surveys undertaken by Jacobs UK Ltd. on behalf of Highways England to support the proposed improvements to the A1 between Morpeth and Felton. The table below sets out the survey aims, techniques and an overview of the methods used.

Survey	Objective
Tree Climb and Inspect Surveys	Climb and inspect surveys were completed to inspect closely the potential roost features identified from the ground and to confirm whether they were being used by bats at the time of survey.
Internal Building Inspections	Internal building inspections were undertaken to identify any signs of roosting bats present within the buildings.
Evening Emergence and Dawn re-entry surveys	Evening emergence and dawn re-entry surveys were undertaken on trees, buildings, and structures to identify whether the potential roost features were in use at the time of survey.
Bat Activity Transect Surveys	Transect surveys were undertaken to identify the species assemblage within the survey area and to assess the relative importance of the various habitat types, and features for commuting and foraging bats.
DEFRA-Style Transect Surveys	DEFRA-style transects were completed to help identify the impact of the existing roads on species diversity and abundance at a landscape scale and to create a baseline for future monitoring.
Static Automated Detector Surveys	Static automated surveys were undertaken using Peersonic detectors to identify the species assemblage and the relative level of activity in various habitat types over multiple full nights. Static automated surveys were also undertaken using SM2 detectors to sample the species assemblage in key habitats during each month of the bats' active season.
Crossing Point Surveys	Crossing point surveys were completed to identify the height and regularity that bats were crossing the existing A1 at key locations between Morpeth and Felton.

The evening emergence and dawn re-entry surveys identified the presence of small bat roosts of common species in the survey area. Transect and static detector surveys verified the expected higher level of bat activity in and adjacent to woodland and in particular in the vicinity of Banktop Plantation, Hangingleaves Wood, Broom Plantation, the woodland along the River Coquet, and Park Wood.

The DEFRA transect surveys identified that the presence of the existing A1 does appear to slightly reduce the level of bat activity and species diversity. The DEFRA transects also verified the presence of Nathusius' pipistrelle in the area.

The crossing point surveys confirmed that all three species groups (bat species associated with open, edge or cluttered habitat) regularly cross the existing A1 at multiple locations. Very few bats crossed the road at the 0-2 m height band, Open Habitat Species crossed the road most frequently at a height of more than 5 m, both Edge and Cluttered Habitat Species crossed most frequently at heights of 2–5 m. The crossing point surveys also identified that the area around the River Coquet and land to the north provided key east-west connectivity across the A1.

1 INTRODUCTION

1.1 Scheme Background

1.1.1 Following the outcomes of the 2014 A1 North of Newcastle Feasibility Study the Department of Transport confirmed, in its first Roads Investment Strategy, the intention to upgrade twenty-one kilometres of the existing A1 to a dual carriageway between Morpeth and Ellingham in Northumberland. This comprised two discrete sections:

- Section A - Morpeth to Felton, and;
- Section B - Alnwick to Ellingham.

1.1.2 The bat activity surveys reported here were completed for the section between Morpeth and Felton. The surveys were designed to inform an Environmental Statement to accompany the planning application.

1.2 Survey Area Context

1.2.1 The proposed scheme and associated survey area is shown on Figure 1. The scheme is online at its north and south ends, but a large central section would form a new bypass to the west of the existing A1 between the Floodgate Burn crossing and Bockenfield Bridge. The existing A1 would be detrunked and form part of a local road network, which would separate local and strategic traffic.

1.2.2 The survey area comprised arable farmland and pasture with small blocks of woodland. The town of Moulton was present at the southern end and the River Coquet corridor and village of Felton near the north.

1.3 Report Rationale

1.3.1 Table 1 below summarises each bat activity survey undertaken.

Table 1 Surveys Undertaken

Survey
Ground-Level Tree Inspections, and Building Inspections[1]
Internal Building Inspetions
Evening Emergence and Dawn Re-entry Surveys
Tree Climb and Inspect Surveys
Monthly Transect Surveys
DEFRA-Style Transect Surveys
Static Automated Detector Surveys
Crossing Point (CP) Surveys

1.3.2 This report should be read in conjunction with the A1 in Northumberland Bat Roost Potential and Habitat Quality Report[2]. Together the aim of these reports is to present the results of the surveys undertaken, to provide baseline bat data to support an Environmental Impact Assessment and, where appropriate, to allow the recommendation, and monitoring, of appropriate mitigation measures.

1.4 Definitions

1.4.1 The study area relates to a 2 km buffer around the initially proposed options in which desk study information has been collated via online and third party sources.

[1] Reported in: Jacobs (2017) A1 in Northumberland Bat Roost Potential Survey Report.
[2] Jacobs (2017) A1 in Northumberland Bat Roost Potential Survey Report.

1.4.2 The survey area refers to a 500 m buffer around the initially proposed options, extended where required to enable access or incorporate connected habitats. The survey area is shown on Figure 1 of this report.

1.5 Legislative, Policy, and Regulatory Context

1.5.1 An assessment of the legislative and regulatory framework covering bats in the UK has been undertaken. Due consideration has been given to the following statutory instruments and policy frameworks in the preparation of this report:

- Conservation of Habitats and Species Regulations 2017[3];
- Wildlife and Countryside Act 1981 (as amended)[4] (WCA), and;
- Natural Environment and Rural Communities Act 2006[5] (NERC).
- Working With Wildlife: The Northumberland Biodiversity Action Plan 2008 (Northumberland LBAP) [6]; and
- The Highways England Biodiversity Plan 2015[7].

1.5.2 Appendix A of this report provides a brief synopsis of how the above relate to the protection of bats in the UK.

[3] http://www.legislation.gov.uk/uksi/2017/1012/contents/made

[4] http://www.legislation.gov.uk/ukpga/1981/69

[5] http://www.legislation.gov.uk/ukpga/2006/16/pdfs/ukpga_20060016_en.pdf

[6] http://www.nwt.org.uk/sites/default/files/files/Nland_Biodiversity_Action_Plan.pdf

[7] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/441300/N150146_-_Highways_England_Biodiversity_Plan3lo.pdf

2 METHODOLOGY

2.1 General

2.1.1 The survey area was deemed to have moderate bat habitat quality as reported in Jacobs 2017[8].

2.1.2 The survey methodology was designed using the standard good practice guidance[9&10] for a site with moderate habitat quality.

2.2 Previous Survey and Desk Study

2.2.1 Previous survey work and desk study data was reported in Jacobs 2017[11]. The information covered previously is listed in Table 2 below along with the date of completion:

Table 2 Previous survey work and desk study data

Survey	Completion Date
Desk Study – Bat Group Records	January 2017
Desk Study – Environmental Records Information Centre Records	May 2016
External Building Inspections	March – December 2016
Tree Inspections (ground based)	March – December 2016

2.3 Field Survey Overview

2.3.1 A range of field surveys were undertaken. These surveys and their objectives are given in Table 3 below.

Table 3 Survey objectives

Survey	Objective
Tree Climb and Inspect Surveys	Climb and inspect surveys were completed to inspect closely the potential roost features identified from the ground and to confirm whether they were being used by bats at the time of survey.
Internal Building Inspections	Internal building inspections were undertaken for accessible buildings with significant bat roost features present. These inspections were completed to identify any signs of roosting bats present within the buildings.
Evening Emergence and Dawn Re-entry Surveys	Evening emergence and dawn re-entry surveys were undertaken on trees, buildings, and structures that were deemed to have potential to support roosting bats to identify whether the potential roost features were in use at the time of survey.
Bat Activity Transect Surveys	Transect surveys were undertaken to identify the species assemblage within the survey area and to assess the relative importance of the various habitat types, and features for commuting and foraging bats.
DEFRA-style Transect Surveys	DEFRA-style transects were completed to help identify the impact of the existing roads on species diversity and abundance at a landscape scale and to create a baseline for future monitoring.
Static Automated Detector Surveys	Static automated surveys were undertaken using two methods. A total of 20 Peersonic detectors were used to identify the species assemblage within the area and the relative level of activity in various habitat types.

[8] Jacobs (2017) A1 Northumberland BRP and Habitat Quality Reporting.
[9] Collins J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.).* Bat Conservation Trust, London.
[10] Anon (1999) *Design Manual for Roads and Bridges, Volume 10: Environmental Design and Management, Section 4: Nature Conservation, Part 3 HA 80/99 Nature Conservation Advice in Relation to Bats.* Highways Agency.
[11] Jacobs (2017) A1 Northumberland BRP and Habitat Quality Reporting.

Table 3 Survey objectives

Survey	Objective
	Because the Peersonic detectors were not available at the beginning of the survey period, and were not generally able to record for more than approximately three nights, surveys of key static detector locations (five of the 20 locations) were also undertaken using Wildlife Acoustic Song Meter 2 (SM2) detectors. The objective of the SM2 surveys was principally to sample the species assemblage in key habitats during each month of the bats active season.
Crossing Point (CP) Surveys	CP surveys were completed to identify the height and regularity that bats were crossing the existing A1 at key locations between Morpeth and Felton. Additional data on potential influencing factors such as the surrounding topography and vegetation structure was also collected.

2.4 Tree Climb and Inspect Surveys

2.4.1 Tree climb and inspect surveys were completed for all trees identified in the A1 in Northumberland Bat Roost Potential Survey Report (Jacobs 2017) as having moderate or high Bat Roost Potential (BRP) within 50 m of the proposed scheme and for all trees classed as having high BRP within 100 m of the proposed scheme.

2.4.2 Tree climbing was completed by a team of two licensed tree climbers. Both climbers were experienced ecologists, one of whom held a Natural England bat survey licence. The surveys were completed between 15 May 2017 and 11 August 2017.

2.4.3 The climbers used roped access techniques to access the vicinity of potential bat roost features (PRFs). The PRFs were then inspected using torches (including Cluson Clubman CB2, and Led Lenser SEO 5 head torches), and endoscopes (Ridgid Seesnake CA 350, or Shekar wifi endoscope connected to an iPad Air 2).

2.4.4 The tree climb and inspect surveys were also completed for new trees in areas where access was previously limited, or where minor amendments to the scheme resulted in a change to the identified survey area. All new trees were initially appraised from the ground as per Section 2.3 of the A1 in Northumberland Bat Roost Potential Survey Report (Jacobs 2017).

2.4.5 The trees inspected are shown in Appendix B, and on Figure 2.

2.5 Internal Building Inspections

2.5.1 Internal building inspections were undertaken by a team of two experienced ecologists, one of whom held, or was an accredited agent on a Natural England bat survey licence. Each building was searched for bats, signs of bats (such as droppings or scratch marks), and features with the potential to support a bat roost or allow access to potential roost features. The construction of each building was noted and the location of all evidence identified.

2.5.2 The buildings subject to internal inspection, and the date of survey are listed in Appendix C, their location is shown on Figure 2.

2.6 Evening Emergence and Dawn Re-entry Surveys

2.6.1 Evening emergence surveys involved the monitoring of PRFs on a building, tree, part of a tree, or small group of trees from half an hour before sunset until two hours after sunset. Dawn re-entry surveys involved the monitoring of PRFs on the same features from an hour and a half before sunrise until 15 minutes after sunrise. All emergence or dawn surveys were undertaken by professional ecologists and led by ecologists experienced in bat survey.

All surveys were completed using broad band bat detectors[12] to assist surveyors. Each survey was recorded in its entirety for subsequent analysis.

2.6.2 Trees were scoped in or out of evening emergence or dawn re-entry surveys as identified in Table 4 below.

Table 4 Tree surveys required

Tree Potential	Distance from the scheme	
	within 50 m	50 - 100 m
Negligible	No further survey	No further survey
Low	No further survey	No further survey
Moderate	Two surveys (one dusk emergence and one dawn re-entry survey)	No further survey
High	Three surveys (including one dusk emergence and one dawn re-entry)	Three surveys (including one dusk emergence and one dawn re-entry survey)

2.6.3 Where the climb and inspect surveys of trees were considered to be sufficient to exhaustively check all PRFs on a tree, the climb and inspect survey results were taken to replace one of the evening emergence or dawn re-entry surveys.

2.6.4 Evening emergence surveys and dawn re-entry surveys were completed in suitable weather conditions, generally taken to be:

- Temperature: 10 C or higher;
- Wind: calm or light;
- Rain: dry or intermittently light.

2.6.5 Where possible the surveys were undertaken between June and September 2017 with at least two weeks between each survey. Where this was not possible this is identified in the limitations section. The survey dates, start and end times, and weather conditions for each survey are included as Appendix D.

2.7 Bat Activity Transect Surveys

2.7.1 Using the data collected during previous site visits, and data from aerial photos of the survey area, a circular transect route was designed to cover all prominent habitat types within the survey area. The total transect length was approximately 49 km long and incorporated 124 no. five-minute point counts (PCs). In two locations (one near the northern end, and one near the southern end) access constraints meant that surveyors were required to drive between sections of the transect survey. During the driven sections no survey was undertaken. The transect route and point count locations are shown on Figure 3.

2.7.2 The transect was walked by four or five teams of two ecologists, at least one of whom was experienced at completing transect surveys. The full 49 km of transect route was surveyed over the course of two consecutive nights during each survey month. Surveys were completed monthly from April to October 2017 inclusive.

2.7.3 The start locations were varied throughout the year to reduce any sampling bias associated with the time of emergence, and change in activity patterns throughout the night. The transects commenced at sunset and lasted for between approximately 3 and 3.5 hours.

[12] Generally, Wildlife Acoustics EchoMeter Touch detectors connected to an iPad 2 air or iPad mini 2. Some of the surveys were also completed using Anabat Express detectors or EchoMeter 3 units with integral recording capabilities, or, on occasion, Batbox duet detectors connected to a H2 Zoom recorder.

The bat activity transect survey dates, start and end locations and times are given in Appendix E.

2.7.4 Experienced bat surveyors used bat detectors[13] to identify and record the number of bat passes[14] at each point count, as well as an indicative record of the bat activity between point counts. On completion of the transect surveys sonograms of the recordings were analysed (as per Section 2.11) to ensure that the field identification was accurate.

2.7.5 Weather conditions were recorded at the beginning of each transect survey along with any significant changes as the survey progressed. All surveys were undertaken in appropriate weather conditions.

2.7.6 Where point counts were located in, or adjacent to, the following broad habitat types, this was identified and used in the subsequent analysis:

- Arable;
- Pasture;
- Woodland edge;
- Woodland centre;
- Buildings; and
- River / Stream.

2.7.7 Where point counts were located adjacent to two or more habitat types, these were all recorded and attributed to the point count. If a point count was within the centre of a field (i.e. away from any linear habitat features), or adjacent to the A1, this was also recorded. The habitat / features associated with each point count are given in Appendix F.

2.8 DEFRA-style Bat Transect Surveys

2.8.1 Following the methodology published by DEFRA[15] ten linear landscape transects were identified along the proposed scheme. The transects covered areas which extended out for 1 km from the existing A1 and each comprised a minimum of 11 no. ten-minute point counts. The transect route started with a sampling point adjacent to the scheme, and then included samples at 100 m (and multiples thereof) from the scheme, with distance measured as a direct line.

2.8.2 Because the scheme will involve the creation of a new section of road and the de-trunking of some of the existing road, the DEFRA transects commenced at the existing A1 but, where the off-line section was planned, additional transect lengths and point counts were added. This was done to ensure both the results for the 1 km from the existing A1, and the 1 km from the new proposed route could be calculated to allow the assessment of future monitoring against both baselines as required. This meant that Transects 2, and 3 had an additional four point counts added to the end (making a total of 15 point counts, with point counts five to 15 covering the 1 km from the proposed scheme), and Transect 4 had a single

[13] Wildlife Acoustics EchoMeter Touch detectors connected to an iPad air 2 or iPad mini 2, or on occasion an EchoMeter 3 unit with integral recording.

[14] A bat pass was taken to be a series of echolocation calls from a single bat lasting for no more than 10 seconds. For example, a single bat recorded for an entire five-minute stop at a point count would represent 300 seconds of bat activity or 30 bat passes. If two bats were recorded at the point count for half the time the same number of bat passes would be noted although (where possible to detect) the number of bats would also be noted on the survey form.

[15] Berthinussen A. & Altringham J. (2015) WC1060 Development of a cost effective method for monitoring the effectiveness of mitigation for bats crossing linear transport infrastructure. http://sciencesearch.defra.gov.uk/Default.aspx?Module=More&Location=None&ProjectID=18518

additional point count added to the end (making a total of 12 point counts, with point counts two to 12 covering the 1 km from the proposed scheme).

2.8.3 It is acknowledged that this deviates from the guidance in the DEFRA document but, comparison of bat activity recorded at point counts over 1 km from an existing scheme has some precedent[16], as has the comparison of bat activity at point counts completed more than two hours after sunset (BCT guidance suggests transects (with point counts) should finish between two and three hours after sunset, with one lasting between sunset and sunrise)[17]. in practical terms, the only variable affected by this deviation is time. Time is a factor that can be corrected for in the statistical modelling and therefore this approach was considered to be a pragmatic/proportional solution (in line with the spirit of the guidance) to obtain baseline data for both future monitoring of the offline section and the assessment, when compared to the alternatives of completing separate transects, or completing only 1 km transects at either the existing or proposed A1 locations.

2.8.4 As the scheme is currently unbuilt, the additional transect sections and point counts are reported in Appendix G, but are not analysed in this report. The transect routes and point counts, including the location of the additional sections, are shown in Figure 4.

2.8.5 The transects were surveyed on 22 August 2017 by teams of two ecologists. The transects commenced at 30 minutes after sunset and lasted for approximately two hours (up to approximately three hours if more than 11 point counts were required). Each team used an EchoMeter Touch bat detector connected to either an iPad air 2 or iPad mini 2 to sample the bat activity for 10 minutes at each point count. As per the published methodology, the surveyors also recorded the time, wind speed, and temperature at each point count, along with the habitat classification score as defined below:

- 1 – Fence or wall lining road / path and open fields beyond;
- 2 – Hedges / shrubby verges lining road / path and open fields beyond;
- 3 – Intermittent medium trees / bushes lining road / path and open fields beyond;
- 4 – Intermittent tall trees lining road / path and open fields beyond; or
- 5 – Continuous tall tree cover lining road / path with woodland and / or open fields beyond.

2.8.6 Once the ten-minute sampling was complete at the point count, the surveyors walked as quickly as possible to the next point count location. All transect surveys commenced half an hour after sunset. Five of the transects were walked from the scheme to a distance of 1 km away and five were walked in the opposite direction. The transect surveys were recorded in their entirety for subsequent analysis and verification.

2.8.7 On completion of the survey, a multiple regression model was built to investigate the relationship between bat activity and distance from the existing scheme, and at the same time, examine the effects of other variables (time and habitat) that could potentially influence bat activity and hence the relationship. This was performed by fitting appropriate generalised estimating equations (GEE) using the Geeglm function from the library Geepack (Halekoh, Højsgaard & Yan 2006) in the R program[18]. This approach was used to account for within cluster correlation that violates the independence assumption in conventional regression analyses and leads to Type 1 errors. GEEs adjust regression

[16] Berthinussen A. & Altringham J. (2012) *The effect of a major road on bat activity and diversity*. Journal of Applied Ecology. Vol 49, p82-89.

[17] Collins J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.).* Bat Conservation Trust, London.

[18] R Core Team (2017) version 3.4.0 (https://www.r-project.org/)

coefficients and variance to account for spatially and temporally correlated data, which is common in ecological research. In this study, a first-order autoregressive model AR(1) was used to account for auto-correlation between spot checks conducted along the same route and on the same night. Transect routes were assumed to be independent. A fully iterated jackknife estimation principle was used to avoid bias because of small number of clusters. A Gaussian distribution with an identity link was used.

2.8.8 Explanatory variables used in the model were distance from the road, time after sunset (either specified as a linear term or as a quadratic term) and habitat type. Six a priori models were specified and model selection was based on Quasilikelihood under the Independence Model Criterion (QICu) values, with the model with the lowest QICu value selected as the best fitting and most reliable model. Plots of residuals were examined to check for normality and assess the appropriateness of the fitted model. Models for individual species or genera in this study were carried out where the species/genera were recorded at more than 20% of point counts.

2.9 Static Automated Surveys

Song Meter 2 Surveys

2.9.1 A total of 20 static detector locations, representative of the habitats present within the survey area, were identified. The habitats and features of potential bat interest present within 2 m, 25 m, 50 m, and 100 m of each static detector location were recorded.

2.9.2 Static detectors comprising Song Meter 2 (SM2) real time expansion bat detectors were deployed in five of the 20 static detector locations. The SM2 detectors were located in what was judged to be the five locations most representative of the broad habitat types likely to be well used by bats within the survey area. The SM2 detectors were used as they were able to record for a minimum of five nights per month, and were available for deployment from the beginning of the survey season (April 2017).

2.9.3 The SM2 static detectors were placed in the following locations / habitat types present within the survey area:

- SD6 - Ponds, stream and scrub;
- SD9 - Open pasture;
- SD10 - The River Coquet;
- SD18 - Woodland and stream; and
- SD19 - Arable farmland

2.9.4 The detectors were set to record from half an hour before sunset until half an hour after sunrise, for a minimum of five nights per month between April and October 2017 (inclusive). Each static detector location is shown on Figure 5. The SM2 settings used during the surveys are shown in Table 5 below.

Table 5 - SM2 Recording Settings

Parameter	Setting
Sample rate	384000
Channels	Mono-L
File Format	WAC4
High pass frequency	fs/32
Low pass frequency	Off
Location	55.25N, 1.71 W

2.9.5 Weather data was obtained from www.wow.metoffice.gov.uk with September and October data verified by recordings made on a Vantage Vue Integrated sensor suite mounted at a height of 2 m at location: NZ 18671 90366 (i.e the same location as SD19). For ease of analysis the precipitation data was converted to a rainfall index score as detailed in Appendix H. The index score gave a value between 1 (poor) and 10 (good), weighted to take account of the likely increased effect rain in the first hour after sunset would have on bat activity, relative to that later in the night.

2.9.6 All five SM2 detectors were deployed in a single day so that the commencement of the recording period was the same for all detectors. Five consecutive nights of data were collected for May, July, August, September and October; with six consecutive nights collected (due to battery performance and deployment / collection logistics) for April and June. The recorded data was analysed as identified in Section 2.11. The average nightly number of passes[19] was then calculated for each static detector location during each deployment. The weather data was used to help interpret the results. The nights each detector was deployed and active for are shown in Appendix I together with key weather information for each active night.

Peersonic IP67 Surveys

2.9.7 Static detectors comprising Peersonic IP67 direct sampling detectors were deployed in each of the 20 locations along the length of the proposed route as shown in Figure 5.

2.9.8 The detectors could be set to wake or sleep at either 0, 15, 30, or 45 minutes past any designated hour. Therefore, the detectors were set to wake at the 15-minute point closest to 45 minutes before the time of sunset on the day of deployment, and sleep at the 15-minute point closest to 45 minutes after sunrise on the first morning after deployment.

2.9.9 Peersonic detectors were deployed once per month from July to October 2017 inclusive and left to record until either the 3,000 file limit was reached, or the batteries ran out.

2.9.10 The settings used during the deployment of the Peersonic units are shown in Table 6 below.

Table 6 - Peersonic IP67 Recording Settings

Setting	Month	
	July	August - October
Input Gain	-2	0
Auto Record Threshold	-20	-45
Maximum recording length	2 minutes	

2.9.11 Weather data was obtained as detailed in Paragraph 2.9.5.

2.9.12 All 20 Peersonic detectors were deployed in a single day so that the commencement of the recording period was the same for all detectors. All nights with recorded data were analysed as identified in Section 2.11. The average nightly number of passes[20] was then calculated for each static detector location during each deployment. The weather data was used to help interpret the results. The nights each detector was deployed and active for are shown in Appendix H together with key weather information for each active night.

[19] For static detector surveys a bat pass was taken to be a single sonogram file.
[20] For static detector surveys a bat pass was taken to be a single sonogram file.

2.10 Crossing Point Surveys

2.10.1 Bat activity CP surveys were conducted at fifteen locations along the proposed scheme. The locations were chosen using the aerial photography and Google Streetview as well as existing knowledge of the survey area gathered during previous ecology survey work.

2.10.2 The aim of the CP surveys was to determine the height and frequency at which bats were crossing the existing scheme at the potential crossing points. Although the scheme was partly offline, data over the existing A1 was identified as most useful in determining the key locations where retaining east-west connectivity is important. Together with the knowledge of the embankment and vegetation height, this was also considered key in determining the risk to bats flying across the proposed scheme. The locations of the crossing points are shown on Figure 6. The fifteen crossing points were surveyed over two or threenights by between three and eight survey teams each night. Each crossing point was surveyed on three occasions, once in spring (March), once in summer (July), and once in autumn (September). The surveys were conducted at dusk, and commenced 30 minutes before sunset, ending two hours after sunset. The dates and timings of the surveys are shown in Appendix J.

2.10.3 Each survey team recorded details of the crossing point structure and made a sketch detailing road width and height and distance of vegetation from the road. Bat activity was recorded in terms of whether the bat crossed the road or not, the height band at which it crossed relative to the road surface (A: below the road; B: 0–2 m above the road, C: 2–5 m above the road; and D: more than 5 m above the road surface), and the direction from which it travelled. Surveyors recorded all bats which crossed the road, partially crossed, and attempted to cross but turned back. General foraging activity was not recorded, except for noting the first bat of each species. Bat activity was recorded throughout the surveys using the equipment detailed in Footnote 12 (Paragraph 2.6.1 above). Weather conditions, as described in Paragraph 2.6.4 above, were recorded at the start and end of each survey. The recorded weather data is shown in Appendix J.

2.11 Sonogram Analysis

2.11.1 WAC recordings from SM2 static detectors and EM3 detectors were converted into ZCA and WAV format using Kaleidoscope 2.0.7. During the conversion a filter was applied to filter out noise files. WAV files recorded from the Peersonic units were also filtered using the same version of Kaleidoscope. The settings used during the filter process are given in Table 7 below:

Table 7 Kaleidoscope filter settings

Signal of Interest	
Kilohertz	9 - 120
Milliseconds	1 - 500
Minimum number of calls	2

2.11.2 All noise files filtered out during the conversion process were saved but not analysed or included in subsequent data counts. Where surveyors had recorded bat species in the field but similar sonograms were not present in the filtered files, the noise files were searched. Where sonograms were still not present, the surveyor made a judgement call, based on their confidence in the field.

2.11.3 The converted files were analysed using AnalookW v3.3q (Corben, 2006) Anabat data analysis software. Where calls were still unclear, the corresponding WAV file was analysed using BatSound v3.3.1.1 or Kaleidoscope v4.5.4.

2.11.4 WAV files from Duet detectors were analysed using BatSound v3.3.1.1.

2.11.5 Any amendments to species identification were marked onto the survey sheet using a different coloured pen. The date of the check was also marked.

2.12 Survey Limitations

Desk Study

2.12.1 It should be noted that an absence of desk study records for particular species does not necessarily convey an absence of such species in that area, but is often a facet of under-recording. Because the desk study is designed to give an overview of the species already recorded in the local area, and used as indicative data prior to more detailed surveys such as bat activity and commuting route surveys, it is not considered to be a significant constraint.

Field Survey

General

2.12.2 Bat surveys undertaken using bat detectors are inherently biased. Bats with louder calls (such as the *Nyctalus* species) will be recorded at a greater distance (and therefore each bat will be recorded more frequently) than species which use quiet calls such as *Plecotus* species. This affects the results of all surveys undertaken and the number of times that each species present will be recorded. The analysis of the results of the transect and static detector surveys takes this discrepancy in detectability into account. This limitation is not considered to be significant for the other survey types because in those surveys the primary means of identification of key bat activity (e.g. bats emerging from a building or tree, or crossing a road) is visual.

2.12.3 Species identification by sonogram is limited (to a certain extent) by similarities in call structure. In addition, all bats can modulate their calls according to the habitats they are navigating, their behaviour and the information they require at the time. This imposes limitations on reliable analysis particularly between species of the same genus in the genera: *Plecotus, Myotis* and *Nyctalus*. Due to the geographical location and habitat structure within the survey area every *Plecotus* bat recorded was assumed to be a brown long-eared bat *Plecotus auritus* and unidentified *Myotis* species were assumed to be either Daubenton's bat *Myotis daubentonii*, whiskered bat *Myotis mystacinus*, Brandt's bat *Myotis brandtii* or Natterer's bat *Myotis Nattereri*. *Nyctalus* species were separated where possible but grouped where call parameter overlap prevented reliable identification.

2.12.4 Due to similarities in ecology and flight behaviour (within the species likely to be present within the site) the mitigation to reduce any impact is likely to be similar for all species present within *Myotis* or *Nyctalus* genera's. Therefore, as long as any potential impacts recognise that the numbers of each individual species within the genera may be much lower than the total *Myotis* or *Nyctalus* recordings, identification to species level is not considered a significant limitation.

Roost Surveys

2.12.5 Of the ten buildings with identified bat roost potential within the survey area (B4A, B8A, B10A, B13A, B84A, B86A, B101A, B104A, B106A, and B109A), internal building inspections were completed on just three, Buildings B8A, B10A, and B13A, due to a lack of access. Building 86A was a high bridge carrying the A1 over the River Coquet and therefore an internal survey was not practical as it would have entailed a substantial amount of scaffold or other access techniques from the bridge deck, adjacent to live traffic.

2.12.6 With the exception of Building 101A (previously identified as having low BRP) where no access at all was permitted, all other buildings were subject to emergence and dawn survey. Building 101A is discussed in Table 8 below, for the other buildings, although the lack of internal survey may have meant that historical roosts were missed, the combination of the

desk study and fieldwork achieved was considered proportionate to identify the bat use of the area.

2.12.7 Survey limitations identified for Building 101A, and the tree and building evening emergence and dawn re-entry surveys undertaken are presented in Table 8 below.

Table 8 Tree and Building Survey Limitations

Tree / Building number	Limitation	Significance
B8A	No access was available to complete any emergence, re-entry surveys.	Old bat droppings were identified during the internal building inspection. The number and age of the droppings indicated that it was not a frequently-used roost. Because the droppings identified the building as a confirmed bat roost, the lack of emergence and re-entry survey information is considered less problematic in understanding the way the area is used by bats as a precautionary approach to the evaluation and impact assessment can be taken.
B10A	No access was available to complete any emergence, re-entry surveys.	These buildings may have supported roosting bats but it is considered probable that the presence of a large roost would have been identified by the internal inspections completed on 30 August, or the CP surveys undertaken at the nearby (225 m east) CP2. The lack of detailed information about a potential smaller bat roost in either of these buildings is not considered likely to significantly affect the understanding of the bat use of the area.
B13A	No access was available to complete the emergence and re-entry surveys.	
B104A and B106A	Access to survey these buildings was not permitted until the end of August 2017. The second survey of two, a re-entry survey was undertaken during low temperatures (start temperature 6°C and end temperature 3°C).	Although the temperature was low, and the survey conducted was a re-entry survey late in the year, a bat was recorded during the survey, indicating that conditions were not unsuitable for flight by bats (although temperatures may have resulted in a reduced number of flying insects). It is acknowledged that the level of activity was likely to have been substantially reduced and therefore it is possible that a roost may have been present in either building that was not picked up. It is also considered possible that a maternity colony could have been present in either building earlier in the year, before surveys were permitted. It is considered likely however, that clues to the presence of a substantial roost would possibly have been picked up during the CP surveys at CP12 (approximately 200 m to the east), the survey of Building

Table 8 Tree and Building Survey Limitations

Tree / Building number	Limitation	Significance
		84A (approximately 80 m to the east), or the bat transect survey (specifically at PC44, or PC45 which were 75 m, and 40 m distant respectively). Each of the locations identified were located between B104A/B106A, and the bulk of the proposed scheme. No bat activity indicative of the presence of a substantial roost in these buildings was recorded.
B101A	No access was provided and therefore no surveys undertaken.	Building 101A was located approximately 30 m to the east of Buildings 104A and 106A. Building 101A was being renovated and appeared to be in the process of conversion from agricultural use, to dwelling(s) at the time nearby surveys were being undertaken. It is considered reasonable to assume that the lack of a European Protected Species licence record on MAGIC[21] is indicative of the likely lack of a bat roost in this building.
T136A (Roost)	All three activity surveys were emergence surveys and no re-entry surveys were undertaken.	A roost was identified on the initial survey. This, together with the trees structure and lack of foliage, meant that this was not considered a significant limitation.

Activity Transect Surveys

2.12.8 Part of the transect survey route could not be accessed during the August transect survey. This meant that Point Count 117 could not be sampled on this occasion. During the September transect survey, rain prevented the completion of the second evenings transect. This meant that a total of 25 point counts (PC11-14, PC23-27, PC35-39, PC49-53, and PC62-67) were not sampled. The lack of survey at these points has been taken into account when calculating the level of bat activity at each point count (e.g. the total number of passes recorded at Point Count 11 was divided by five (the number of minutes each PC is sampled for), then by six (rather than seven) to give its passes per minute score). The lack of sampling in August / September has been taken into account when assessing the survey results at the affected PC locations.

Static Detector Surveys

2.12.9 Not all Peersonic static detectors and SM2 static detectors worked on each deployment. Where a detector did not record, this is identified in Table 9 and Table 10 below, in the results section and Appendices H and I.

Table 9 Peersonic Detector Failures to Record

Peersonic Detector	Month During Which the Detector Failed to Record
SD1	July
SD2	September

[21] http://www.natureonthemap.naturalengland.org.uk/

Table 9 Peersonic Detector Failures to Record

Peersonic Detector	Month During Which the Detector Failed to Record
SD5	August, and October
SD6	October
SD7	August
SD8	October
SD9	July, and September
SD10	July, and September
SD12	September
SD14	July, and August
SD15	August
SD16	September
SD17	October
SD19	July
SD20	July, and September

2.12.10 As Table 9 above shows that no data was collected by the Peersonic detectors on 20 out of a total of 80 occasions. This means that 60 multiple-night recordings were captured from across the 20 locations. Where data was not available for a specific month in a specific location, the potential for this to have increased or decreased the average passes per night figure was taken into account when interpreting the results. The 60 successful deployments were considered sufficient to gain an understanding of the use of the habitat types within the survey area.

Table 10 SM2 Detector Failures to Record

SM2 Detector	Month During Which the Detector Failed to Record
SD6	April, June, and July
SD9	July[22]
SD10	July, and three days in August
SD18	One day in June, and two days in September
SD19	One day in July, and three days in October

2.12.11 As Table 10 above shows, the five SM2 detectors failed to record on five occasions with short recording periods on a further five occasions. This equated to a total of 37 missed recording nights out of a total of 185, or 20 %. Because the SM2 detectors were principally used to identify seasonal differences in the use of key bat areas, the weather and other static detector data was used to predict whether the lack of data for each specific location was likely to have increased or decreased the average number of passes per night for that month. This was taken into account in the interpretation of the results.

2.12.12 The limitations identified above are not considered to represent a significant constraint as the combination of bat surveys, comprising a variety of survey methods, is sufficient to provide a robust pre-construction baseline.

[22] The lack of recording on Detector SD9 in July was caused by a lack of access to the static detector location.

3 BASELINE

3.1 Summary

3.1.1 In summary, at least six bat species were recorded within the survey area following analysis of the desk study and survey results.

3.1.2 Because of the differences in flight behaviour and ability or willingness to cross gaps, the level of risk posed by a new road will differ significantly on a species by species basis. Many bat species have similar hunting behaviour and flight characteristics due to the fact that they occupy similar ecological niches; these similarities mean that the risks and mitigation required for species with similar ecological niches are broadly the same. For the purposes of this report the bats recorded have been classified as cluttered habitat; edge habitat or open habitat species with the flight characteristic assumptions as shown in Table 11 below.

Table 11 Species groups and general characteristics

Ecological niche	Genus	Species	Flight speed	Willingness to cross gaps and open habitat	Flight height	Light tolerance
Cluttered habitat species	*Myotis*	Natterer's bat (*Myotis nattereri*)	Slow	Least willing to cross gaps and open ground.	Generally fly close to linear features, when crossing open habitat will usually fly close to the ground	Least tolerant of light. Artificial lighting may present a barrier to these species.
		Daubenton's bat (*Myotis Daubentonii*)				
		Whiskered bat (*Myotis mystacinus*)				
		Brandt's bat (*Myotis brandtii*)				
	Plecotus	Brown long-eared bat (*Plecotus auritus*)				
Edge habitat species	*Pipistrellus*	Common pipistrelle (*Pipistrellus pipistrellus*)	Medium	Will regularly cross small and medium sized gaps	Tend to fly within 10 m of the ground / linear features	Mixed - some species such as pipistrelles will hunt insects drawn to lights, other edge habitat species such as Barbastelle (not present here) are likely to avoid lighting.
		Soprano pipistrelle (*Pipistrellus pygmaeus*)				
		Nathusius pipistrelle (*Pipistrellus nathusii*)				
Open habitat species	*Nyctalus*	Noctule (*Nyctalus noctula*)	Fast	Open habitat does not present a problem for these species	Usually fly high 10 m + above open habitat	Light tolerant, will often predate insects drawn to lights.
		Leisler's bat (*Nyctalus leisleri*)				

3.1.3 The level of activity within the survey area varied considerably, with some areas regularly registering relatively high levels of bat activity and other areas registering no, or relatively very low levels. This variation in the level of activity was species specific with particular habitats / locations preferentially used by specific groups.

3.2 Previous Survey Work and Desk Study

3.2.1 The A1 in Northumberland Bat Roost Potential Report (Jacobs 2017) reports the findings of the desk study and previous survey work.

3.3 Tree Climb and Inspect Surveys

3.3.1 Following the scoping out of trees previously identified as having low BRP, and those located beyond the 50 m or 100 m buffer (as required) following refinement of the proposed options, 27 trees with moderate or high BRP were identified as requiring a climb and inspect survey.

3.3.2 Following the climb and inspect survey of all 27 trees 13 of the trees previously identified as having moderate BRP were downgraded; of these seven were re-classed as having low BRP and six re-classed as having negligible BRP. There was no change in the grade of five high BRP trees, or seven trees previously identified as having moderate BRP. The BRP grade of two of the trees was upgraded from moderate to high BRP.

3.3.3 During the climb and inspect surveys, additional access and vantage points allowed the identification of a further 19 trees with some BRP (low – high BRP). No bat roosts were identified in trees during the climb and inspect surveys.

3.3.4 The number of trees assigned each level of BRP following the climb and inspect surveys is given in Table 12 below and Appendix B. Each tree location is shown on Figure 2[23].

Table 12 bat roost potential of trees following climb and inspect surveys

BRP following the climb and inspect survey	Number of trees	Tree reference number
Negligible	6	2A, 53A, 68A, 69A, 111A, 142A
Low	12	16A, 44A, 55A, 108A, 109A, 110A, 157A, 204A, 205A, 218A, 219A, 221A
Moderate	16	45A, 54A, 56A, 131A, 136A, 152A, 156A, 203A, 206A, 211A, 212A, 213A, 214A, 216A, 217A, 220A
High	12	36A, 51A, 112A, 128A, 147A, 148A, 201A, 207A, 208A, 209A, 210A, 215A
Confirmed Bat Roost	0	N/A

3.4 Internal Building Inspections

3.4.1 The internal inspections of Buildings 8A, 10A, and 13A identified the presence of a bat roost in B8A. No other bat roosts were identified through the internal building inspections.

3.4.2 The bat roost in Building B8A was identified through the presence of approximately 15 bat droppings. The droppings were of medium size and relatively old. Samples of the droppings present were taken and sent to Nature Metrics for DNA analysis. The DNA analysis did not identify the presence of any bat DNA, only the DNA of the white-shouldered house moth (*Endrosis sarcitrella*), and 14 species of fungus. It is possible that the age of the droppings

[23] The level of BRP potential shown in Figure 2 is the final grade following all survey undertaken and therefore is not representative of the grade identified in this table. All changes to the BRP grade given to each tree during the course of the surveys reported here are identified in Appendix B.

meant that any bat DNA had “degraded beyond the limits of detection”. An extract from the Metabarcoding Results report is included as Appendix K.

3.5 Evening Emergence and Dawn Re-entry Surveys

3.5.1 Following the scoping out of trees, buildings and structures identified as having low or negligible BRP, and those located beyond the 50 m or 100 m buffer (as required) following refinement of the proposed options, 28 trees, and ten buildings / structures were identified as requiring emergence and dawn surveys.

3.5.2 The surveys identified the presence of bat roosts in three of the buildings / structures: Building B4A, B84A, and B86A. The roosts comprised two small soprano pipistrelle roosts (B84 and B86, one and two bats respectively), and one common pipistrelle roosting in B4A. A brown long-eared bat was also thought to have emerged from Building B84A.

3.5.3 The evening emergence and dawn re-entry surveys completed on the trees identified a total of four roosts in four different trees (T220A, T136A, and two separate roosts in bat boxes on the two trees identified as T147A). All four were small (one to three bats) soprano pipistrelle roosts.

3.5.4 Additional species recorded in flight during the emergence and re-entry surveys comprised: *Myotis* species, noctule, and additional *Nyctalus* bats that could not be determined to species level from their calls.

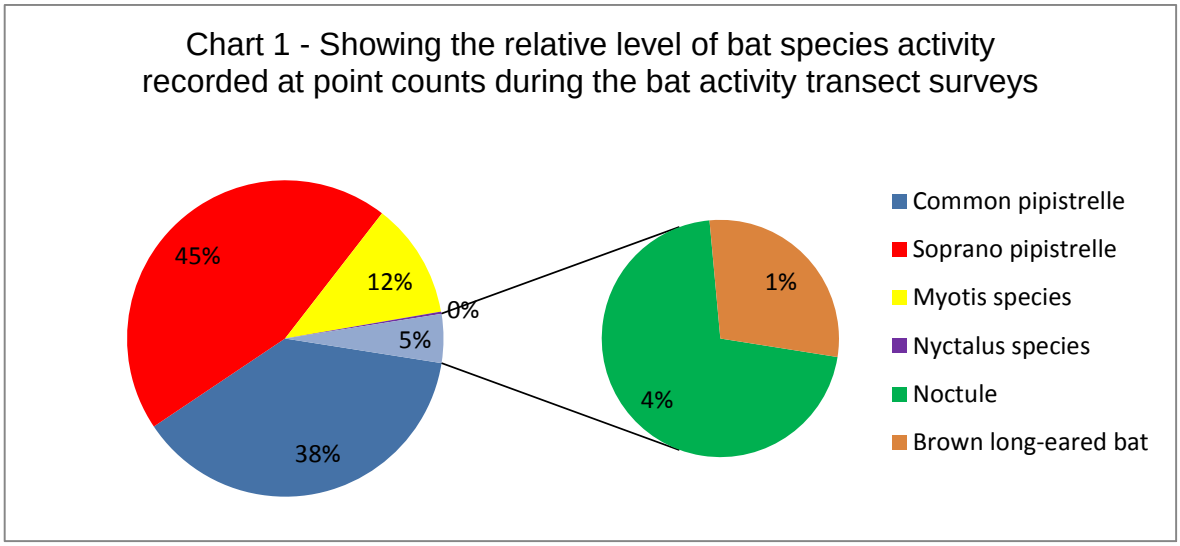
3.5.5 The full results of the evening emergence and dawn re-entry surveys are included in Appendix B, C, and D.

3.6 Transect Surveys

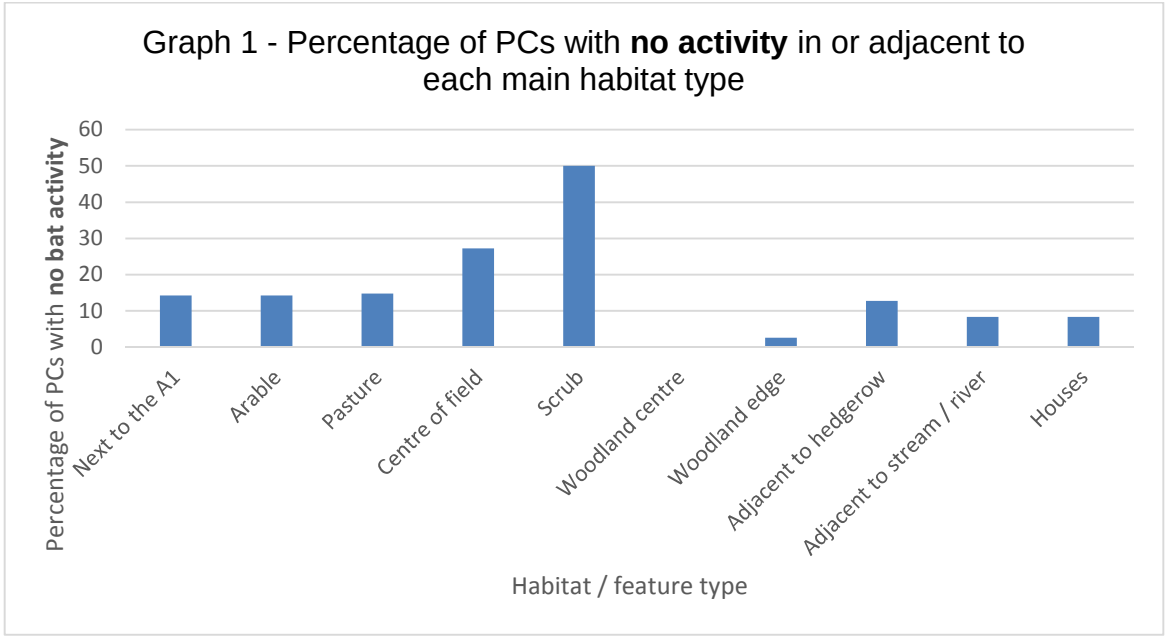
3.6.1 At least five bat species were recorded at point counts within the survey area during the transect surveys. The species recorded comprised common pipistrelle, soprano pipistrelle, noctule, and brown long-eared bat. In addition, bats from the genera *Myotis* (which could have comprised Daubenton’s bats, Natterer’s bats, whiskered bats, and/or Brandt’s bats) and *Nyctalus* (which could have been either Leisler’s bat, and/or noctule) were recorded.

3.6.2 During the transect surveys the most commonly encountered species was soprano pipistrelle which made up 45 % of all passes. The second most commonly recorded species was common pipistrelle. Soprano pipistrelle, common pipistrelle, and *Myotis* bat species were recorded during each transect survey. Noctule were recorded on all bar the April and October transects with unidentified *Nyctalus* bats recorded in May and August. Brown long-eared bats were only recorded during the May, July, and August transects.

3.6.3 Chart 1 shows the percentage breakdown of bat passes by species, recorded during all transect surveys.



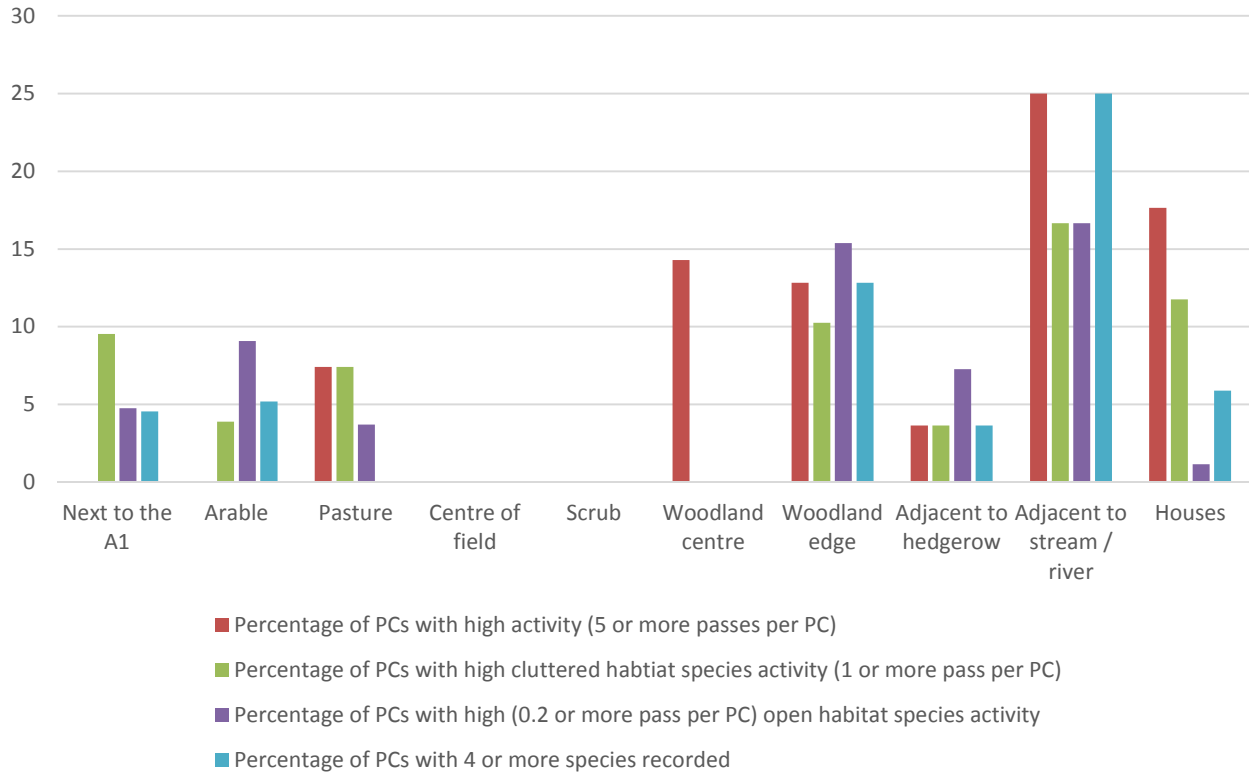
3.6.4 No bat activity was recorded at 17 point counts (Point Count: 4, 18, 39, 40, 48, 60, 74, 76, 81, 83, 94, 95, 97, 104, 105, 107, and 115). As shown on Figure 3, six of these point counts were located in the southern half of the scheme, and 11 in the north. As Graph 1 below shows, the habitat which most frequently recorded no activity (relative to the total number of point counts in that habitat type) was scrub. All point counts located in the habitat type woodland centre recorded some bat activity across all six transect surveys combined. Point counts located in the centre of fields recorded no activity more frequently than habitats adjacent to boundary features such as woodland edge, hedgerows, or rivers and streams, even where these were located adjacent to the existing A1.



3.6.5 The habitat with the highest percentage of point counts recording high levels of bat activity (determined as the percentage of point counts with an average of five or more passes; the percentage of point counts with an average of one or more passes by cluttered habitat species; the percentage of point counts with an average of 0.2 or more passes by open habitat species; and the percentage of point counts with four or more species recorded)

was habitat 'adjacent to stream / river'[24]. Point counts in the vicinity of habitat types 'woodland edge', and 'houses', were also above average in terms of the percentage of point counts that met these criteria, although point counts in the vicinity of houses were less likely to record higher levels of open habitat species activity. This is shown in Graph 2 below.

Graph 2 - Percentage of PCs with 'high activity' levels in or adjacent to each main habitat type

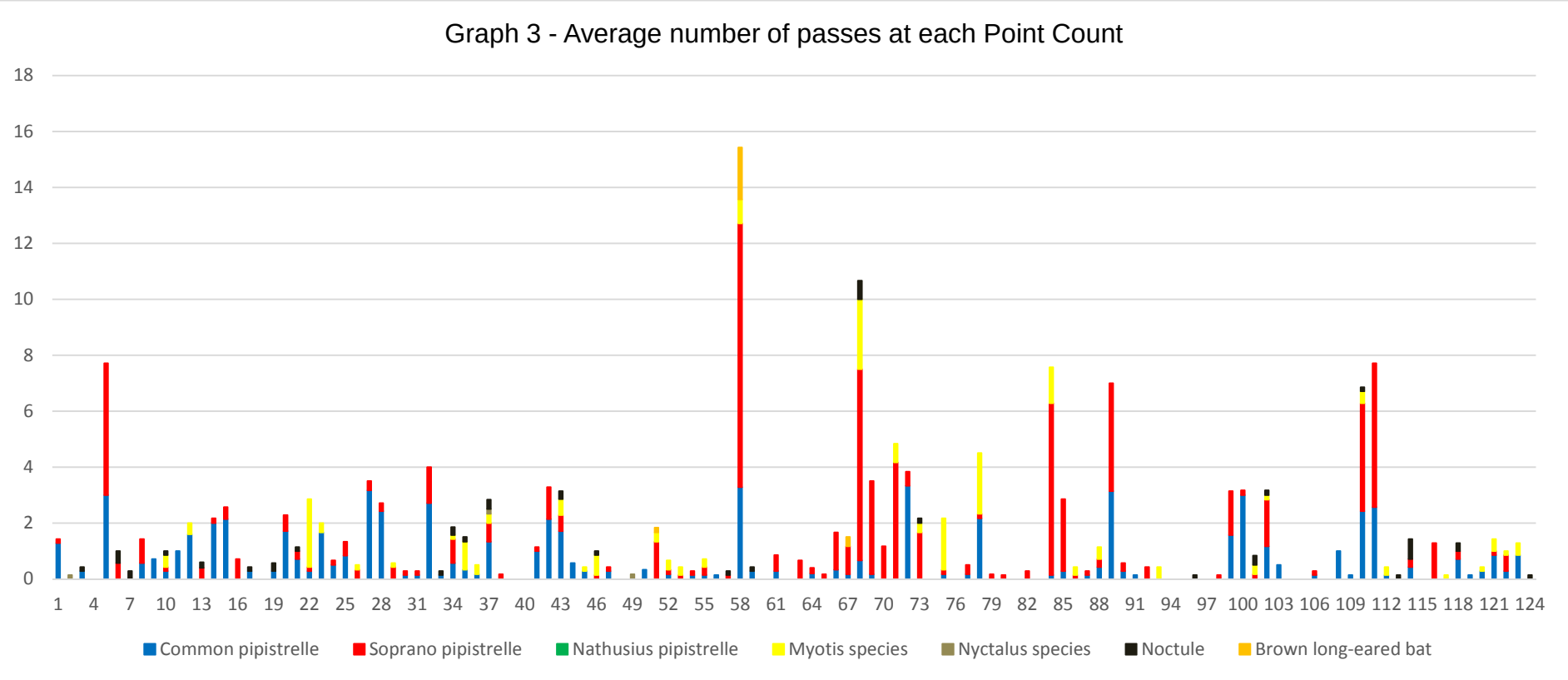


3.6.6 The highest level of activity overall was recorded at Point Count 58 (with an average of 15.4 passes per point count (PPPC) recorded). Point Count 58 was located at Mill Banks, beneath B86A, the existing A1 road bridge over the River Coquet.

3.6.7 Point Count PC68 (9.1 PPPC) recorded the next highest level of activity with Point Counts PC5, PC84, PC89, and PC111 all recording an average of seven or more PPPC. These point counts were located: by the River Coquet in West Thirston; near Banktop Plantation close to the southern end of the scheme; adjacent to the pond and Longdike Burn in Bockenfield Holiday Park; at Helm Wood near the Eshott turn off; and at Hangingleaves Wood respectively.

3.6.8 A breakdown of the mean activity level recorded at each point count is shown in Graph 3 below with the location of each point count and the named woodlands identified in Figure 3.

[24] NB because the majority of bat activity comprised edge habitat species, the activity of this group was not substantially different from the percentage of point counts with an average of five or more passes. Because of this, and for ease of viewing, this information is not graphed or specifically presented.



3.6.9 Although no strong commuting routes were recorded during the transect surveys, the data showed that The River Coquet which crossed the survey area from west to east was a well-used resource by bats in the local area.

3.6.10 The areas to the north of Bockenfield airfield (PC58, PC67, PC68, PC75, and PC78), in the vicinity of Bockenfield Holiday Park (PC35, and PC84), and Hangingleaves Wood (PC10, and PC110) were also well used by a wide range of bat species both to the east and west of the carriageway.

3.6.11 Noctule was the only open habitat species recorded during the transect surveys although additional *Nyctalus* bat passes (which could have been either noctule or Leisler's bats) were also identified. Noctule were recorded at 26 of the 124 point counts, with *Nyctalus* bats recorded at an additional two point counts. The overall level of open habitat species activity was relatively low and was not focused on a particular area or habitat type.

3.6.12 Two edge habitat species were recorded during the transect surveys, namely soprano pipistrelle, and common pipistrelle. As identified above, the soprano pipistrelle and common pipistrelle activity comprised a large proportion of the overall bat activity recorded. Both soprano pipistrelles and common pipistrelles were recorded at 75 of the 124 point counts. At most point counts common pipistrelle activity was more numerous than soprano pipistrelle, although soprano pipistrelle activity was higher in the area around the River Coquet (PC58 – 71).

3.6.13 Cluttered habitat species were recorded at 37 of the 124 point counts with *Myotis* species recorded at 36 of these and brown long-eared bats recorded at just three. As well as recording one of the highest levels of activity overall, Point Count 58 was also the location where most brown long-eared bat activity was recorded. Likewise Point Count 68 recorded relatively high levels of overall activity and was also the location which recorded the highest level of *Myotis* bat activity. These two locations were both adjacent to the River Coquet. Point Count 22 near New Houses Farm also recorded a particularly high level of *Myotis* bats species activity.

3.7 Bat DEFRA Transects

3.7.1 A total of 779 bat passes were recorded during the DEFRA transects. Distance was the only variable in the model with the lowest QICu. Distance from the road was found to have a low but significant positive effect on the number of bat passes ($p=0.418$, χ^2 4.142). The results are given in full in Appendix G.

3.7.2 Six species / genera (noctule, common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, *Myotis* bat species, and brown long-eared bat) were recorded in total during the DEFRA transects. Of these, noctule, common pipistrelle, soprano pipistrelle, and *Myotis* species were recorded at more than 20% of the point counts.

3.7.3 For noctule the model with distance only was the best fitting. Distance was not found to have a significant effect on the level of noctule activity recorded as distance from the road increased ($p=0.292$, $X^2 =1.11$).

3.7.4 For common pipistrelle, the model with the lowest QICu value only included distance as an explanatory variable. Distance was not found to have a significant effect on the level of common pipistrelle activity recorded as distance from the road increased ($p<0.13$, $X^2 =2.28$).

3.7.5 For soprano pipistrelle, the best fitting model contained both the distance and habitat terms. Distance had a low-level but significant positive increase on the level of soprano pipistrelle activity ($p= 0.0049$, $X^2 =7.92$) recorded as distance from the road increased. Although Habitat 1, 3, and 5 had low magnitude positive trends, and Habitats 2, and 4 had low magnitude negative trends (see Section 2.8 for definitions), no significant effect on the number of soprano pipistrelles was attributable to the difference in habitat category alone.

3.7.6 For *Myotis* species bats the model with distance as the only explanatory variable was the best fitting model. Distance was found to have a low-level but significant positive effect on the level of *Myotis* species activity recorded ($p=<0.0005$, $X^2 =18.13$).

3.7.7 The full species specific results are given in Appendix G.

3.7.8 The six species recorded during the transects was transformed into proportion data for each point count and models fitted. The model with the lowest QICu contained only the distance

explanatory variable term. Distance was found to have a significant effect on the probability of recording higher numbers of bat species ($p=<0.0046$, $X^2 =8.5$).

3.7.9 The full species diversity results are given in Appendix G.

3.8 Static Automated Detector Surveys

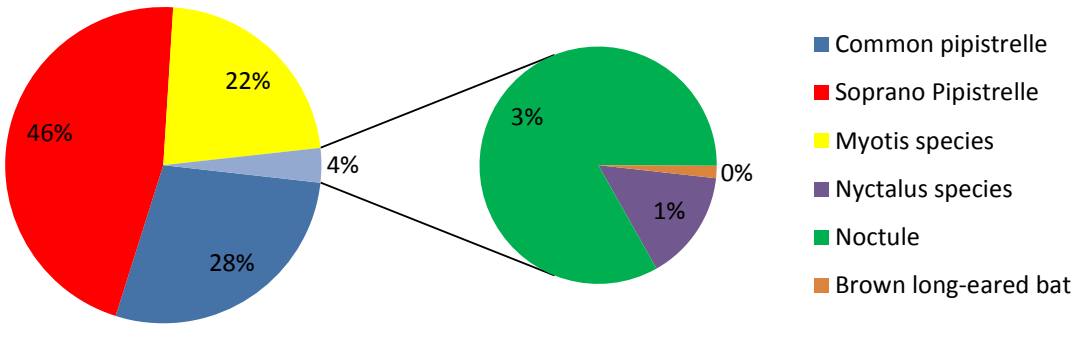
3.8.1 Static automated detectors were deployed in 20 locations within areas of representative habitat along the scheme. All locations were monitored using Peersonic IP67 detectors with five of the key locations also monitored using Song Meter 2 detectors. The location of each detector is shown on Figure 5. Due to differences in sampling methodology the results from the two separate survey methodologies are displayed and analysed separately below.

Song Meter 2 Detector Surveys

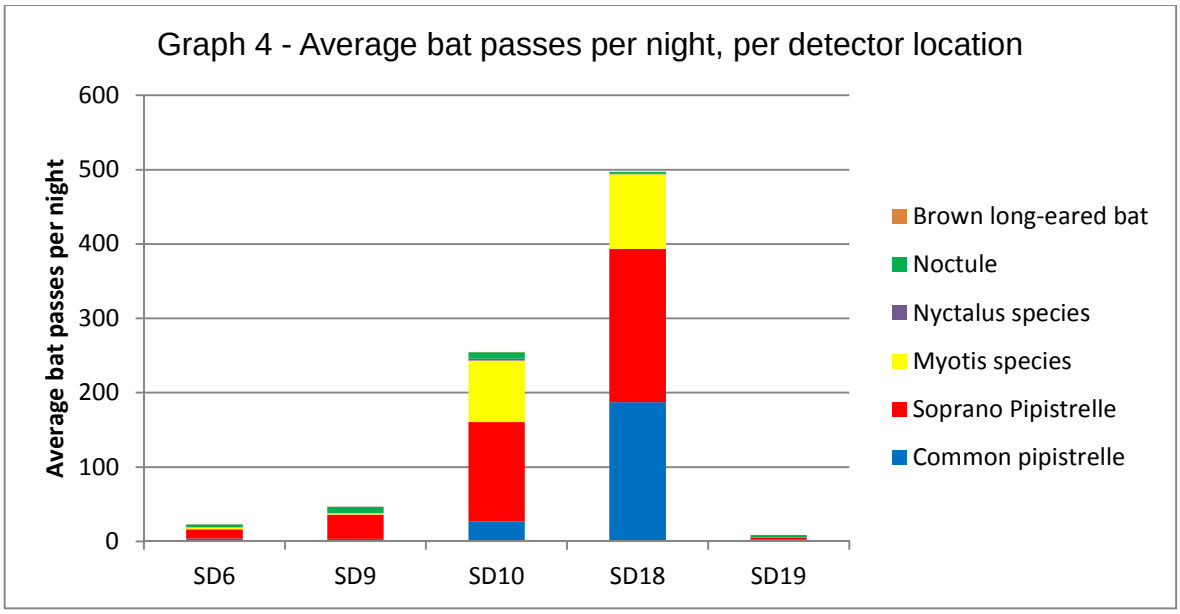
3.8.2 The Song Meter 2 detectors recorded at least one open habitat species (noctule and *Nyctalus* passes which could have been either noctule or Leisler's bat) and two edge habitat species (common pipistrelle, and soprano pipistrelle). At least two cluttered habitat species (*Myotis* and brown long-eared bat) were also recorded by the Song Meter 2 detectors.

3.8.3 The mean number of nightly passes recorded for all five Song Meter 2 detectors summed was 829.5. As shown in Chart 2 below, of the 829.5 passes per night, most passes were soprano pipistrelle (46%), with common pipistrelle (28%), and *Myotis* bat species (22%) passes making up almost all of the remaining activity.

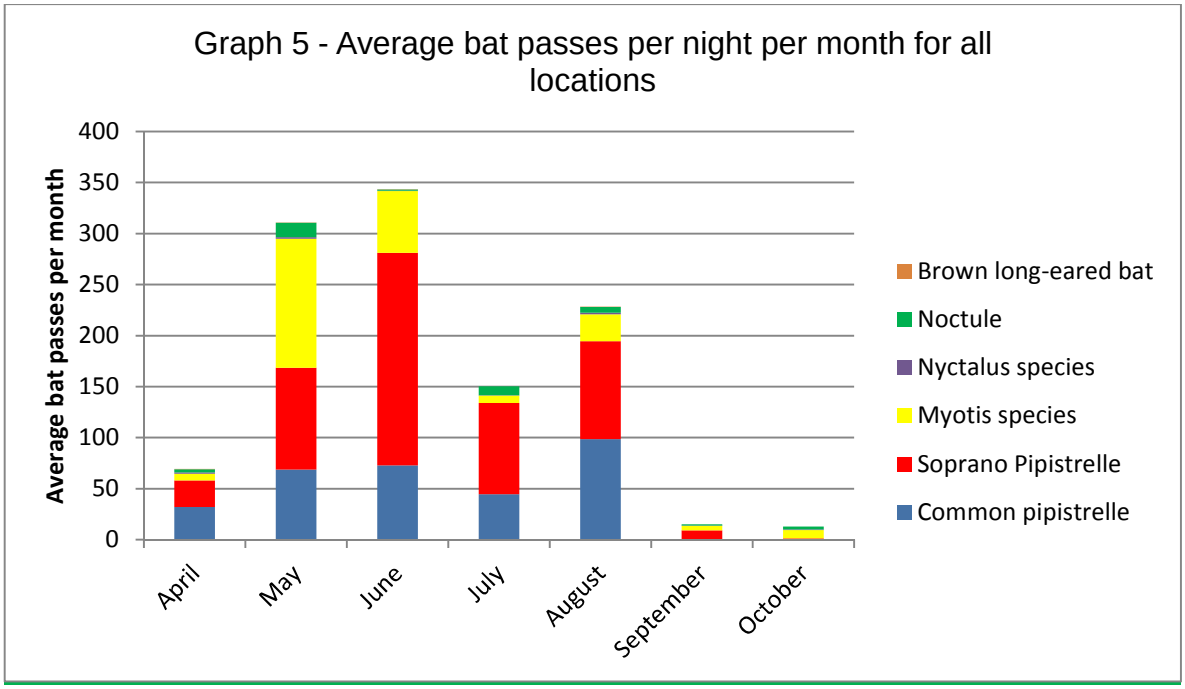
Chart 2 - Species composition- total bat passes from all SM2 Detectors



3.8.4 The bat activity recorded was not split evenly among the static detector locations. Detector location SD18 recorded most activity (59.9 %) followed by detector location SD10 (30.7 %). The mean number of nightly passes recorded on each detector is shown on Graph 4 below. The relatively high level of *Myotis* species activity recorded on detectors SD10, and SD18 was also notable.



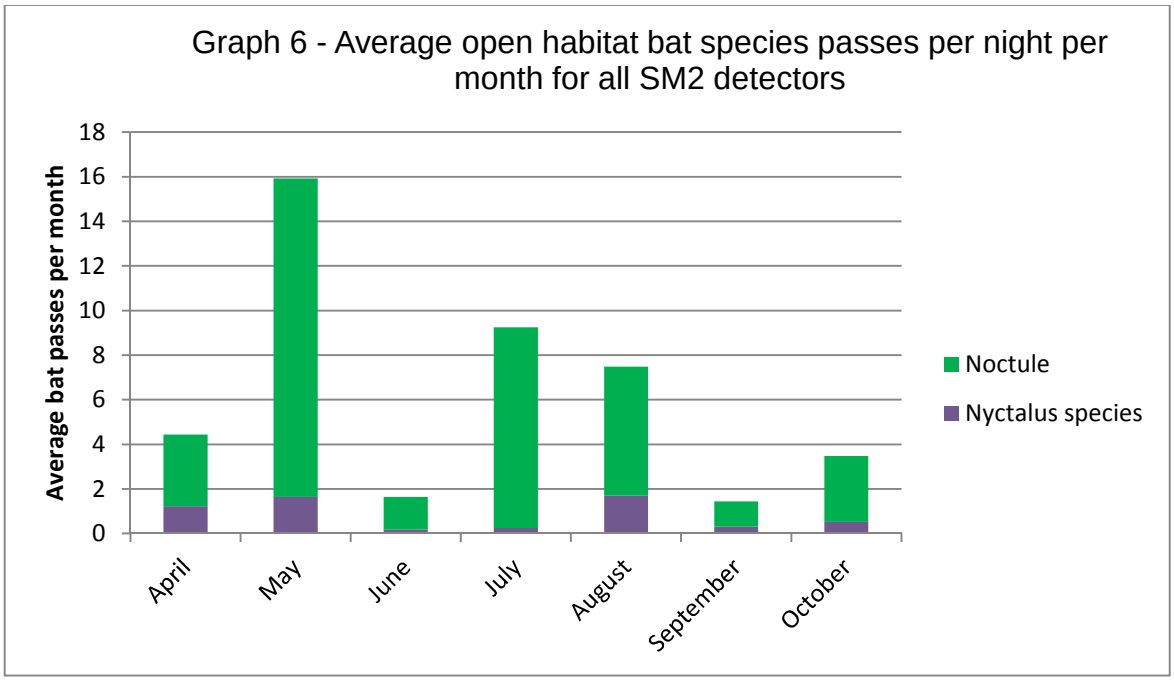
3.8.5 The level of bat activity recorded on the static detectors was higher in the May to August months than at the start or end of the recording period (as shown on Graph 5 below). This was despite the poor weather in July during the recording period.



3.8.6 Graphs showing the nightly breakdown of bat activity together with the rain index score and minimum nightly temperature are included in Appendix I. Illustrative summary graphs are included in the text in the rest of this section.

Open habitat species

3.8.7 The highest level of open habitat species activity was recorded on the detector located at SD10 (11.1 passes per night (PPN)) with the second highest amount of activity recorded on SD9. These two detectors were located at the northern end of the scheme, adjacent to the River Coquet, just to the west of the A1; and in the parkland to the east of the A1 respectively.



3.8.8 As shown in Graph 6 the *Nyctalus* activity recorded was highest in May, driven predominately by the results from Detectors SD9 and SD10. Detectors SD6 and SD9, both located in parkland habitat, also recorded a small peak in August, and Detector SD10 also recorded a single night of relatively high activity in October following a rise in minimum nightly temperature from 8.2°C to 11.4°C. The relatively high level of activity shown in July may be due, at least in part, to the failure of three of the detectors (SD6, SD9, and SD10) reducing the sample size.

3.8.9 The activity patterns recorded suggest that the area around the River Coquet was most important during the flux transitional periods and less well used during the peak maternity period.

Edge habitat species

3.8.10 Edge habitat species recorded comprised soprano pipistrelle and common pipistrelle. This species group made up the majority of bat activity recorded. Edge habitat species were recorded most often at locations SD10 and SD18. SD10 was sited at the northern end of the scheme to the west of the existing A1, just to the north of the River Coquet crossing. SD18 was located in Hangingleaves Wood, also just to the west of the existing A1.

3.8.11 The peak level of activity was recorded in June when an average of 281 edge habitat species passes were recorded on each detector per night. The slightly reduced level of activity recorded in July is likely to be at least in part due to the failure of detector SD10. It may also have been partly due to the variable weather conditions with some rain recorded on four of the five nights.

3.8.12 The data suggests that both the Hangingleaves Wood and River Coquet areas are important for edge habitat species with the survey area used by this species group throughout the year, but particularly in the maternity season.

Cluttered habitat species

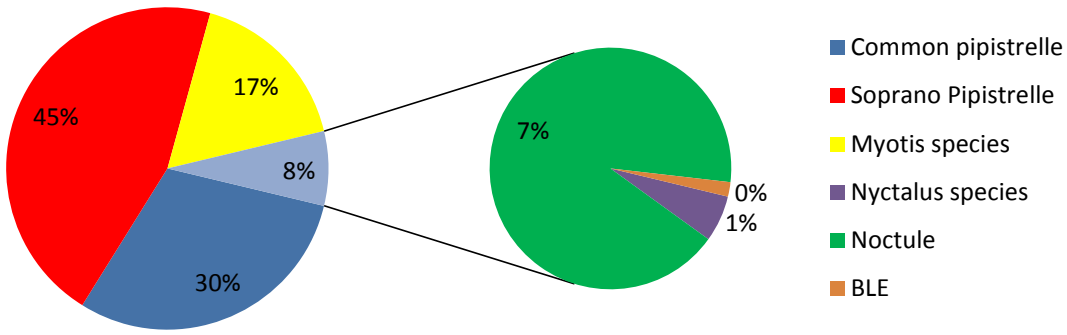
3.8.13 The level of cluttered habitat species (*Myotis* species and brown long-eared bat) activity recorded was relatively high at SD10 and SD18 with an average of 82.96 PPN, and 100.68 PPN recorded respectively. The other locations recorded an average of less than 3 PPN each.

3.8.14 *Myotis* calls made up the vast majority (99.7%) of the cluttered habitat species activity recorded. Cluttered habitat species activity was greatest in May, reducing slightly in June and substantially in July, before a slight rise in August. As with the edge habitat species, the reduction in activity in July is likely to be due in part to a lack of data from location SD10 in this month and the relatively poor weather conditions in July.

Peersonic IP67 Surveys

3.8.15 The bat activity recorded on the 20 Peersonic detectors at all static detector locations across the survey area identified a broadly similar breakdown of species activity to the SM2 detectors with slightly more noctule activity recorded and slightly less *Myotis* activity (as a proportion of all bat passes). This is shown in Chart 3 below.

Chart 3 - Species composition recorded by the Peersonic detectors - total bat passes from all locations



3.8.16 It was considered that the Peersonic detectors recorded relatively high levels of activity at six locations (SD1, SD3, SD5, SD10, SD14, and SD18). This matched with the SM2 results which also identified SD10 and SD18 as locations with relatively high levels of activity. Graphs showing the Peersonic IP67 survey data, together with the rainfall index score and minimum nightly temperature are included in Appendix H. Tables identifying the habitat recorded in the vicinity of each static detector are included in Appendix F.

Open Habitat Species

3.8.17 Location SD1 recorded substantially more open habitat species activity (192.5 PPN) than the other locations, the next highest being 4 PPN at SD20. The two locations with the highest level of open habitat species activity were both located at the southern end of the scheme, SD1 to the west of the existing A1 and SD20 located to the east. The two were well connected with woodland planting and the overbridge which carried the A697. Noctule social calls were recorded at SD1 in August (an example sonogram is included as Appendix L).

3.8.18 Of the remaining locations, higher average levels of activity were recorded on the west side of the A1 than on the east (apart from SD1, SD6 was the only other location on the east side of the A1 that recorded an average of two or more PPN compared to SD9, SD14, SD17, SD18, SD19, and SD20 on the west).

Edge Habitat Species

3.8.19 Edge habitat species (soprano pipistrelle and common pipistrelle) activity made up the majority of the total bat activity recorded. Therefore, the same six SD locations identified in

Paragraph 3.8.16 recorded the majority of edge habitat species activity, and bat activity in general.

3.8.20 The habitat type most closely associated with relatively high levels of edge habitat species activity was woodland. All static detectors recording an average of more than 100 PPN for edge species were located within 2 m of woodland. Some of these woodlands were relatively small, such as the woodland at SD3, and the woodland composition (broadleaved or mixed; plantation or semi-natural) did not seem to matter.

3.8.21 More of the high (>100 PPN) edge habitat species activity sites were located on the east of the existing A1 and, the six SD locations with relatively high activity levels were distributed relatively evenly north-south along the route.

Cluttered Habitat Species

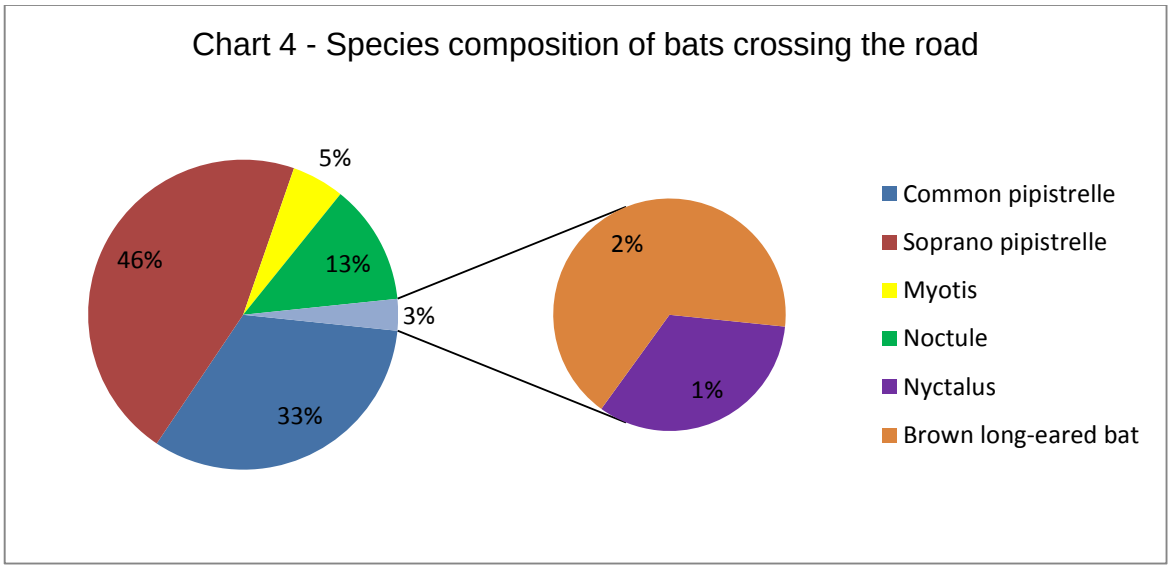
3.8.22 Brown long-eared bats were recorded at seven of the 20 static detector locations. The brown long-eared bats were recorded on detectors in areas with woodland planting, dense or scattered scrub, but the highest level of brown long-eared bat activity (3.29 PPN) was recorded in the parkland habitat with scattered trees at SD9. Brown long-eared bats were recorded at more SD locations on the west of the existing A1, than on the east. Three of the six locations that brown long-eared bats were recorded were located at the southern end of the scheme, to the south of Fenrother, with the other three locations spread relatively evenly across the schemes extent.

3.8.23 *Myotis* bat species were recorded at each of the 20 static detector locations. All areas with higher levels of *Myotis* activity (more than 30 PPN) were recorded in woodland (SD3, SD10, SD14, and SD18). The SD location which recorded the highest level of *Myotis* bat activity was SD10 on the northern bank of the River Coquet. The Peersonic detector at this location recorded an average of 258.5 PPN, almost as much activity as all other detectors combined. This demonstrates importance of the River Coquet corridor for this species group.

3.9 Crossing Point Surveys

3.9.1 CP surveys were completed at 15 locations along the existing A1. In total 183 bat crossings were recorded from at least five species. As shown in Chart 4 below, the proportion of edge habitat species recorded crossing the existing A1 was similar to the proportion recorded during the static detector surveys. The proportion of open habitat species was slightly higher, and the proportion of cluttered habitat species was slightly lower. This difference may reflect differences in the willingness of these species groups to cross gaps.

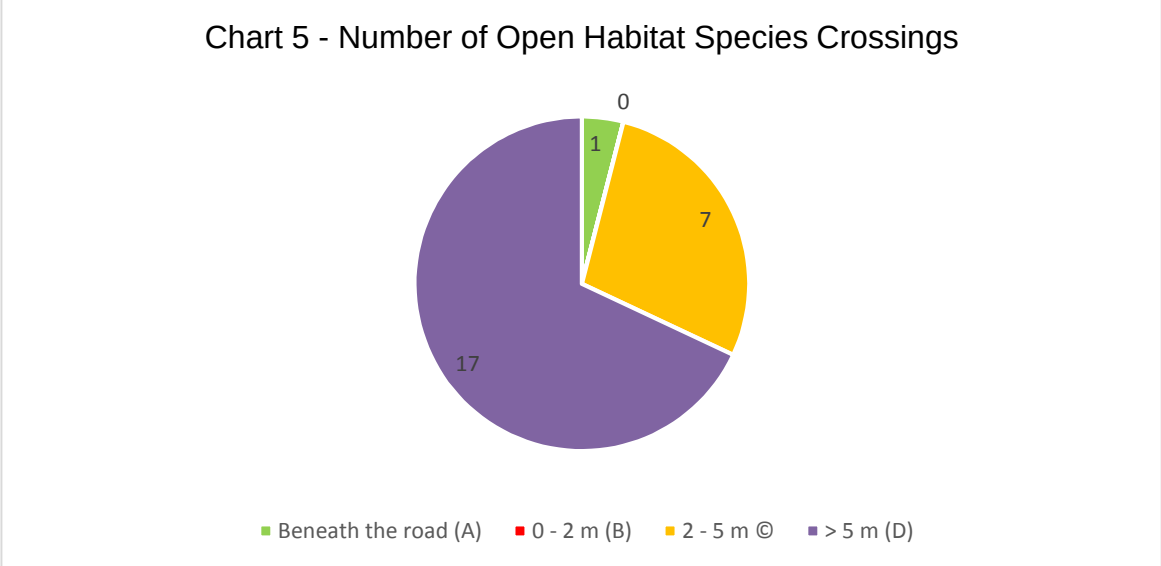
3.9.2 Location CP14 recorded 100 bat crossings, this was substantially more crossings than the other CP locations (CP15 recorded the second highest number of crossings (18), with CP13 recording (15) the third highest number). These three CPs were all located at the northern end of the scheme (CP13 being the southernmost, located at the River Coquet) and between them recorded 73 % of the bat crossings identified.



3.9.3 Of the 183 crossings recorded, 28 % of bats crossed the existing A1 below the road; 2 % crossed at a height of 0–2 m; 44 % crossed at a height of 2–5 m; and 25 % crossed at a height of more than 5 m[25].

3.9.4 **Open Habitat Species**

3.9.5 Open habitat species were recorded crossing the existing A1 a total of 25 times. Of the 25 crossings, 4 % (equating a single pass) were below the road's surface; none were recorded between 0 and 2 m above the road; 28 % crossed at a height of 2–5 m; and 68 % crossed at a height of more than 5 m. The breakdown is shown in Chart 5 below.



3.9.6 Most (72 %) open habitat species crossings were recorded at CP14. This crossing point was located at a farm underpass, on the edge of woodland, to the north of the River Coquet. Additional crossings were recorded at CP1, CP4, CP13, and CP15. With the exception of CP4, all open habitat species crossings occurred at locations where an underpass or overbridge was present. CP4 was notable for the fact that mature trees were present close to the edge of the road with canopies which overhung the road. This meant that even though the road was three lanes wide at this location (northbound, southbound, and a lane to allow

[25] All heights were taken from the road surface.

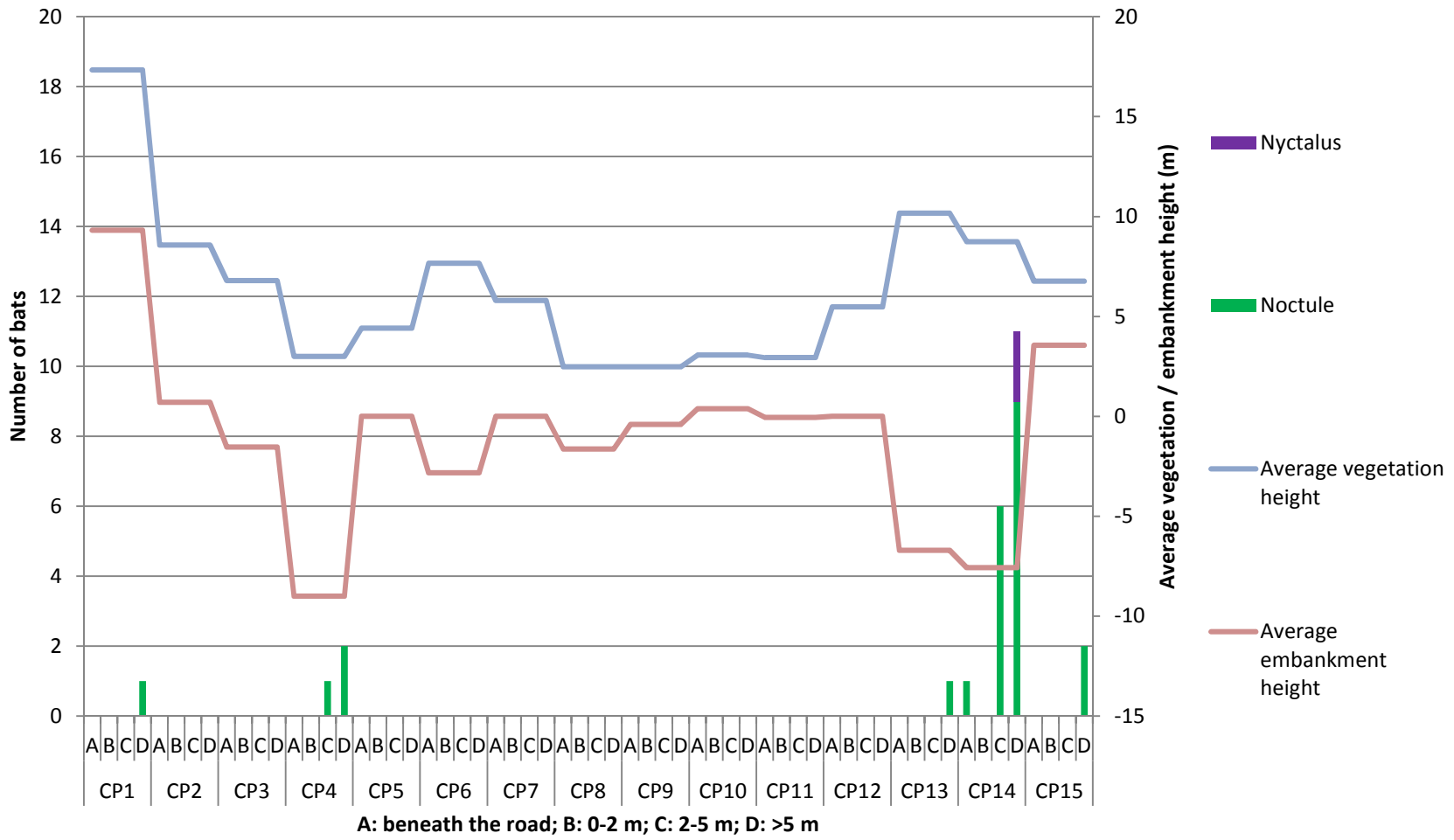
vehicles to turn right), the trees on either side of the road were only approximately 5.5 m apart[26].

3.9.7 Open habitat species were only recorded crossing at risk (i.e. at heights of 0 to 2, and 2–5 m) at CP4, and CP14. None of the open habitat species at risk crossings were recorded at heights of 0–2 m.

3.9.8 The number of open habitat species recorded crossing the existing A1 at each CP location is shown in Graph 7, together with the height band that represented the minimum height the bat flew at while over the carriageway. The CP locations are shown on Figure 6.

[26] As measured from GoogleEarth Pro.

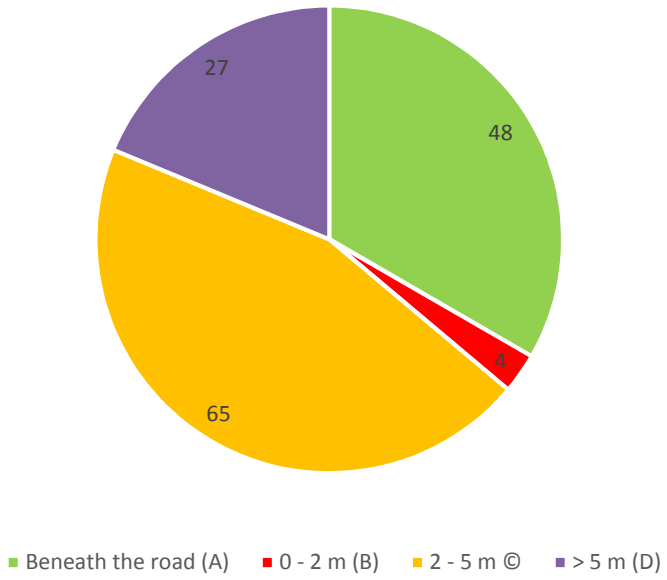
Graph 7 - Number of open habitat species crossing at different heights at each crossing point location



3.9.9 Edge Habitat Species

3.9.10 Edge habitat species were recorded crossing the existing A1 a total of 144 times. Edge habitat species were recorded crossing beneath the road 33 % of the time; 3 % were recorded crossing between 0 and 2 m above the road; 45 % crossed at a height of 2–5 m; and 19 % crossed at a height of more than 5 m. The breakdown is shown in Chart 6 below.

Chart 6 - Edge Habitat Species Crossings



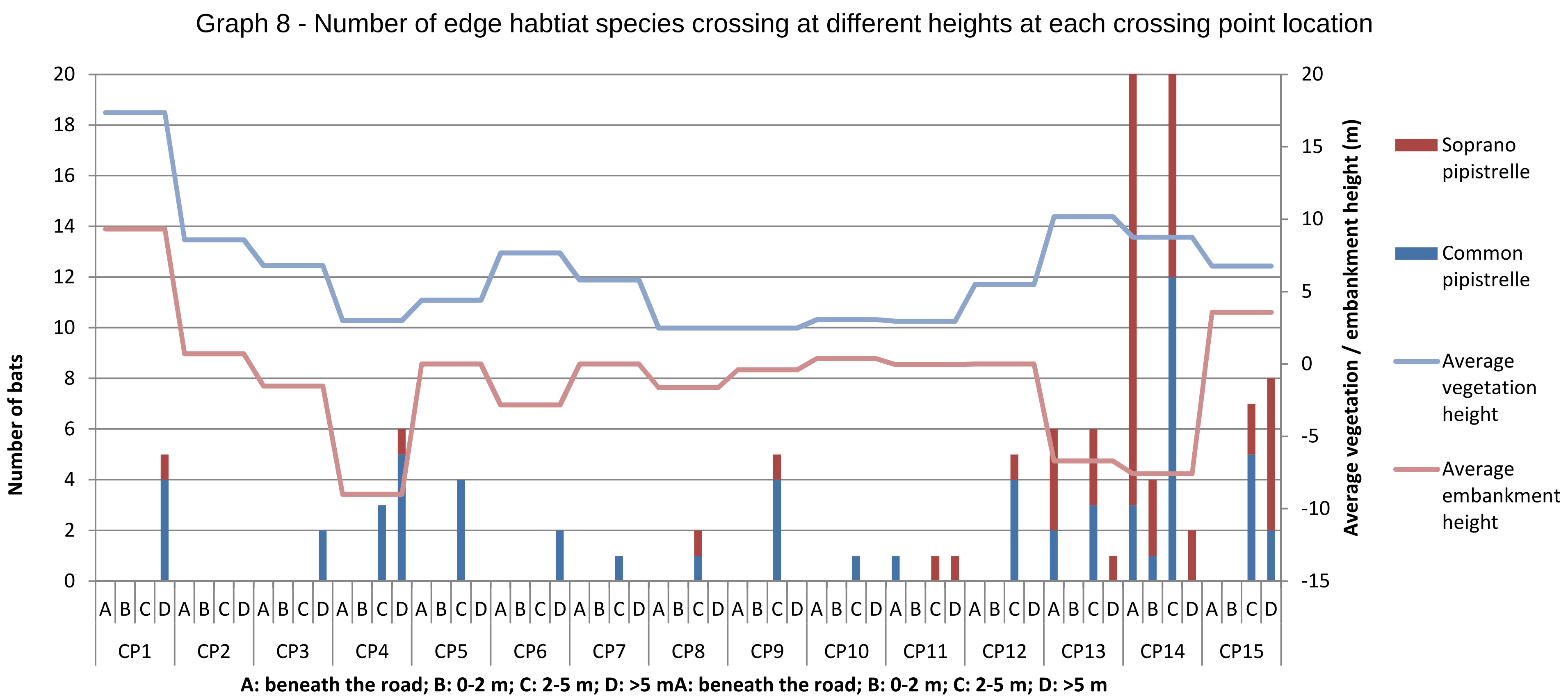
3.9.11 Of the two edge habitat species recorded crossing the road, soprano pipistrelles crossed more frequently beneath the road, with common pipistrelles crossing more often at 2–5 m, and slightly more at >5 m.

3.9.12 Most (53 %) edge habitat species crossings were recorded at CP 14. As identified in Paragraph 3.9.6, this CP was located at a farm underpass, on the edge of woodland, to the north of the River Coquet. Additional crossings were recorded at every other CP monitored with the exception of CP2.

3.9.13 Edge habitat species were recorded crossing at risk (i.e. at heights of 0 to 2, and 2–5 m) at 11 of the 15 crossing points (all except CP1, CP2, CP3, and CP6). Crossing point CP14 was the only location where edge habitat species were recorded crossing in the 0–2 m height band.

3.9.14 The number of edge habitat species recorded crossing the existing A1 at each CP location is shown in Graph 8 below[27], together with the height band that represented the minimum height the bat flew at while over the carriageway. The CP locations are shown on Figure 6.

[27] NB the scale has been fixed with a maximum value at 20 bats crossing to keep consistency with Graph 7 and Graph 9; note however that the number of edge habitat bat crossings below the road at CP 14 was 41, and the number of edge habitat bat crossings at a height of 2-5 m at CP14 was 30.

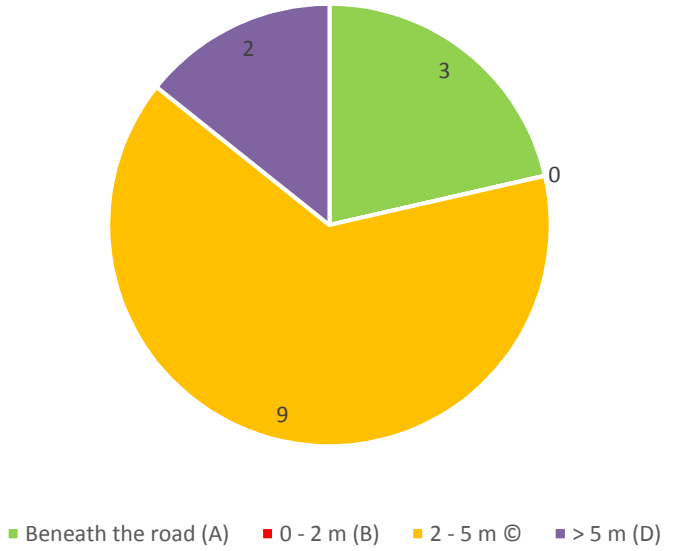


NB the scale has been fixed with a maximum value at 20 bats crossing to keep consistency with Graph 7 and Graph 9; note however that the number of edge habitat

3.9.15 Cluttered Habitat Species

3.9.16 Cluttered habitat species were recorded crossing the existing A1 a total of 14 times. Of the 14 crossings, 21 % were below the roads surface; none were recorded between 0 and 2 m above the road; 64 % crossed at a height of 2–5 m; and 14 % crossed at a height of more than 5 m. The breakdown is shown in Chart 7 below.

Chart 7 - Cluttered Habitat Species Crossings

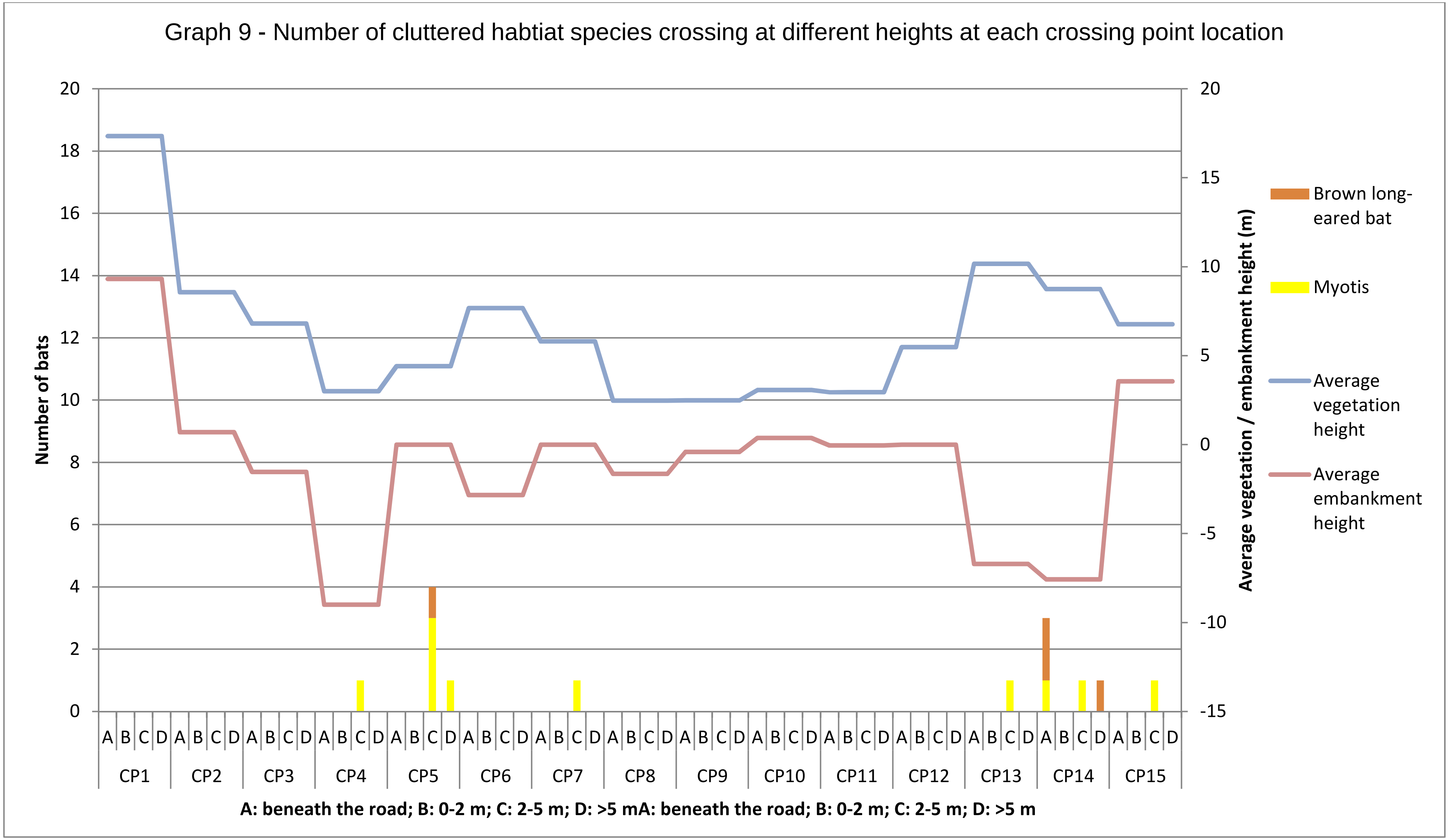


3.9.17 Of the brown long-eared bat crossings, half (two crossings) were beneath the road with one each at 2–5 m, and above 5 m. *Myotis* bat species were recorded crossing beneath the road once, at a height of more than 5 m once, and at a height of 2–5 m on eight occasions.

3.9.18 Cluttered habitat species were recorded crossing the road five times at both CP5, and CP14. Additional locations cluttered habitat species were recorded crossing comprised CP4, CP13, and CP15. CP13–CP15 were all located at the northern end of the proposed scheme from the River Coquet northwards. Notably CP5 was located in an area between Static Detector locations SD3, and SD4, which both recorded relatively high levels of *Myotis* species activity during the Peersonic IP67 surveys (94, and 15.1 PPN respectively).

3.9.19 Cluttered habitat species were recorded crossing at risk (i.e. at heights of 0 to 2, and 2 – 5 m) at 6 of the 15 crossing points (CP4, CP5, CP7, CP13, CP14, and CP15). None of the cluttered habitat species at risk crossings were recorded at heights of 0–2 m.

3.9.20 The number of cluttered habitat species recorded crossing the existing A1 at each CP location is shown in Graph 9, together with the height band that represented the minimum height the bat flew at while over the carriageway. The CP locations are shown on Figure 6.


Graph 9 - Number of cluttered habtiat species crossing at different heights at each crossing point location
Number of bats
20
18
16
14
12
10
8
6
4
2
0
Average vegetation / embankment height (m)
20
15
10
5
0
-5
-10
-15
Brown long-eared bat
Myotis
Average vegetation height
Average embankment height
A B C D
CP1
CP2
CP3
CP4
CP5
CP6
CP7
CP8
CP9
CP10
CP11
CP12
CP13
CP14
CP15
A: beneath the road; B: 0-2 m; C: 2-5 m; D: >5 mA: beneath the road; B: 0-2 m; C: 2-5 m; D: >5 m

4 DISCUSSION

4.1.1 The emergence and dawn surveys identified the presence of small bat roosts of common species in the survey area. Transect and static detector surveys verified the expected higher level of bat activity in and adjacent to woodland and in particular in the vicinity of Banktop Plantation, Hangingleaves Wood, Broom Plantation, the woodland along the River Coquet, and Park Wood.

4.1.2 The DEFRA transect surveys identified that the presence of the existing A1 does appear to slightly reduce the level of bat activity and species diversity. The DEFRA transects also verified the presence of Nathusius' pipistrelle in the area.

4.1.3 The CP surveys confirmed that all three species groups regularly cross the existing A1 at multiple locations. They also identified that the area around the River Coquet and land to the north provided key east-west connectivity across the A1.

4.1.4 Overall the level of bat activity recorded is summarised in Table 13 below.

Table 13 Activity levels recorded

Species group	Species	Roosts recorded in the survey area	Transect and static detector activity level	Crossing[28]	Important areas / habitats
Open habitat species	noctule	None	Relatively low generally, relatively high at the southern end	Moderate at Park Wood in the north, relatively low elsewhere	Banktop plantation and the surrounding habitat at the southern end of the scheme
Edge habitat species	common pipistrelle	One small building roost	Moderate	Moderate at Park Wood in the north, relatively low elsewhere	Woodland, particularly between Hangingleaves Wood and Earsdon Moor. The River Coquet and area to the north
	soprano pipistrelle	2 small building roosts, 4 small tree roosts	Relatively high	Relatively high at Park Wood in the north, relatively low elsewhere	Woodland and the area around the River Coquet.
	Nathusius' pipistrelle	None	Very low	None	None
Cluttered habitat species	*Myotis* species	None	Moderate	Moderate at Earsdon Moor, relatively low in the north of the scheme	The River Coquet (and area to the north). Between Hangingleaves Wood and Earsdon Moor

[28] NB – low levels of crossing activity recorded does not constitute "lower than average" levels of crossing activity, but instead that low numbers of bats were crossing the road, rather than none.

Table 13 Activity levels recorded

Species group	Species	Roosts recorded in the survey area	Transect and static detector activity level	Crossing[28]	Important areas / habitats
	brown long-eared bat	One (unconfirmed building roost)	Relatively low[29]	Relatively high at Park Wood in the north, relatively low at Earsdon Moor	The area to the north of the River Coquet

4.2 Status of the Species Recorded

4.2.1 In total five species and two genera (which could potentially represent up to five additional species) were recorded within the survey area. Each species recorded is known to be present within Northumberland[30]. The status of each species is given in Table 14 below.

Table 14 Species status

Species type	Genus	Species	National Status[31]	Known Local Status[32]
Open habitat species	*Nyctalus*	noctule	Uncommon	Scattered
		Leisler's bat	Scarce	Rare
Edge habitat species	*Pipistrellus*	common pipistrelle	Common	Common
		soprano pipistrelle	Common	Common
		Nathusius' pipistrelle	Rare	Rare
Cluttered habitat species	*Plecotus*	brown long-eared bat	Common	Frequent
	Myotis	Daubenton's bat	Common	Frequent on water
		Natterer's bat	Fairly common	Uncommon
		Whiskered bat	Locally distributed	Uncommon
		Brandt's bat	Common in the north and west, rare or absent in the south and east.	Rare

4.3 Evaluation

Open Habitat Species

4.3.1 Relatively low levels of activity from open habitat species were recorded and although not all calls could be identified to species level no confirmed Leisler's bat calls were identified within the survey area. The relative rarity of noctule and generally low level of activity, with localised hotspots, has been taken into account when determining that the open habitat species using the survey area were of Local importance.

Edge Habitat Species

4.3.2 Relatively high levels of activity from edge habitat species were recorded within the survey area. All three edge habitat species known to be present within Northumberland were recorded within the survey area including very low levels of the nationally rare Nathusius'

[29] Although the level of brown long-eared bat activity recorded was relatively low, it is noted that the quiet calls of this species can lead to under-representation through these survey methods.
[30] http://www.northumberlandbats.org.uk/bats-in-northumberland/4593042246 [accessed 01/12/2017]
[31] Mitchell-Jones A. J. Carlin C. (2012) *Natural England Technical Information Note TIN051; Bats and onshore wind turbines interim guidance*. Natural England.
[32] The local status has been taken from The Northumberland Biodiversity Action Plan 2008.

pipistrelle. The Nathusius' pipistrelle was thought to have been passing through rather than using the area in any more extensive way. The substantial east-west connectivity and well used foraging opportunities provided by the River Coquet corridor and adjacent Park Wood, together with the level of activity recorded for each species combined with their expected abundance indicated that the edge habitat species populations using the survey area were of District importance.

Cluttered Habitat Species

4.3.3 Generally moderate levels of activity from cluttered habitat species were recorded within the survey area although in two specific locations relatively high levels were recorded. The species present were common or relatively common both locally and nationally. The species recorded represent both genres of cluttered habitat species known to be present within Northumberland (*Plecotus* and *Myotis* species).

4.3.4 Taking the level of activity and species composition recorded, together with the number of cluttered habitat species bats recorded crossing the A1, the populations of cluttered habitat species using the survey area was considered to be of District importance.

4.4 Likely Impact and Proposed Mitigation

4.4.1 The assessment of impact and any mitigation required will be detailed in the ecology chapter of the associated Ecological Impact Assessment.

FIGURES

FIGURE 1

Legend

Survey Area

N
W E
S

0 2,000 m

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

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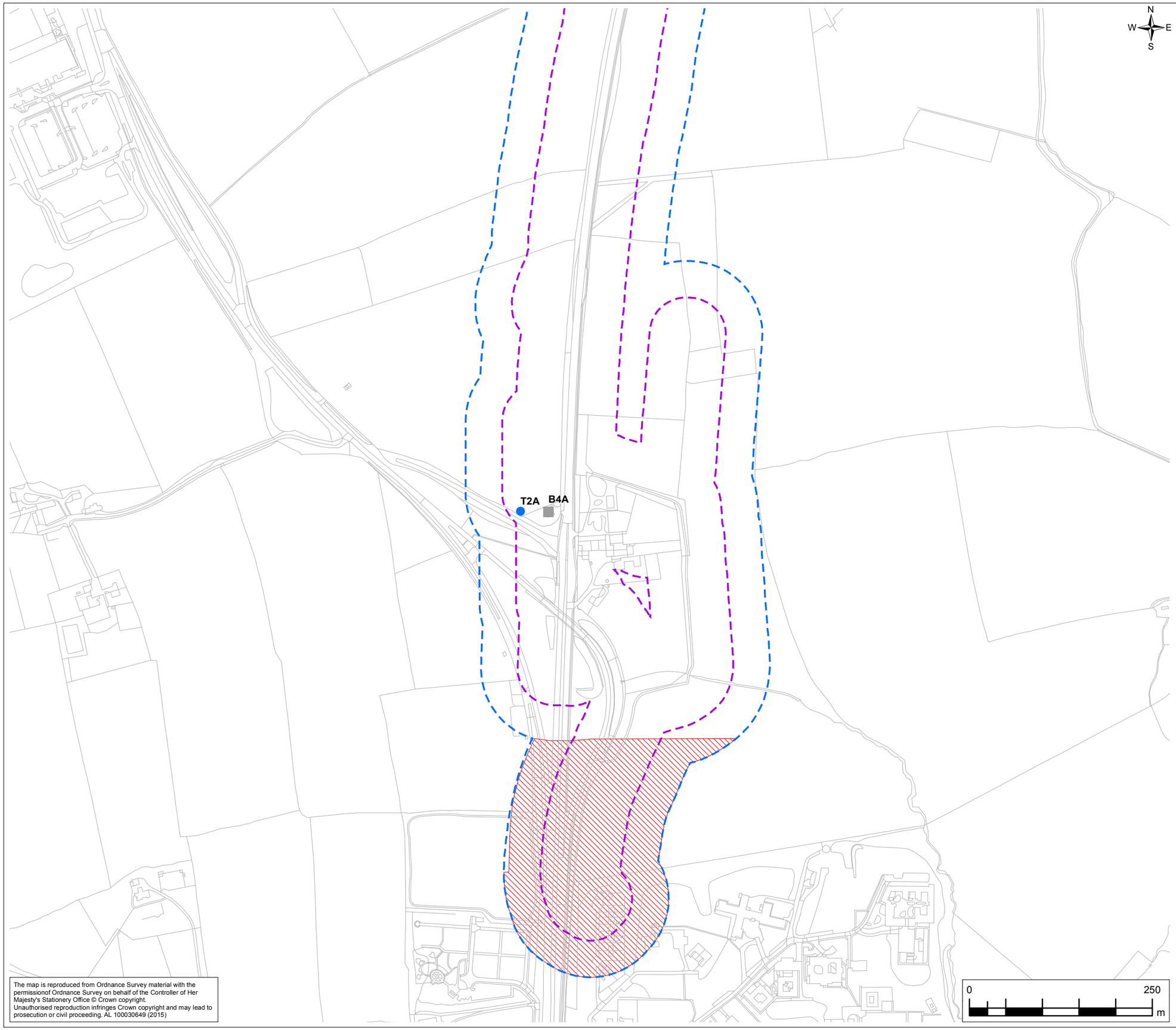

FIGURE 2.1

Legend

- 50m Buffer
- 100m Buffer

Building Bat Roost Potential Results

- Moderate
- Low
- Confirmed bat roost

Tree Bat Roost Potential Results

- High
- Moderate
- Low
- Negligible
- Confirmed Roost
- No access at time of survey
- Not part of original buffer

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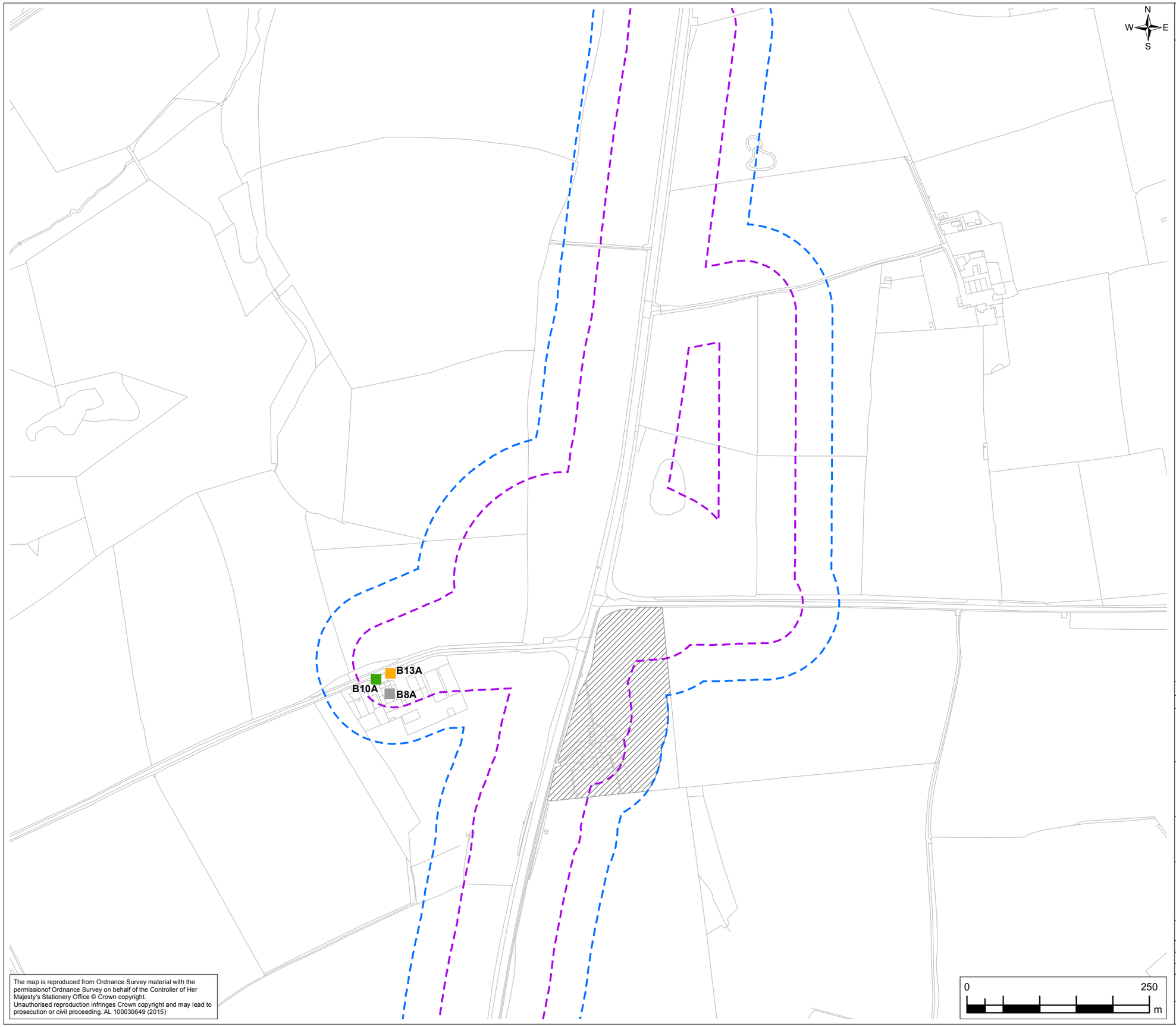

FIGURE 2.2

Legend

- 50m Buffer
- 100m Buffer

Building Bat Roost Potential Results

- Moderate
- Low
- Confirmed bat roost

Tree Bat Roost Potential Results

- High
- Moderate
- Low
- Negligible
- Confirmed Roost
- No access at time of survey
- Not part of original buffer

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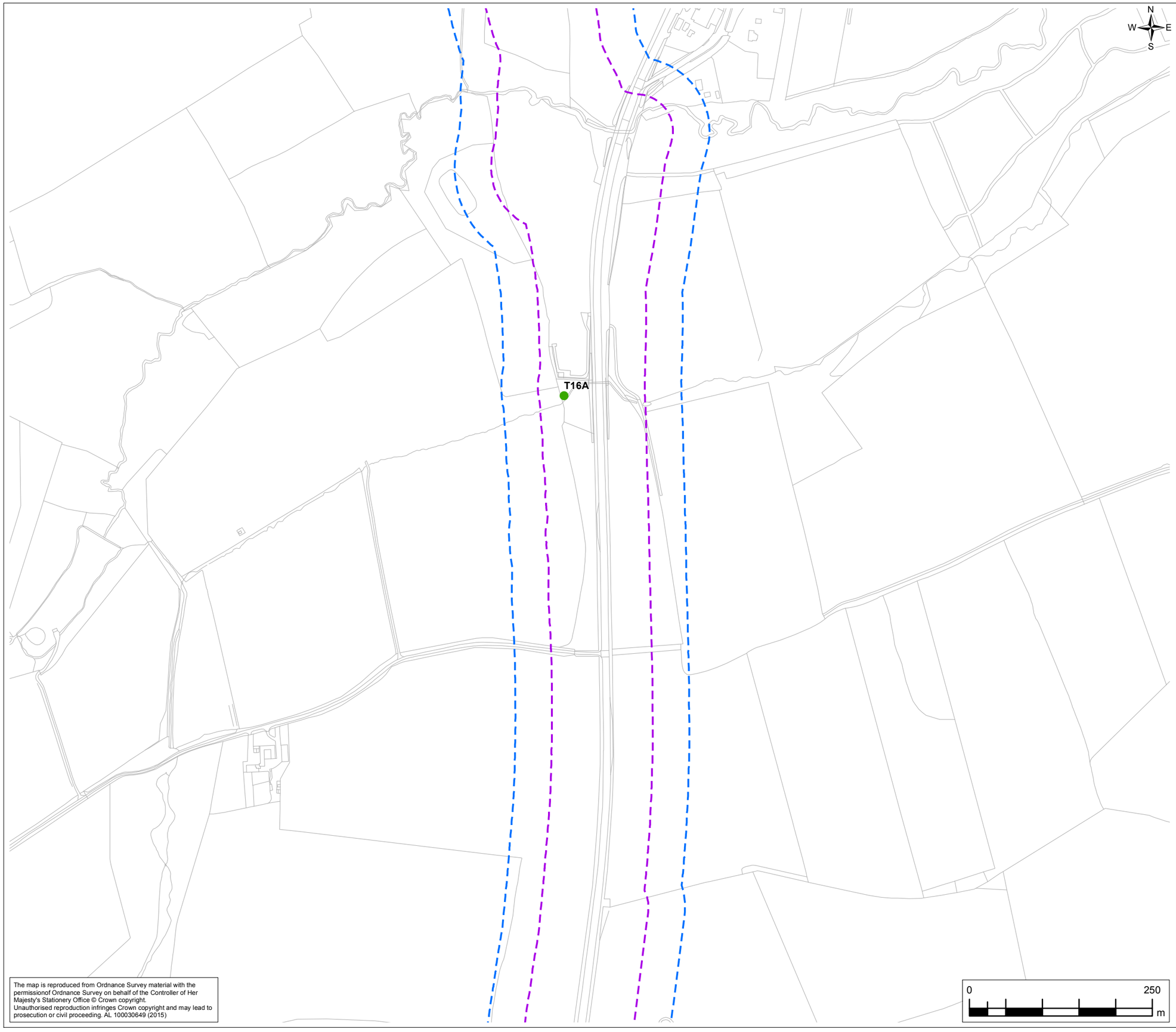

FIGURE 2.3

Legend

- 50m Buffer
- 100m Buffer

Building Bat Roost Potential Results

- Moderate
- Low
- Confirmed bat roost

Tree Bat Roost Potential Results

- High
- Moderate
- Low
- Negligible
- Confirmed Roost
- No access at time of survey
- Not part of original buffer

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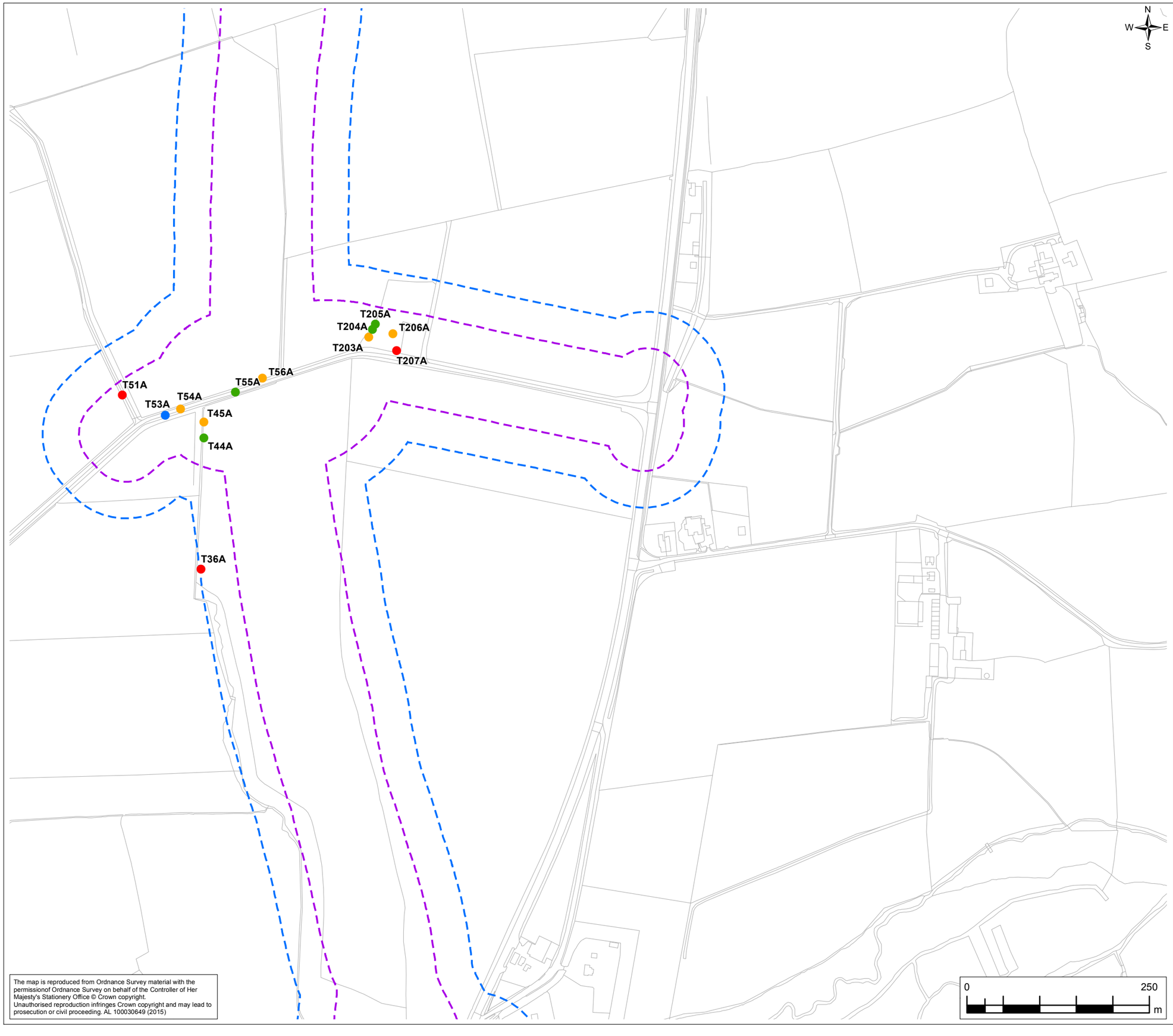
FIGURE 2.4



Legend

- 50m Buffer
- 100m Buffer

Building Bat Roost Potential Results

- Moderate
- Low
- Confirmed bat roost

Tree Bat Roost Potential Results

- High
- Moderate
- Low
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Drawing Title: TREE AND BUILDING SURVEY RESULTS Sheet 4

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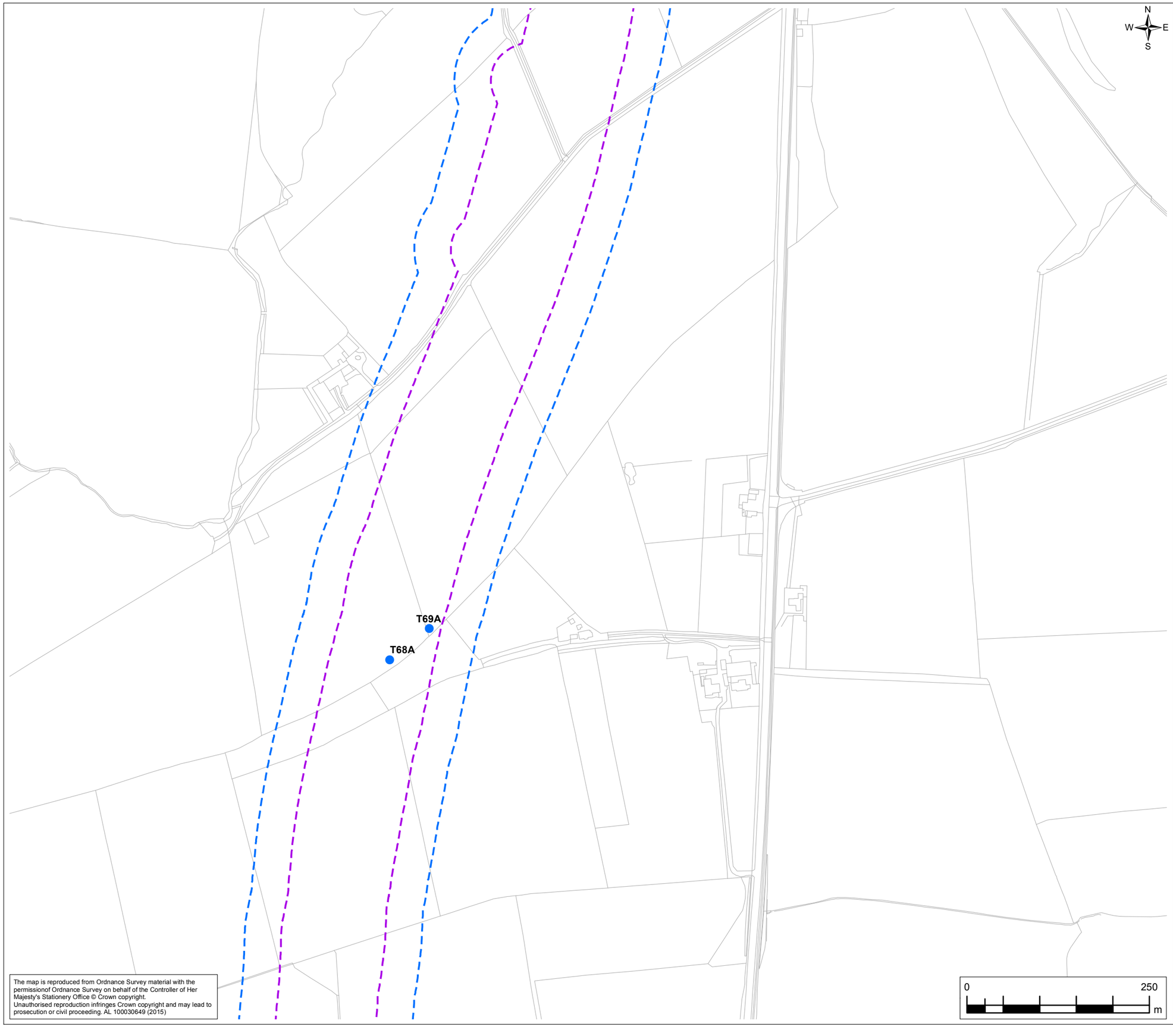

FIGURE 2.5

Legend

- 50m Buffer
- 100m Buffer

Building Bat Roost Potential Results

- Moderate
- Low
- Confirmed bat roost

Tree Bat Roost Potential Results

- High
- Moderate
- Low
- Negligible
- Confirmed Roost
- No access at time of survey
- Not part of original buffer

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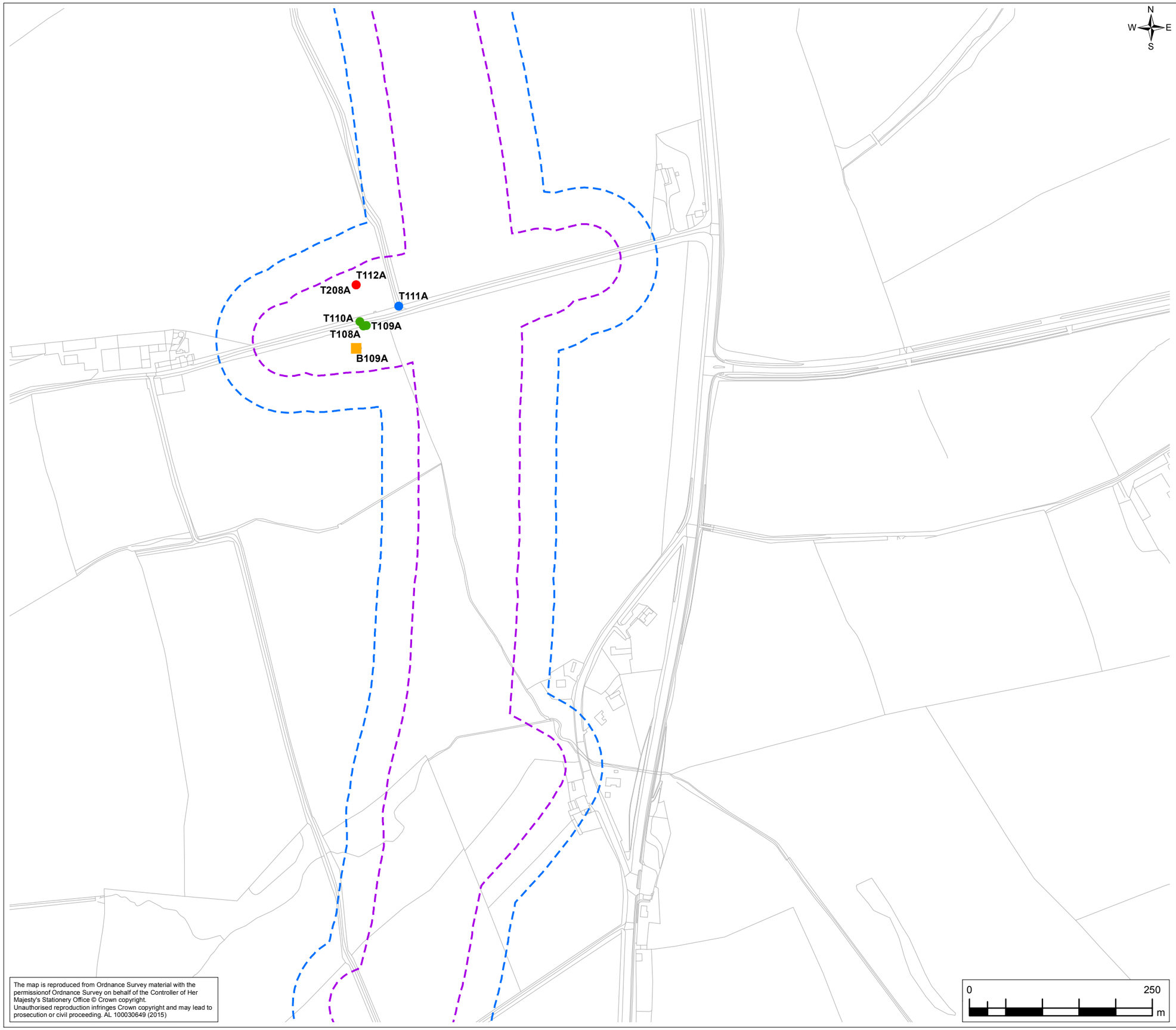

FIGURE 2.6

Legend

- 50m Buffer
- 100m Buffer

Building Bat Roost Potential Results

- Moderate
- Low
- Confirmed bat roost

Tree Bat Roost Potential Results

- High
- Moderate
- Low
- Negligible
- Confirmed Roost
- No access at time of survey
- Not part of original buffer

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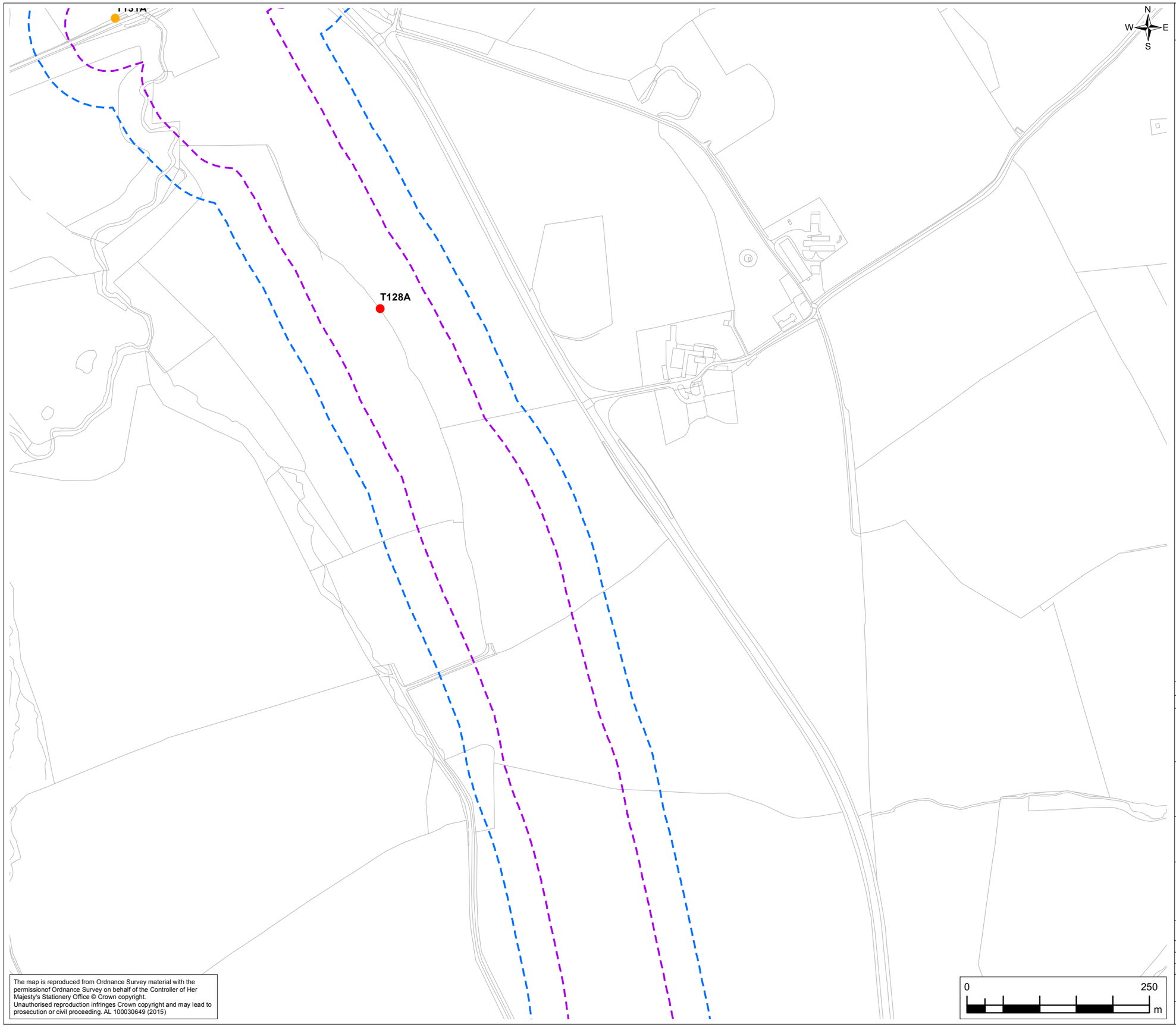

FIGURE 2.7

Legend

- 50m Buffer
- 100m Buffer

Building Bat Roost Potential Results

- Moderate
- Low
- Confirmed bat roost

Tree Bat Roost Potential Results

- High
- Moderate
- Low
- Negligible
- Confirmed Roost
- No access at time of survey
- Not part of original buffer

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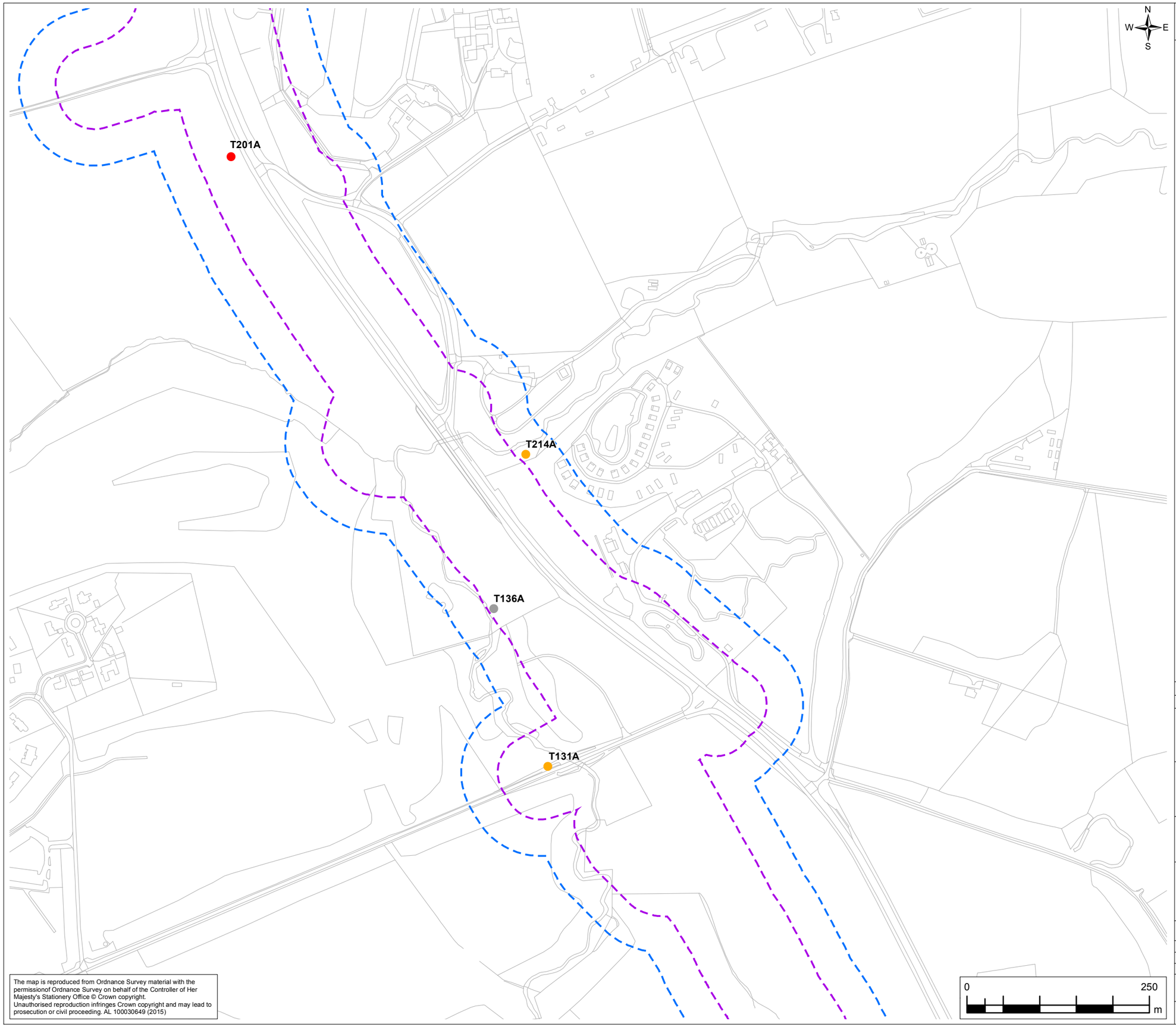

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FIGURE 2.8

Legend

- 50m Buffer
- 100m Buffer

Building Bat Roost Potential Results

- Moderate
- Low
- Confirmed bat roost

Tree Bat Roost Potential Results

- High
- Moderate
- Low
- Negligible
- Confirmed Roost
- No access at time of survey
- Not part of original buffer

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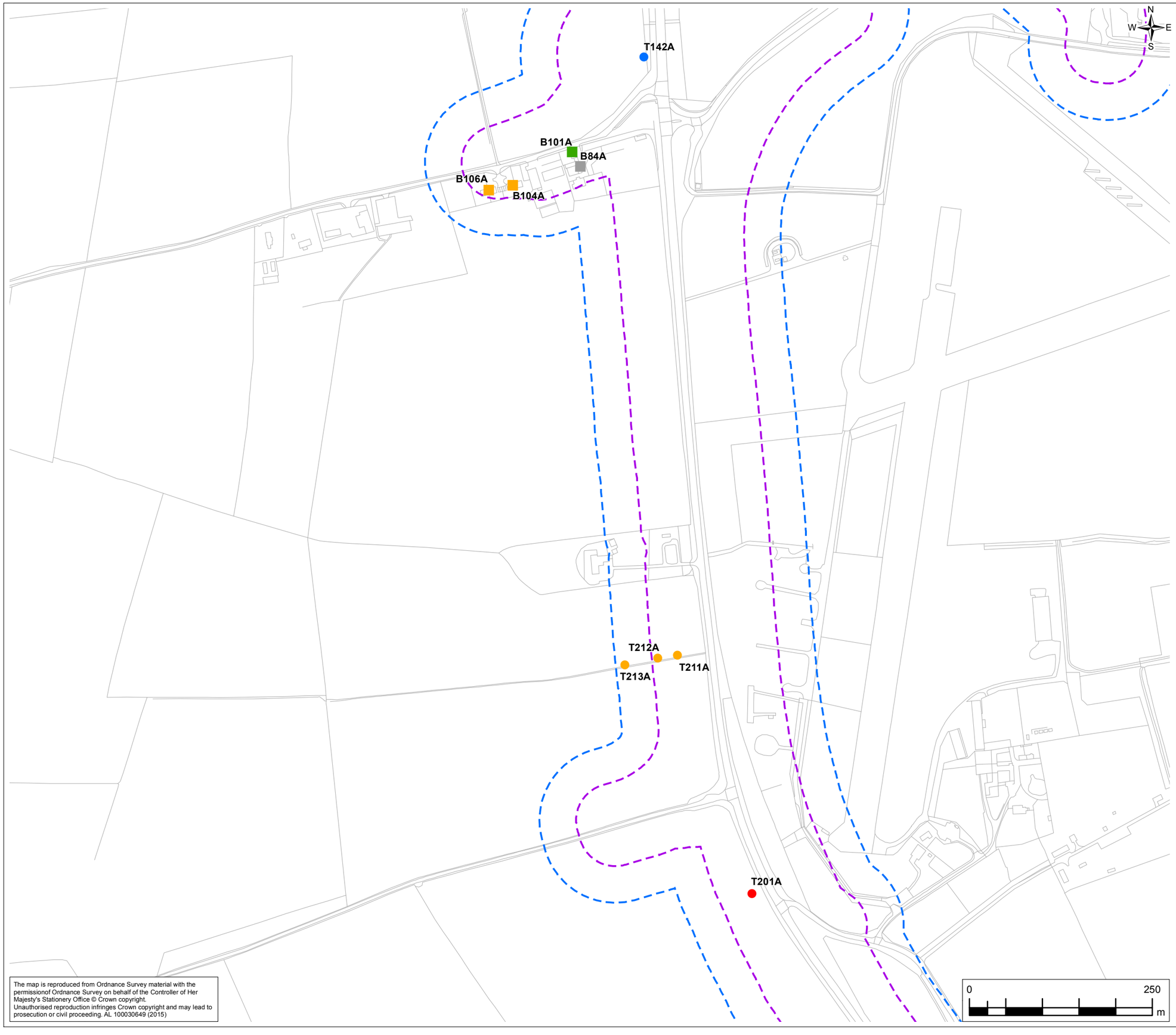

FIGURE 2.9

Legend

- 50m Buffer
- 100m Buffer

Building Bat Roost Potential Results

- Moderate
- Low
- Confirmed bat roost

Tree Bat Roost Potential Results

- High
- Moderate
- Low
- Negligible
- Confirmed Roost
- No access at time of survey
- Not part of original buffer

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Drawing Title: TREE AND BUILDING SURVEY RESULTS Sheet 9

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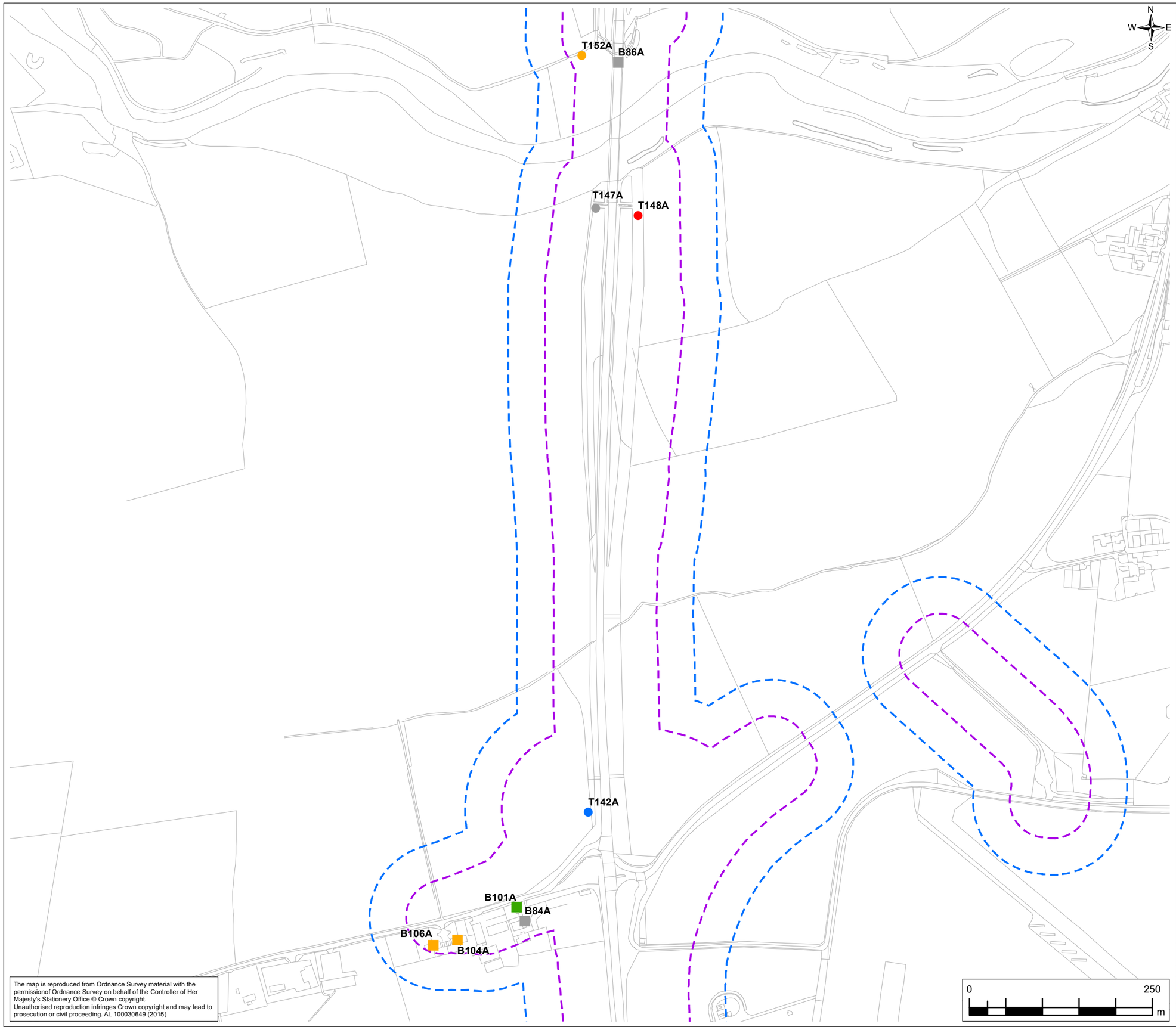

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FIGURE 2.10

Legend

- 50m Buffer
- 100m Buffer

Building Bat Roost Potential Results

- Moderate
- Low
- Confirmed bat roost

Tree Bat Roost Potential Results

- High
- Moderate
- Low
- Negligible
- Confirmed Roost
- No access at time of survey
- Not part of original buffer

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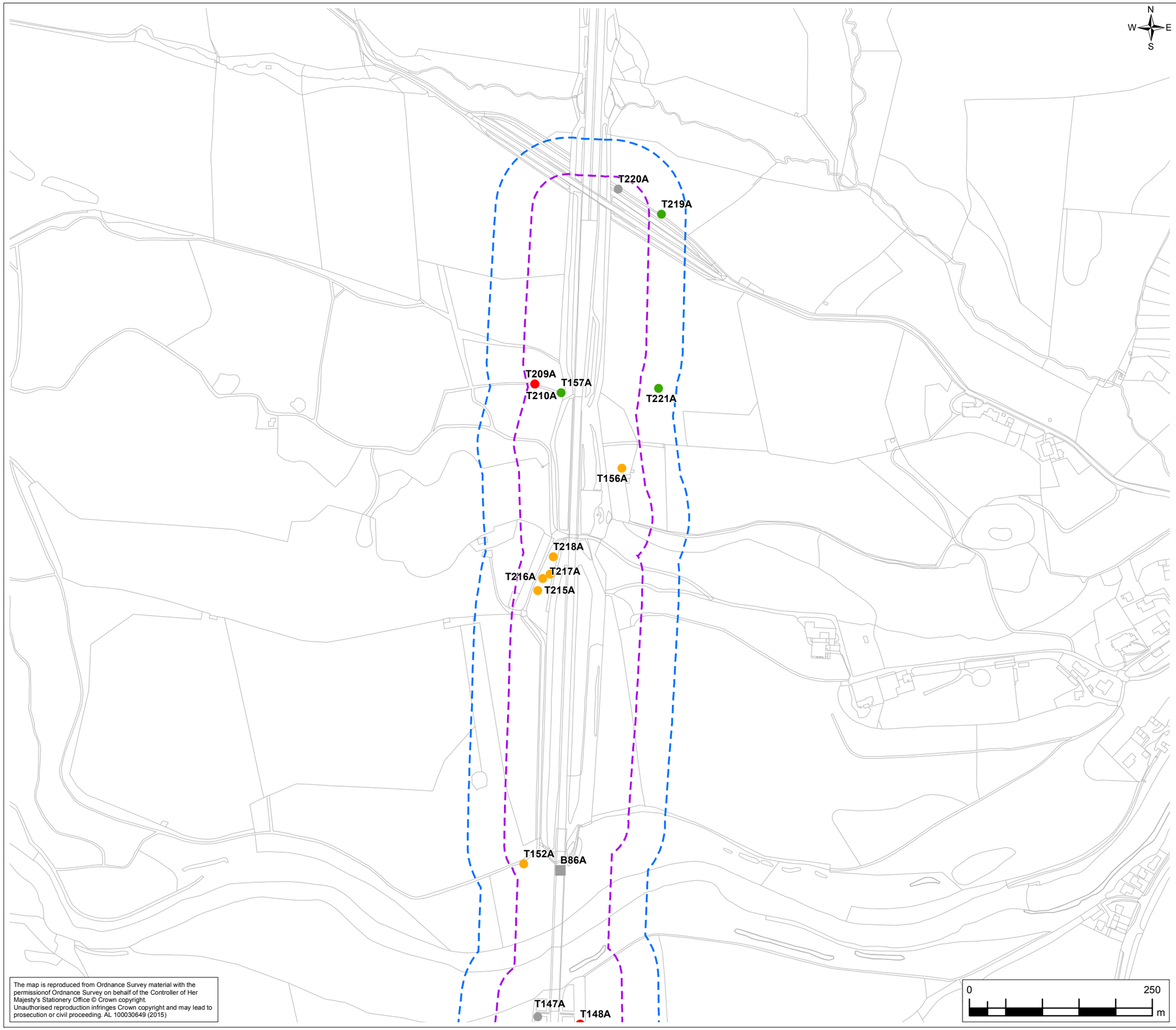
FIGURE 2.11



Legend

- 50m Buffer
- 100m Buffer

Building Bat Roost Potential Results

- Moderate
- Low
- Confirmed bat roost

Tree Bat Roost Potential Results

- High
- Moderate
- Low
- Negligible
- Confirmed Roost
- No access at time of survey
- Not part of original buffer

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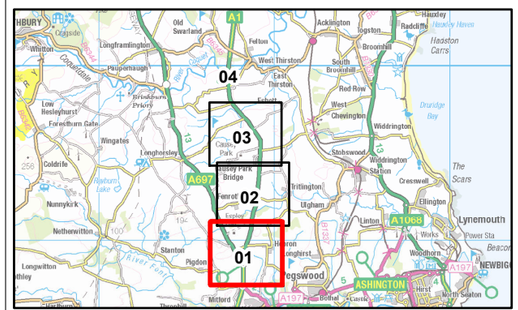
FIGURE 3.1

Legend

- 500m Buffer
- Point Count
- Transect Route
- Unsurveyed driven section connecting transect route



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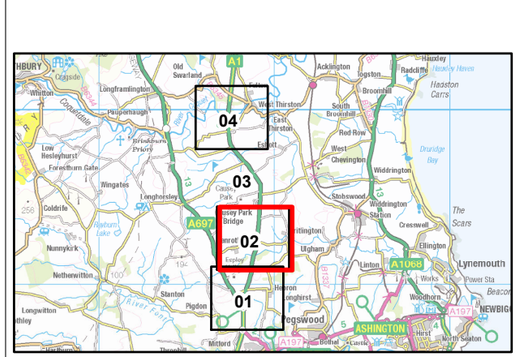
0 1,000 m

FIGURE 3.2

Legend

- 500m Buffer
- Point Count
- Transect Route
- Unsurveyed driven section connecting transect route



PC23A
PC22A
PC21A
PC20A
PC19A
PC18A
PC17A
PC16A
PC15A
PC14A
PC13A
PC12A
PC11A
PC10A
PC99A
PC100A
PC101A
PC102A
PC103A
PC104A
PC106A
PC107A
PC105A
PC108A
PC109A
PC110A
PC111A
PC112A
PC113A
PC114A

Causey Park Bridge
Fieldhead House
New Houses Farm
Earsdon West Farm
Earsdon Cottage
Earsdon Moor Farm
The Farmhouse
Broom Plantation
Tritlington
The Old School
Fenrother
Bridge House
Hanging leaves Plantation
Cockle Park New Cottages
Gamekeepers
A1

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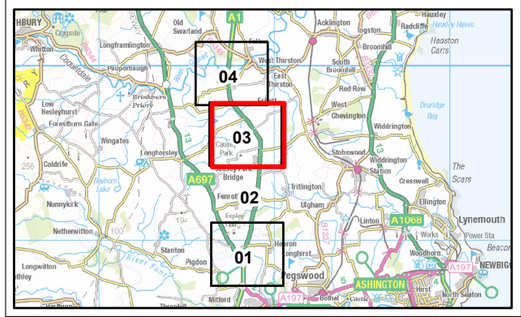
FIGURE 3.3

Legend

- 500m Buffer
- Point Count
- Transect Route
- Unsurveyed driven section connecting transect route



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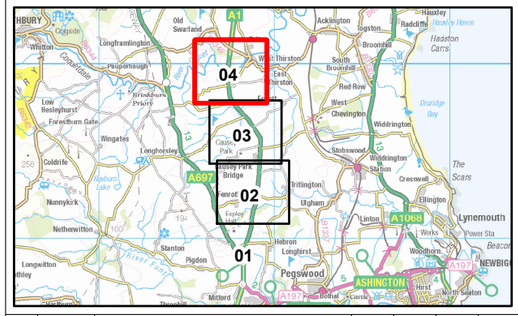
0 1,000 m

FIGURE 3.4

Legend

- 500m Buffer
- Point Count
- Transect Route
- Unsurveyed driven section connecting transect route



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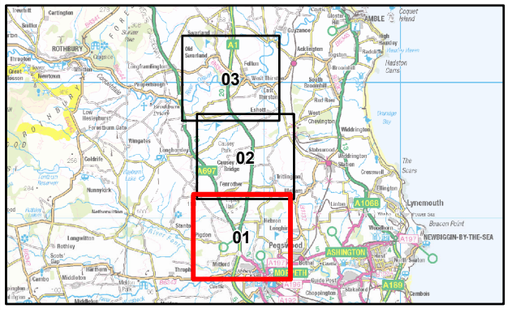
0 1,000 m

FIGURE 4.1

Legend

- 500m Buffer
- Point Count (every 100m)
- Transect Line



Transect 1
Transect 9
Transect 10
A1
A697
A192
Sandy Letch
Gorfenletch Cottage
Gamekeepers Cottage
Cockle Park New Cottages
Broad Wood
Blubbery Wood
Longhirst Burn
Abshiel Cottage
Heronsclose Burn
The Oaks
Whinny Lane
Bank Top Cottage
Butchers Cottage
Courtyard Cottage
The Bungalow
April Cottage
Hare Wood
High Highlaws Cottage
Strafford House
Hebron
Todd Hill
Heighley Gate Garden Centre
Benridge Moor House
North Gate House
Low Heighley Rigg Cottage
Northgate Farm
West Shield Hill Cottage
East Shield Hill Farm
Pigdon
White Knights
Heighley Wood
Benridge Hagg
Southernwood
Willy's Wood
Benridge Cottage
Fair Moor
Middle Benridge
Howburn Wood
Cottingwood Common
West Park Wood
Harry's Burn
Harry's Wood
River Font
Mill Wood
East Wood
Mother's Wood
Newton Mill Farm
Lightwater Farm House
Newton Crook
French Holm
Mitford
Inkles Heugh
St Leonard's Lane
Peacock Gap
Davie's Wood
Mitford Road
River Wansbeck
How Burn
Whorral Bank
Parkhouse Banks
Parish Haugh
Park House
MORPETH
Allery
Abbey Banks
Curly Kews
Lynemouth
ASHINGTON
NEWBIGGIN-BY-THE-SEA

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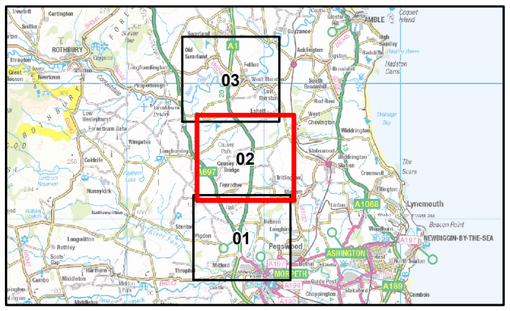
FIGURE 4.2

Legend

- 500m Buffer
- Point Count (every 100m)
- Transect Line



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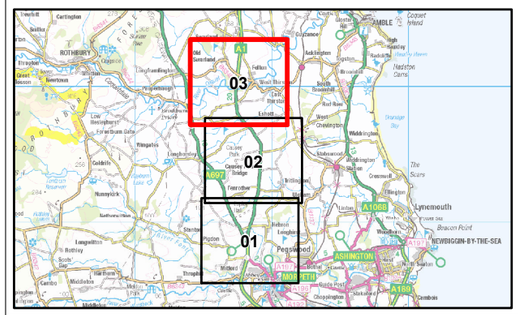
0 1,000 m

FIGURE 4.3

Legend

- 500m Buffer
- Point Count (every 100m)
- Transect Line



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Drawing Title: DEFRA STYLE BAT TRANSECT ROUTES

Drawing Status:

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0 1,000 m

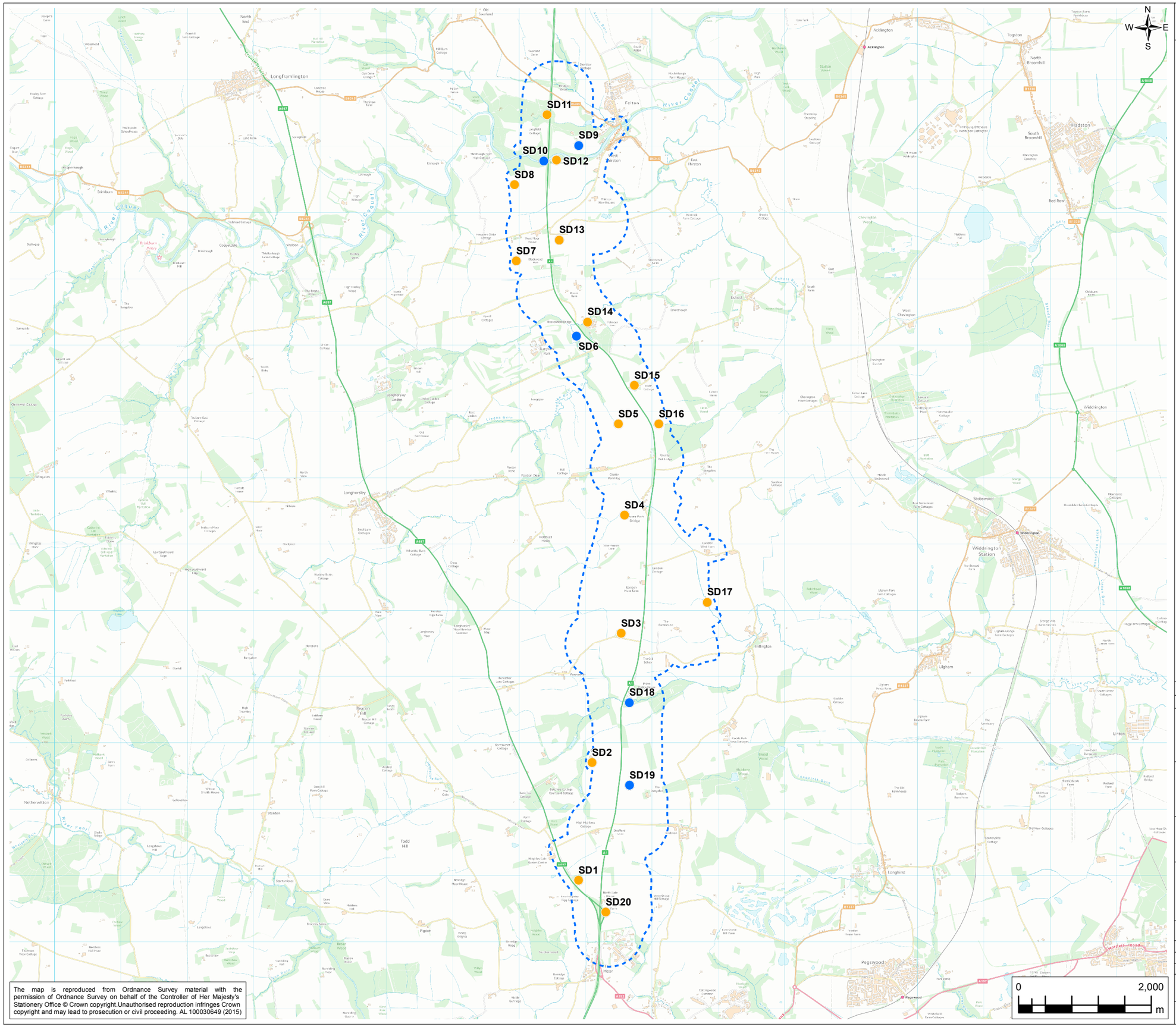

FIGURE 5

Legend

- Survey Area
- Peersonic Static Detector Location
- Peersonic and SM2 Static Detector Location

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Project: A1 NORTHUMBERLAND

Drawing Title: STATIC DETECTORS LOCATIONS

Drawing Status:

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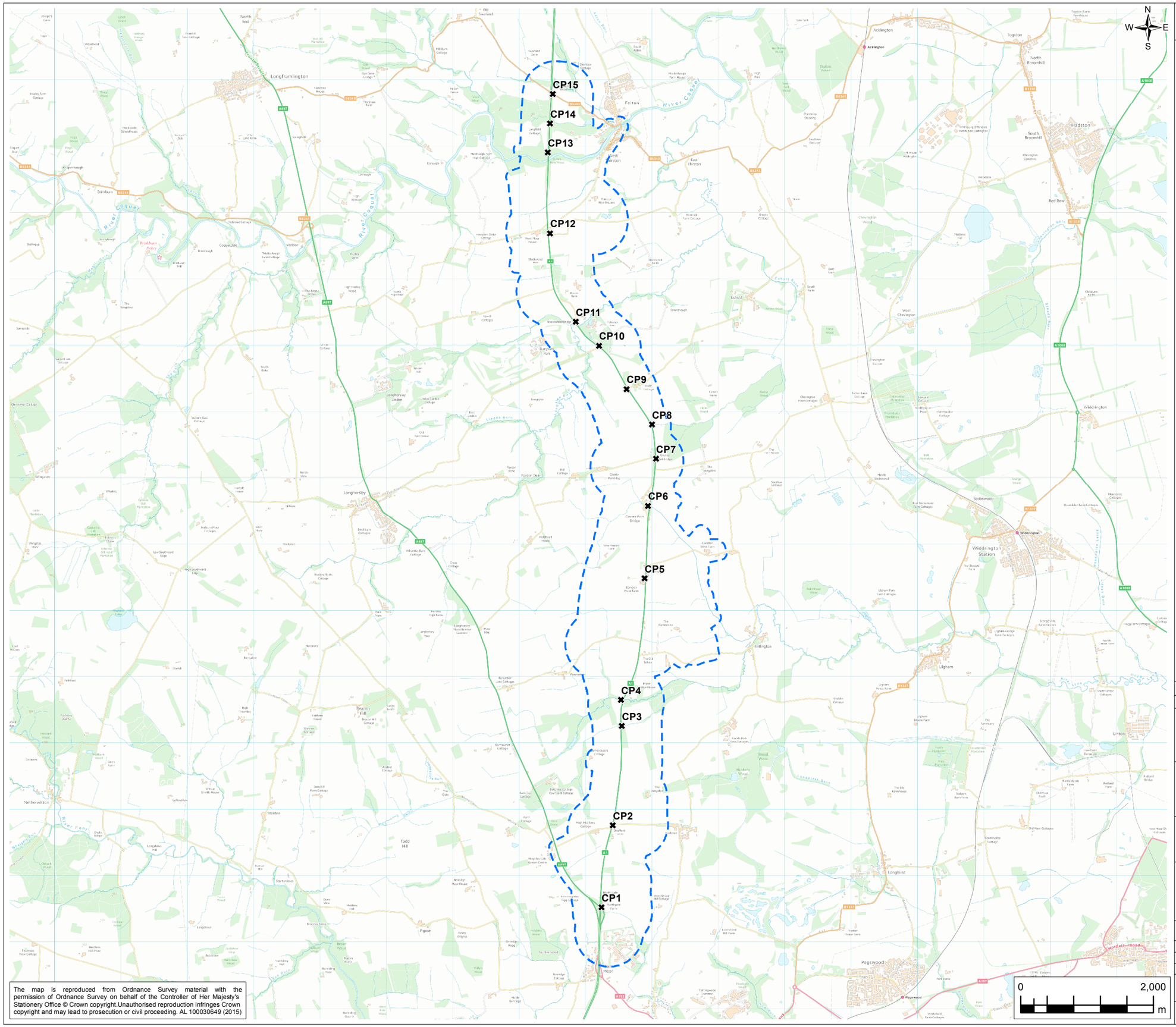

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FIGURE 6

Legend

- Survey Area
- ✖ Crossing Point

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	JAN 18	Initial Issue	IM	GS	AM	MC

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Client: highways england

Project: A1 NORTHUMBERLAND

Drawing Title: CROSSING POINT LOCATIONS

Drawing Status:

Scale @ A3	1:55,000	DO NOT SCALE
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Drawing No.: B2104700_EC_BRP_06

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APPENDIX A – LEGISLATION POLICY, AND REGULATION CONTEXT

Legislation

All bat species and their roosts and resting places are protected under Schedule 5 & 6 of the Wildlife and Countryside Act 1981 (as amended), the Countryside and Rights of Way (CRoW) Act 2000, and the Conservation of Habitats and Species Regulations 2017. The Conservation of Habitats and Species Regulations 2017 transpose the European Union's 'Habitats Directive' (Council Directive 92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora (EC Habitats Directive) into UK law. The Regulations provide for the designation and protection of 'European Sites', the protection of 'European Protected Species' (EPS), and the adaptation of planning and other controls for the protection of European Sites. EPS are listed on Schedule 2 of the Conservation of Habitats and Species Regulations 2017.

The relevant sections of this legislation (combined) make it an offence to:

- deliberately capture, injure or kill any wild animal listed as a European Protected Species;
- deliberately disturb wild animals of any such species in such a way as to be likely:
  - to impair their ability:

    i) to survive, to breed or reproduce, or to rear or nurture their young, or;

    ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate, or;
  - to affect significantly the local distribution or abundance of the species to which they belong.
- damage or destroy a breeding site or resting place of such an animal; and
- intentionally or recklessly obstruct access to a place of shelter or protection

The legislation also makes it an offence to possess or control (live or dead animal, part or derivative); and sell, offer for sale, possess or transport for the purpose of sale (live or dead animal, part or derivative).

The above legislation applies to all life stages of a bat including juveniles and adults. Impacts upon each individual bat as the result of an illegal act constitute a separate offence under the above legislation.

Planning Policy

Natural Environment and Rural Communities Act 2006 (NERC 2006)

Section 40 of the Natural Environment and Rural Communities Act 2006 (NERC 2006) Act concerns biodiversity and states: "*Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity*."

Section 41 of the NERC Act sates that: "*The Secretary of State must, as respects England, publish a list of the living organisms and types of habitat which in the Secretary of State's opinion are of principal importance for the purpose of conserving biodiversity*". Common toad, natterjack toad, pool frog and GCN have been listed as 'Species of Principal Importance' under the NERC Act. The list of species can be downloaded from the natural England website at:

http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx

The Act stresses that "*it is important that public authorities seek not only to protect important habitats and species, but actively seek opportunities to enhance biodiversity through development proposals, where appropriate. Incorporating enhancement opportunities into projects may help applicants to achieve planning permission*."

Highways England Biodiversity Plan 2015

The Highways England Biodiversity Plan 2015 commits to "mitigate and compensate [the biodiversity impacts of network improvement projects] in order to achieve no net loss of biodiversity, as far as the projects are reasonably able. In addition, projects will identify biodiversity opportunities and deliver actions that will achieve net biodiversity gain, wherever possible."

Northumberland local Biodiversity Action Plan

The Northumberland LBAP identifies the presence of 10 of the 17 UK bat species as present in Northumberland and all are listed on the LBAP.

Current targets outlined in the Northumberland LBAP are the following:

- Maintain the current population of bats in Northumberland by 2010; and
- Maintain the current range of bats in Northumberland by 2010.

To achieve this the ongoing priority actions include:

- Prevent where possible, or mitigate against, any roost loss or fragmentation (including commuting routes); and
- Require habitat enhancement as planning gain for all developments that adversely affect bat roosts.

APPENDIX B: TREE SURVEY RESULTS

<table>
<tr><td colspan="4">A1 Ecological Inspection of Trees and Woodlands</td></tr>
<tr><td>Project Name:</td><td>A1 in Northumberland</td><td>Project Number:</td><td>B2104700</td></tr>
<tr><td>Tree 1A
Low BRP</td><td colspan="3">No further survey</td></tr>
<tr><td rowspan="7">Tree 2A
Negligible BRP</td><td colspan="3">  </td></tr>
<tr><td>Description</td><td colspan="2">Grid reference: NZ 18162 88668
Mature ash, approximately 11 m high and 0.93 m diameter at breast height, with thick ivy coverage which was itself a potential bat roost feature and could have hidden other potential features.</td></tr>
<tr><td>Climb and Inspect</td><td colspan="2">Undertaken during w/c 15 May 2017, downgraded from Moderate</td></tr>
<tr><td>Activity Survey</td><td colspan="2">N/A</td></tr>
<tr><td>Limitations</td><td colspan="2">None recorded.</td></tr>
<tr><td>Bat evidence</td><td colspan="2">None recorded.</td></tr>
<tr><td>Tree 3A
Low BRP</td><td colspan="3">No Further Survey</td></tr>
<tr><td>Tree 4A
Low BRP</td><td colspan="3">No Further Survey</td></tr>
<tr><td>Tree 5A
High BRP</td><td colspan="3">Tree scoped out due to distance</td></tr>
<tr><td>Tree 6A
Moderate BRP</td><td colspan="3">Tree scoped out due to distance</td></tr>
<tr><td>Tree 7A
Low BRP</td><td colspan="3">No Further Survey</td></tr>
<tr><td>Tree 8A
Low BRP</td><td colspan="3">No Further Survey</td></tr>
<tr><td>Tree 9A
Low BRP</td><td colspan="3">No Further Survey</td></tr>
<tr><td>Tree 10A
Low BRP</td><td colspan="3">No Further Survey</td></tr>
<tr><td>Tree 11A
Low BRP</td><td colspan="3">No Further Survey</td></tr>
</table>

<table>
<tr><td>Tree 12A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 13A
Moderate BRP</td><td colspan="2">Tree scoped out due to distance</td></tr>
<tr><td>Tree 14A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 15A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td rowspan="6">Tree 16A
Low BRP</td><td colspan="2">  </td></tr>
<tr><td>Description</td><td>Grid reference: NZ 18486 91266
A mature ash tree approximately 15 m high with a diameter at breast height of 1.5 m. Medium sized holes, splits and occasional lifted bark were observed. The tree was located on the woodland edge.</td></tr>
<tr><td>Climb and Inspect</td><td>Undertaken in w/c 15 May. Tree downgraded from Moderate BRP.</td></tr>
<tr><td>Activity Survey</td><td>N/A</td></tr>
<tr><td>Limitations</td><td>None recorded.</td></tr>
<tr><td>Bat evidence</td><td>None recorded.</td></tr>
<tr><td>Tree 17A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 18A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 19A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 20A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 21A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 22A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 23A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
</table>

Tree 24A Low BRP	No Further Survey	
Tree 25A Low BRP	No Further Survey	
Tree 26A Low BRP	No Further Survey	
Tree 27A Low BRP	No Further Survey	
Tree 28A Low BRP	No Further Survey	
Tree 29A Low BRP	No Further Survey	
Tree 30A Low BRP	No Further Survey	
Tree 31A Low BRP	No Further Survey	
Tree 32A Low BRP	No Further Survey	
Tree 33A Low BRP	No Further Survey	
Tree 34A Low BRP	No Further Survey	
Tree 35A Low BRP	No Further Survey	
Tree 36A High BRP		
	Description	Grid reference: NZ 18213 92308 Two mature ash trees which were within five metres of each other, both approximately 9 m high. One had a diameter at breast height of 1.1 m and the other had a diameter at breast height of 0.7 m. Butt rot, a tear out, and a knot hole were observed on the northern tree. The southern tree had callouses and small holes.
	Climb and Inspect	The tear out on the northern tree was identified as having high BRP, the other features were identified as having low BRP during the climb and inspect survey completed on 7 August 2017.

	Activity Survey	One emergence survey completed on 20 June 2017. One re-entry survey completed on 13 July 2017
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 37A Low BRP	No Further Survey	
Tree 38A Moderate BRP	Tree scoped out due to distance	
Tree 39A Moderate BRP	Tree scoped out due to distance	
Tree 40A Low BRP	No Further Survey	
Tree 41A Low BRP	No Further Survey	
Tree 42A Low BRP	No Further Survey	
Tree 43A Low BRP	No Further Survey	
Tree 44A Low BRP		
	Description	Grid reference: NZ 18217 92488 A mature ash tree approximately 10 m high with a diameter at breast height of 1.1 m. A large hole was present from a fallen limb (tear out), there were also numerous splits and good connectivity with hedgerows.
	Climb and Inspect	Downgraded from Moderate BRP during survey undertaken on 5 June 2017.
	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.

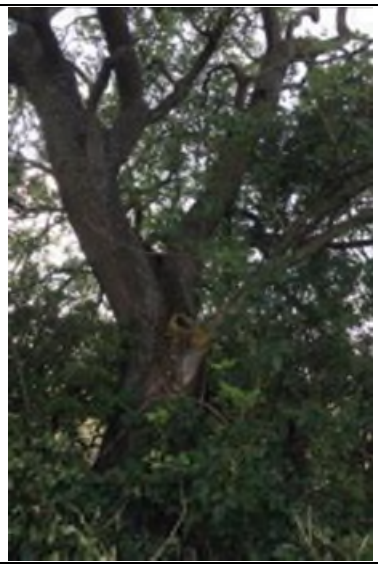
Tree 45A Moderate BRP		
	Description	Grid reference: NZ 18217 92510 A mature ash tree approximately 8 m high with a diameter at breast height of 1.1 m. The tree appeared to be dying, numerous holes and splits were observed with good habitat connectivity.
	Climb and Inspect	Downgraded from High BRP during survey completed in w/c 15 May 2017.
	Activity Survey	One emergence survey completed on 27 June 2017
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 46A Low BRP	No Further Survey	
Tree 47A Low BRP	No Further Survey	
Tree 48A Low BRP	No Further Survey	
Tree 49A Low BRP	No Further Survey	
Tree 50A Low BRP	No Further Survey	

Tree 51A **High BRP**		
	Description	Grid reference: NZ 18105 92547 A mature ash tree approximately 10 m high with a diameter at breast height of 1.1 m. A medium sized cavity was observed at a height of approximately 3 m and small splits were present.
	Climb and Inspect	Upgraded from Moderate BRP during survey completed in w/c 15 May 2017. It was deemed most appropriate to fully inspect the PRFs present therefore two climb and inspect surveys were completed (second in w/c 7 August 2017) in lieu of emergence / re-entry surveys.
	Activity Survey	One emergence survey completed on 27 June 2017
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 52A **Low BRP**	No Further Survey	

Tree 53A Negligible BRP		
	Description	Grid reference: NZ 18164 92519 A semi-mature ash approximately 6 m high with a diameter at breast height of 0.7 m. A south-facing, medium sized fissure was present, also a small hole and a medium hollow limb.
	Climb and Inspect	Downgraded from Moderate BRP during survey completed in w/c 15 May 2017.
	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 54A Moderate BRP		
	Description	Grid reference: NZ 18185 92528 A semi-mature ash tree approximately 7 m high with a diameter at breast height of 0.9 m. A large, hollow limb was observed with a number of potential entrance points.

		Evidence of disease also found which was not thought to be ash dieback.
	Climb and Inspect	No change during survey completed in w/c 15 May 2017.
	Activity Survey	One emergence survey completed on 27 June 2017
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 55A Low BRP		
	Description	Grid reference: NZ 18260 92551 A mature ash tree of approximately 10 m height with a diameter at breast height of 1 m. A large hole was present but this was quite low down. Dead limbs, splits and knotholes were also observed although tree was quite exposed.
	Climb and Inspect	Downgraded from Moderate BRP during survey completed in w/c 15 May 2017.
	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.

<table>
<tr><td rowspan="6">Tree 56A
Moderate BRP</td><td colspan="2">  </td></tr>
<tr><td>Description</td><td>Grid reference: NZ 18297 92570
A mature ash approximately 12 m high with a diameter at breast height of 1.1 m. A calloused hole was observed at front of tree, however surveyors were unable to identify from ground level whether it was hollow. There were also numerous knotholes and good habitat connectivity.</td></tr>
<tr><td>Climb and Inspect</td><td>No change during survey completed in w/c 5 June 2017</td></tr>
<tr><td>Activity Survey</td><td>One emergence survey completed on 20 June 2017</td></tr>
<tr><td>Limitations</td><td>None recorded.</td></tr>
<tr><td>Bat evidence</td><td>None recorded.</td></tr>
<tr><td>Tree 57A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 58A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 59A
Moderate BRP</td><td colspan="2">Tree scoped out due to distance</td></tr>
<tr><td>Tree 60A
Moderate BRP</td><td colspan="2">Tree scoped out due to distance</td></tr>
<tr><td>Tree 61A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 62A
Moderate BRP</td><td colspan="2">Tree scoped out due to distance</td></tr>
<tr><td>Tree 63A
Moderate BRP</td><td colspan="2">Tree scoped out due to distance</td></tr>
<tr><td>Tree 64A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 65A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 66A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 67A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
</table>

Tree 68A Negligible BRP		
	Description	Grid reference: NZ 18389 93454 A mature ash tree approximately 13 m high with a diameter at breast height of 1.5 m. A knothole and numerous splits were observed.
	Climb and Inspect	Downgraded from Moderate BRP during survey completed in w/c 15 May 2017.
	Activity Survey	N/A
	Limitations	Tree was densely ivy clad so assessment was ground based inspections were visually restricted.
	Bat evidence	None recorded.
Tree 69A Negligible BRP		
	Description	Grid reference: NZ 18443 93497 A mature ash tree with a height of 12 m and a diameter at breast height of 1 m. A downward facing knothole was observed. Also, there was good connectivity with hedgerows and good flight lines.
	Climb and Inspect	Downgraded from Moderate BRP during survey completed in w/c 15 May 2017.

	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 70A Moderate BRP	Tree scoped out due to distance	
Tree 71A Low BRP	No Further Survey	
Tree 72A Low BRP	No Further Survey	
Tree 73A Low BRP	No Further Survey	
Tree 74A Low BRP	No Further Survey	
Tree 75A Low BRP	No Further Survey	
Tree 76A Moderate BRP	Tree scoped out due to distance	
Tree 77A Moderate BRP	Tree scoped out due to distance	
Tree 78A Moderate BRP	Tree scoped out due to distance	
Tree 79A Low BRP	No Further Survey	
Tree 80A Low BRP	No Further Survey	
Tree 81A High BRP	Tree Tree scoped out due to distance	
Tree 82A Moderate BRP	Tree scoped out due to distance	
Tree 83A Moderate BRP	Tree scoped out due to distance	
Tree 84A Low BRP	No Further Survey	
Tree 85A Low BRP	No Further Survey	
Tree 86A Low BRP	No Further Survey	
Tree 87A Low BRP	No Further Survey	
Tree 88A Low BRP	No Further Survey	
Tree 89A Low BRP	No Further Survey	
Tree 90A Low BRP	No Further Survey	
Tree 91A Low BRP	No Further Survey	
Tree 92A Low BRP	No Further Survey	
Tree 93A Low BRP	No Further Survey	

Tree 94A Moderate BRP	Tree scoped out due to distance
Tree 95A Low BRP	No Further Survey
Tree 96A Low BRP	No Further Survey
Tree 97A Low BRP	No Further Survey
Tree 98A Moderate BRP	Tree scoped out due to distance
Tree 99A Moderate BRP	Tree scoped out due to distance
Tree 100A Low BRP	No Further Survey
Tree 101A High BRP	Tree scoped out due to distance
Tree 102A Moderate BRP	Tree scoped out due to distance
Tree 103A Moderate BRP	Tree scoped out due to distance
Tree 104A Low BRP	No Further Survey
Tree 105A High BRP	Tree scoped out due to distance
Tree 106A Low BRP	No Further Survey
Tree 107A Moderate BRP	Tree scoped out due to distance
Tree 108A Low BRP	
	Description: Grid reference: NZ 18574 95177 Mature oak situated in a hedgerow, approximately 14 m high and 0.75 m diameter at breast height. Crevices present between bark and ivy.

	Climb and Inspect	Downgraded from Moderate BRP during survey completed in w/c 15 May 2017.
	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 109A Low BRP		
	Description	Grid reference: NZ 18578 95178 Ancient oak situated in a hedgerow, approximately 14 m high with a diameter at breast height of 1.2 m. Old specimen with snagged limb ends and longitudinal fissures on some limbs, covered in ivy.
	Climb and Inspect	Downgraded from Moderate BRP during survey completed in w/c 15 May 2017.
	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.

<table>
<tr><td rowspan="6">Tree 110A
Low BRP</td><td colspan="2">  </td></tr>
<tr><td>Description</td><td>Grid reference: NZ 18569 95183
Ancient oak situated in a hedgerow, approximately 20 m high with a diameter at breast height of 1 m. Numerous splits and cracks which were obscured by ivy.</td></tr>
<tr><td>Climb and Inspect</td><td>Downgraded from Moderate BRP during survey completed in w/c 15 May 2017.</td></tr>
<tr><td>Activity Survey</td><td>N/A</td></tr>
<tr><td>Limitations</td><td>None recorded.</td></tr>
<tr><td>Bat evidence</td><td>None recorded.</td></tr>
<tr><td>Tree 111A
Negligible BRP</td><td colspan="2">  </td></tr>
</table>

	Description	Grid reference: NZ 18622 95204 Mature oak situated in a hedgerow, approximately 14 m high with a diameter at breast height of 1 m. Old specimen with hazard beam present on west facing limb. The tree was also covered in young ivy.
	Climb and Inspect	Downgraded from Moderate BRP during survey completed in w/c 5 June 2017
	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 112A High BRP		
	Description	Grid reference: NZ 18564 95233 Mature ash situated in a field, approximately 20 m high with a diameter at breast height of 1 m. Numerous voids, cavities, splits and rot holes of various sizes on all aspects.
	Climb and Inspect	The climb and inspect survey confirmed the high BRP grade identifying prolific cankers extending into cavities and a woodpecker hole at a height of 18 m on the western aspect during survey completed in w/c 5 June 2017.
	Activity Survey	Two emergence surveys were undertaken on 27 June and 8 August 2017. One re-entry survey was undertaken on 12 July 2017.
	Limitations	None recorded.

	Bat evidence	None recorded.
Tree 113A Moderate BRP	Tree scoped out due to distance	
T114A Low BRP	No Further Survey	
T115A Moderate BRP	Tree scoped out due to distance	
Tree 116A Moderate BRP	Tree scoped out due to distance	
Tree 117A Low BRP	No Further Survey	
Tree 118A Low BRP	No Further Survey	
Tree 119A Low BRP	No Further Survey	
Tree 120A Low BRP	No Further Survey	
Tree 121A Low BRP	No Further Survey	
Tree 122A Moderate BRP	Tree scoped out due to distance	
Tree 123A Low BRP	No Further Survey	
Tree 124A Low BRP	No Further Survey	
Tree 125A Low BRP	No Further Survey	
Tree 126A Low BRP	No Further Survey	
Tree 127A Low BRP	No Further Survey	
Tree 128A High BRP		
	Description	Grid reference: NZ 18346 96481

		Semi-mature ash present in a hedgerow, approximately 8-9 m high with a diameter at breast height of 0.6 m. Central cavity leading to potential void.
	Climb and Inspect	Upgraded from Moderate BRP due to presence of 2 x cankers leading to cavity in stem. Two climb and inspect surveys undertaken, one in w/c 5 June, and one in w/c 7 August 2017.
	Activity Survey	One emergence survey completed on 26 June 2017.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 129A Low BRP	No Further Survey	
Tree 130A Low BRP	No Further Survey	
Tree 131A Moderate BRP		
	Description	Grid reference: NZ 17983 96879 Ancient ash present in a roadside verge, approximately 12 m high with a diameter at breast height of 1.3 m. Densely clad with ivy but numerous splits and rot pockets on visible limbs suggested that more featured were obscured.
	Climb and Inspect	The climb and inspect survey confirmed the moderate BRP grade identifying a knot hole at 3 m on the southern aspect during survey completed in w/c 15 May 2017.
	Activity Survey	One re-entry survey completed on 25 May 2017.
	Limitations	None recorded.

	Bat evidence	None recorded.
Tree 132A Low BRP	No Further Survey	
Tree 133A Low BRP	No Further Survey	
Tree 134A Low BRP	No Further Survey	
Tree 135A Low BRP	No Further Survey	
Tree 136A Confirmed bat roost		
	Description	Grid reference: NZ 17909 97095 Ancient alder present along a riverbank, approximately 12 m high and 0.75 m diameter at breast height. Tree decaying, woodpecker hole at 7 m.
	Climb and Inspect	The climb and inspect survey confirmed the moderate BRP grade and features identified in the initial ground-based assessment during survey completed in w/c 5 June 2017.
	Activity Survey	Three emergence surveys completed on 24 May, 27 June, and 12 July 2017.
	Limitations	None recorded.
	Bat evidence	Three soprano pipistrelles were recorded emerging from a roost in the lowest branch (approx. 2 m high on southern aspect) during the May survey.
Tree 137A Low BRP	No Further Survey	
Tree 138A Low BRP	No Further Survey	
Tree 139A Low BRP	No Further Survey	
Tree 140A Low BRP	No Further Survey	
Tree 141A Low BRP	No Further Survey	

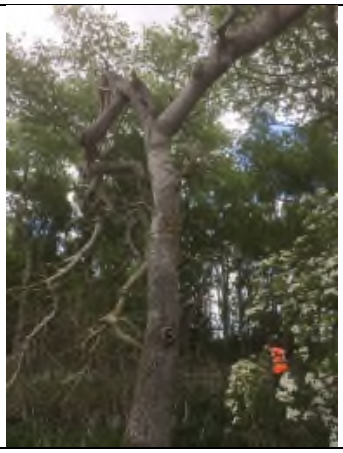
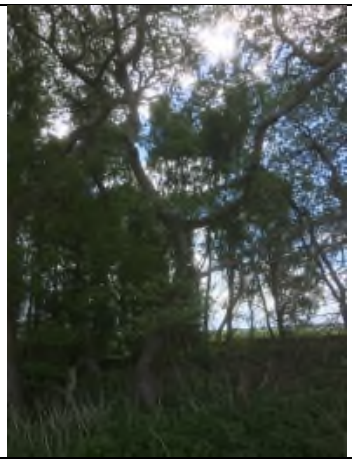
<table>
<tr><td rowspan="6">Tree 142
Negligible BRP</td><td colspan="2">  </td></tr>
<tr><td>Description</td><td>Grid reference: NZ 17401 98859
Ancient ash situated in a hedgerow adjacent to A1, approximately 20 m high with a diameter at breast height of 1 m. A knot hole and tear out were present on the eastern side of the trunk.</td></tr>
<tr><td>Climb and Inspect</td><td>Downgraded from Moderate BRP during survey completed in w/c 5 June 2017.</td></tr>
<tr><td>Activity Survey</td><td>N/A</td></tr>
<tr><td>Limitations</td><td>None recorded.</td></tr>
<tr><td>Bat evidence</td><td>None recorded.</td></tr>
<tr><td>Tree 143A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 144A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 145
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>Tree 146 A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
</table>

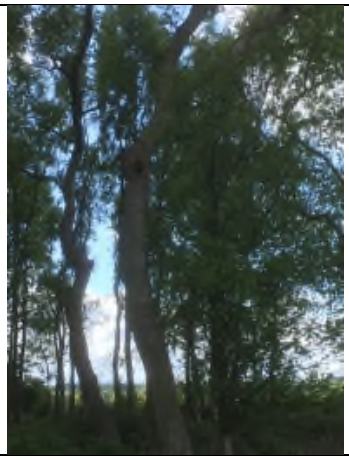
<table>
<tr><td rowspan="6">Tree 147A
Confirmed bat roost</td><td colspan="2">  </td></tr>
<tr><td>Description</td><td>Grid reference: NZ 17411 99685
Two young ash trees, approximately 14 m tall with a diameter of 0.28 m at breast height. Two bat boxes on each tree.</td></tr>
<tr><td>Climb and Inspect</td><td>Not undertaken</td></tr>
<tr><td>Activity Survey</td><td>Two re-entry surveys undertaken on 28 June, and 12 July 2017. One emergence survey undertaken on 8 August 2017.</td></tr>
<tr><td>Limitations</td><td>None recorded.</td></tr>
<tr><td>Bat evidence</td><td>One soprano pipistrelle recorded returning to a roost in a bat box on the southernmost tree during the June survey. One soprano pipistrelle recorded emerging from a bat box on the northernmost tree during the August survey.</td></tr>
<tr><td>Tree 148A
High BRP</td><td colspan="2">  </td></tr>
</table>

	Description	Grid reference: NZ 17469 99675 Two semi-mature beech and ash, approximately 14 m high with diameters at breast height of 0.3 m. Two bat boxes on each tree; part of Highways England monitoring scheme.
	Climb and Inspect	Not undertaken
	Activity Survey	One emergence survey completed on 27 June 2017. Two re-entry surveys completed on 13 July, and 8 August 2017.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 149A Low BRP	No Further Survey	
Tree 150A Low BRP	No Further Survey	
Tree 151A Low BRP	No Further Survey	
Tree 152A Moderate BRP		
	Description	Grid reference: NZ 17392 99894 Young ash, approximately 10 m tall with a diameter of 0.3 m at breast height. Large frost crack on eastern side.
	Climb and Inspect	The climb and inspect survey undertaken on w/c 7 August 2017 confirmed the Moderate BRP grade.
	Activity Survey	One emergence survey completed on 4 July 2017.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 153A Low BRP	No Further Survey	
Tree 154 A	No Further Survey	

Low BRP		
Tree 155A **Low BRP**	No Further Survey	
Tree 156A **Moderate BRP**		
	Description	Grid reference: NU 17526 00435 Mature ash tree, approximately 24 m high with a diameter of 0.8 m at breast height. A large tear out was present with some ivy also present.
	Climb and Inspect	Confirmed as Moderate BRP grade during survey completed in w/c 15 May 2017.
	Activity Survey	One re-entry survey was undertaken on 28 June 2017.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 157A **Low BRP**		
	Description	Grid reference: NU 17443 00538

		Semi-mature oak tree, approximately 24 m high with a diameter of 0.5 m at breast height. A rot hole, broken limb, and a dead branch with a crevice was present.
	Climb and Inspect	Downgraded from Moderate BRP during survey completed in w/c 15 May 2017.
	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 158A Low BRP	No Further Survey	
NB – No Tree Numbers 159 – 199 were present		
T200A Low BRP	No Further Survey	
T201A High BRP		
	Description	Grid reference: NZ 17549 97715 Mature ash, approximately 10 m high and 0.7 m diameter at breast height. The trunk was hollow with a potential access point at the base of the stem.
	Climb and Inspect	The High BRP assessment was confirmed during the climb and inspect survey undertaken in w/c 7 August 2017.
	Activity Survey	A single emergence survey was undertaken on 4 July 2017. A full inspection of the hollow stem was completed from ground level was completed in week commencing (W/c) 15 May, w/c 5 June, and w/c 7 August.
	Limitations	None recorded.
	Bat evidence	None recorded.
T202A Low BRP	No Further Survey	

Tree 203A Moderate BRP		
	Description	Grid reference: NZ 18443 92626 Semi-mature white poplar, with a diameter of 0.4 m at breast height. An impact shatter and two knot holes were present.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017.
	Activity Survey	One emergence survey was completed on 11 July 2017. One re-entry survey was completed on 8 August 2017.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 204A Low BRP		
	Description	Grid reference: NZ 18448 92637 Semi-mature white poplar with a diameter of 0.4 m at breast height. Two knot holes were present, one each on the east and west aspects.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017.
	Activity Survey	N/A
	Limitations	None recorded.

	Bat evidence	None recorded.
Tree 205A Low BRP		
	Description	Grid reference: NZ 18452 92644 Semi-mature white poplar with a diameter of 0.4 m at breast height. A knot hole, was present on the eastern aspect at a height of 10 m.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey took place in w/c 5 June 2017.
	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 206A Moderate BRP		
	Description	Grid reference: NZ 18476 92631 Semi-mature birch with a diameter of 0.2 m at breast height. A longitudinal wound was present approximately 4 m high on the western aspect.
	Climb and Inspect	This additional tree was scoped-in during survey completed w/c 15 May 2017 The climb and inspect survey took place in w/c 5 June 2017.

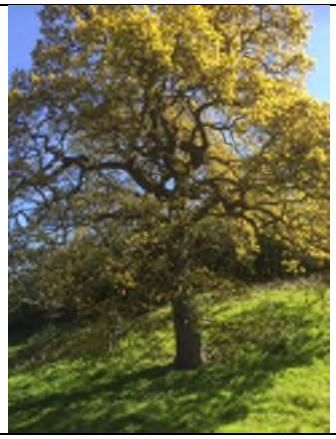
	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 207A High BRP		
	Description	Grid reference: NZ 18481 92608 Semi-mature birch with a diameter of 0.2 m at breast height. A single tear-out was present at a height of 1.8 m on the eastern aspect.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey was completed during the w/c 5 June 2017.
	Activity Survey	One re-entry survey was completed on 8 August 2017. The tear out was subject to a full endoscope inspection in w/c 15 May, w/c 5 June, and following the emergence survey on 8 August.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 208A High BRP	No Photo Available	
	Description	Grid reference: NZ 18481 92608 Semi-mature oak with a diameter of 0.5 m at breast height. Lightning strike damage had developed rams horns on the eastern aspect and some minor lifted bark was also present.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey took place the same week and a second was completed in w/c 5 June 2017.
	Activity Survey	One emergence survey completed on 30 August 2017
	Limitations	None recorded.

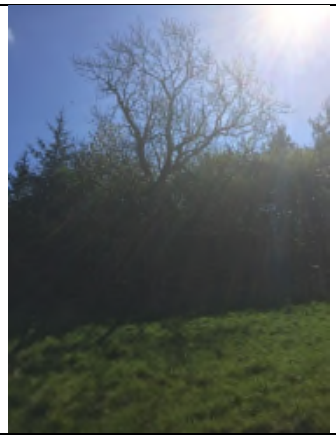
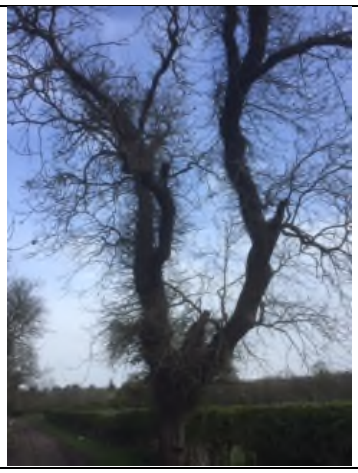
	Bat evidence	None recorded.
Tree 209A High BRP		
	Description	Grid reference: NU 17407 00550 Semi-mature oak with a diameter of 0.4 m at breast height. A single tear-out was present at a height of 15 m on the eastern aspect.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey took place the same week and a second was completed in w/c 7 August 2017.
	Activity Survey	One emergence survey completed on 11 July 2017.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 210A High BRP		
	Description	Grid reference: NU 17407 00550 Semi-mature oak with a diameter of 0.4 m at breast height. A single hazard beam was present in a west-facing limb.

	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey took place the same week and a second was completed in w/c 7 August 2017.
	Activity Survey	One emergence survey completed on 18 July 2017.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 211A Moderate BRP		
	Description	Grid reference: NZ 17447 98041 Semi-mature ash with a diameter of 0.6 m at breast height. A single tear out was present on the eastern aspect.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey was completed in w/c 5 June.
	Activity Survey	One emergence survey completed on 11 July 2017.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 212A Moderate BRP		

	Description	Grid reference: NZ 17420 98037 Semi-mature ash with a diameter of 0.7 m at breast height. A single tear out was present on the eastern aspect.
	Climb and Inspect	This additional tree was during survey completed in w/c 15 May 2017. The tree was climbed in w/c 5 June, and again in w/c 7 August 2017.
	Activity Survey	None completed as climb and inspect surveys undertaken instead.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 213A Moderate BRP		
	Description	Grid reference: NZ 17375 98028 Semi-mature ash with a diameter of 0.6 m at breast height. A single tear out was present on the eastern aspect.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The initial survey took place the same week with a second completed in w/c 5 June 2017.
	Activity Survey	None completed.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 214A Moderate BRP		

	Description	Grid reference: NZ 17953 97307 Semi-mature alder with a diameter of 2 x 0.3 m at breast height. A single tear out was present on the western aspect.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey was completed in w/c 5 June 2017.
	Activity Survey	None completed.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 215A **High BRP**		
	Description	Grid reference: NU 17411 00268 Over-mature oak with a diameter of 1.2 m at breast height. A single hazard beam was present in a north-facing limb and a knot hole was present on the eastern aspect.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey was undertaken in w/c 5 June 2017.
	Activity Survey	Two re-entry surveys were undertaken, one on 31 August and one on 3 October 2017. One emergence survey was undertaken on 19 September 2017.
	Limitations	None recorded.
	Bat evidence	None recorded.

Tree 216A Moderate BRP		
	Description	Grid reference: NU 17418 00284 Mature oak with a diameter of 0.75 m at breast height. A single hazard beam was present in a northwest-facing limb. A knot hole was present on the southern aspect, and wounds were present on the east and western aspects.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey was completed in w/c 5 June 2017.
	Activity Survey	One emergence survey was completed on 31 August 2017.
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 217A Moderate BRP		
	Description	Grid reference: NU 17428 00290 Mature oak with a diameter of 1.2 m at breast height. Knot holes were present on the east and south east aspects and lifting bark was present on the north east aspect.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey was completed in w/c 5 June 2017.
	Activity Survey	One emergence survey was completed on 31 August 2017.

	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 218A Low BRP		
	Description	Grid reference: NU 17432 00314 Semi-mature ash with a diameter of 0.75 m at breast height. A tear out was present on the eastern aspect, and a knot hole was present on the western aspect.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey was completed in w/c 5 June 2017.
	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 219A Low BRP		
	Description	Grid reference: NU 17580 00782 Mature ash. Dense ivy with small pockets suitable to be used by roosting bats, was present.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey was completed in w/c 5 June 2017.

	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.
Tree 220A Confirmed bat roost		
	Description	Grid reference: NU 17521 00817 Mature ash. A tear out was present on the northwest aspect at 5 m high with a knot hole present at a height of 4 m on the eastern aspect.
	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey was completed in w/c 5 June 2017.
	Activity Survey	Two emergence surveys were undertaken, one on 7 August, and one on 2 October 2017. One re-entry survey was undertaken on 20 September 2017.
	Limitations	None recorded.
	Bat evidence	Two soprano pipistrelles were recorded emerging from the tear out during the emergence survey completed on 7 August 2017.
Tree 221A Low BRP		
	Description	Grid reference: NU 17576 00544 Mature oak with a diameter of 0.7 m at breast height. A single hazard beam was present in a west-facing limb. A knot hole was present on the southwest aspect. Lifted bark was also present.

	Climb and Inspect	This additional tree was scoped-in during survey completed in w/c 15 May 2017. The climb and inspect survey was completed in w/c 5 June 2017.
	Activity Survey	N/A
	Limitations	None recorded.
	Bat evidence	None recorded.

APPENDIX C: BUILDING SURVEY RESULTS

<table>
<tr><td colspan="4">A1 Ecological Inspection of Buildings and Structures</td></tr>
<tr><td>Project Name:</td><td>A1 in Northumberland</td><td>Project Number:</td><td>B2104700</td></tr>
<tr><td>B1A
Negligible BRP</td><td colspan="3">No Further Survey</td></tr>
<tr><td>B2A
Negligible BRP</td><td colspan="3">No Further Survey</td></tr>
<tr><td>B3A
Negligible BRP</td><td colspan="3">No Further Survey</td></tr>
<tr><td rowspan="4">B4A
Confirmed BRP</td><td colspan="3">  </td></tr>
<tr><td>Description</td><td colspan="2">Grid reference: NZ 18200 88667
A detached three-storey dwelling, less than 100 years old. The building was approximately 15 m high, 20 m long and 20 m wide, and was constructed from stone with both uPVC and wooden-framed windows. The roof comprised both double pitched and single pitched sections covered with slates.
The surrounding land was grazed pasture, woodland and road.</td></tr>
<tr><td>Activity Surveys</td><td colspan="2">Emergence surveys were completed on 25 June, and 12 July 2017. A re-entry survey was completed on 31 August 2017</td></tr>
<tr><td>Bat Evidence</td><td colspan="2">A single common pipistrelle was recorded emerging during the 25 June, and 12 July surveys. The emergence location is shown in the photo below.
  </td></tr>
<tr><td>B5A
Negligible BRP</td><td colspan="3">No Further Survey</td></tr>
<tr><td>B6A
Negligible BRP</td><td colspan="3">No Further Survey</td></tr>
<tr><td>B7A
Negligible BRP</td><td colspan="3">No Further Survey</td></tr>
</table>

<table>
<tr><td rowspan="4">B8A
Confirmed bat roost</td><td colspan="2">  </td></tr>
<tr><td>Description</td><td>Grid reference: NZ 18127 89651
A single-storey detached farm outbuilding, less than 100 years old. The building was approximately 5 m high, 20 m long and 10 m wide, and was constructed from stone with a two-pitched slate covered roof. The surveys identified that a rubble filled wall cavity was present with cracks and missing mortar allowing bat access to any void present. Within the roof, missing, slipped, and raised slates were present as were missing and raised ridge tiles.

Internally the building was open to the roof (i.e. no void was present). Wooden sarking was present beneath the slates and access suitable for bats was identified at the eaves. The roof was supported by both king-post, and queen-post timber frames.
The surrounding land was pasture and farm buildings.</td></tr>
<tr><td>Activity Surveys/ Internal Inspection</td><td>No emergence or re-entry surveys were permitted by the landowner.

An internal inspection was completed on 30 August 2017.</td></tr>
<tr><td>Bat evidence</td><td>Old bat droppings were located throughout the northern section of the barn, most were located out of reach on the walls but some were present including in one location beneath a peg hole in a king post frame. In total approximately 50 droppings were present. The size of the droppings indicated that they were likely from a small to medium sized bat. Droppings that could be reached were collected during the internal inspection. The droppings were sent for DNA analysis but were too degraded to yield bat DNA. The DNA analysis results are given in Appendix K.</td></tr>
<tr><td>B9A
Negligible BRP</td><td colspan="2">No Further Survey</td></tr>
</table>

<table>
<tr><td rowspan="4">B10A
Low BRP</td><td colspan="2">  </td></tr>
<tr><td>Description</td><td>Grid reference: NZ 18108 89671
A detached three-storey dwelling, less than 100 years old. The building was approximately 10 m high, 10 m long and 8 m wide, and was constructed from brick and render, with UPVC framed windows. The roof was partly two-pitched, covered with slates, and partly flat, covered with felt. On the pitched sections of roof, some raised slates were present, with raised ridge tiles also present (no missing or slipped tiles were observed).

Only approximately 10 % of the roof void was accessible but in the area inspected tiles were present on battens without any membrane / sarking present. No light was observed internally indicating that no obvious bat access into the void was present. This may have been due to the insulation present.

No obvious wall cavity was identified but the buildings age and type indicated that one could be present.
The surrounding land was pasture and farm buildings.</td></tr>
<tr><td>Activity Surveys / Internal Inspection</td><td>No emergence or re-entry surveys were permitted by the landowner.

An internal inspection was completed on 30 August 2017.</td></tr>
<tr><td>Bat evidence</td><td>None recorded.</td></tr>
<tr><td></td><td colspan="2"></td></tr>
<tr><td>B11A
Negligible BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>B12A
Negligible BRP</td><td colspan="2">No Further Survey</td></tr>
</table>

B13A Moderate BRP		
	Description	Grid reference: NZ 18128 89679 A detached two-storey building, less than 100 years old. The building was disused; the previous use was unknown. The building was approximately 10 m high, 10 m long and 8 m wide, and was constructed from brick with wooden-framed windows, some boarded with corrugated metal. The two-pitched roof was covered with tiles, and corrugated metal. Missing, slipped, and raised tiles and ridge tiles were present. Internally the building had a relatively modern timbre structure with underfelt present. Gaps at the eaves were noted but no bats or signs of bats were recorded. The surrounding land was pasture and farm buildings.
	Activity Surveys / Internal Inspection	No emergence or re-entry surveys were permitted by the landowner. An internal inspection was completed on 30 August 2017.
	Bat evidence	None recorded.
B14A Negligible BRP	No Further Survey	
B15A Low BRP	No Further Survey	
B16A Low BRP	No Further Survey	
B17A Low BRP	No Further Survey	
B18A Negligible BRP	No Further Survey	
B19A Negligible BRP	No Further Survey	
B20A Negligible BRP	No Further Survey	
B21A Confirmed bat roost	Building scoped out due to distance	

B22A Negligible BRP	No Further Survey
B23A Negligible BRP	No Further Survey
B24A Negligible BRP	No Further Survey
B25A High BRP.	Building scoped out due to distance
B26A Low BRP.	No Further Survey
B27A Low BRP.	No Further Survey
B28A Moderate BRP.	Building scoped out due to distance
B29A Moderate BRP.	Building scoped out due to distance
B30A Moderate BRP.	Building scoped out due to distance
B31A Moderate BRP.	Building scoped out due to distance
B32A Negligible BRP.	No Further Survey
B33A High BRP.	Building scoped out due to distance
B34A Negligible BRP.	No Further Survey
B35A Negligible BRP.	No Further Survey
B36A Low BRP.	No Further Survey
B37A Low BRP.	No Further Survey
B38A Low BRP.	No Further Survey
B39A Moderate BRP.	Building scoped out due to distance
B40A Low BRP	No Further Survey
B41A Negligible BRP	No Further Survey
B42A Negligible BRP	No Further Survey
B43A Low BRP	No Further Survey
B44A Moderate BRP	Building scoped out due to distance
B45A Moderate BRP	Building scoped out due to distance
B46A Negligible BRP.	No Further Survey
B47A Moderate BRP	Building scoped out due to distance
B48A Moderate BRP	Building scoped out due to distance
B49A Moderate BRP	Building scoped out due to distance
B50A High BRP	Building scoped out due to distance
B51A	Building scoped out due to distance

High BRP	
B52A Moderate BRP	Building scoped out due to distance
B53A Low BRP	No Further Survey
B54A Low BRP	No Further Survey
B55A High BRP	Building scoped out due to distance
B56A Negligible BRP	No Further Survey
B57A Moderate BRP	Building scoped out due to distance
B58A Negligible BRP	No Further Survey
B59A Low BRP	No Further Survey
B60A Low BRP	No Further Survey
B61A Negligible BRP	No Further Survey
B62A Low BRP	No Further Survey
B63A High BRP	Building scoped out due to distance
B64A Low BRP	No Further Survey
B65A Confirmed bat roost	Building scoped out due to distance
B66A Moderate BRP	Building scoped out due to distance
B67A Negligible BRP	No Further Survey
B68A Negligible BRP	No Further Survey
B69A Low BRP	No Further Survey
B70A Moderate BRP	Building scoped out due to distance
B71A Low BRP	No Further Survey
B72A Negligible BRP	No Further Survey
B73A Negligible BRP	No Further Survey
B74A Negligible BRP	No Further Survey
B75A Low BRP	No Further Survey
B76A Negligible BRP	No Further Survey
B77A	Building scoped out due to distance

<table>
<tr><td>High BRP</td><td colspan="2"></td></tr>
<tr><td>B78A
Negligible BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>B79A
Negligible BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>B80A
Negligible BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>B81A
Negligible BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>B82A
Negligible BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>B83A
Negligible BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td rowspan="4">B84A
Confirmed bat roost</td><td colspan="2">  </td></tr>
<tr><td>Description</td><td>Grid reference: NZ 17314 98710
A single-storey stone garage, less than 20 years old, with pan-tile roof. The building was approximately 4.5 m high, 20 m long and 6 m wide. The building had barge boards behind guttering and wooden window frames.
The surrounding land featured residential and farm buildings, arable fields and private gardens.</td></tr>
<tr><td>Activity Surveys</td><td>Emergence surveys were conducted on 4 July, and 29 August 2017. A re-entry survey was completed on 20 September 2017.</td></tr>
<tr><td>Bat evidence</td><td>Anecdotal evidence from a neighbour identified that a pipistrelle roost was present in the northernmost section of the garage during the initial inspection.

A brown long-eared bat was thought to have emerged from beneath the roof tiles on the western gable end during the 4 July survey. A soprano pipistrelle was also recorded emerging from this location during the survey completed on 29 August. A common pipistrelle was recorded entering a roost located at the base of a window, on the southern side of the building during the re-entry survey completed on 20 September.</td></tr>
<tr><td>B85A</td><td colspan="2">No Further Survey</td></tr>
</table>

<table>
<tr><td>Negligible BRP</td><td colspan="2"></td></tr>
<tr><td rowspan="4">B86A
Confirmed bat roost</td><td colspan="2">  </td></tr>
<tr><td>Description</td><td>Grid reference: NZ 17442 99885
The A1 concrete road bridge over the River Coquet, approximately 30 years old. The bridge had three spans and was approximately 16 m tall, 14 m wide and 70 m long. There was woodland eitherside of the bridge.</td></tr>
<tr><td>Activity Surveys</td><td>An emergence survey was completed on 26 June 2017. Re-entry surveys were completed on 11 July, and 30 August 2017.</td></tr>
<tr><td>Bat evidence</td><td>Two soprano pipistrelle were recorded returning to a roost in the top of the peer on the southern enbankment during the 11 July survey.</td></tr>
<tr><td>B87A
Negligible BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td colspan="3">NB – No Building Numbers B88A - B99A were present</td></tr>
<tr><td>B100A
Negligible BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td rowspan="2">B101A
Low BRP</td><td colspan="2">  </td></tr>
<tr><td>Description</td><td>Grid reference: NZ 17303 98729</td></tr>
</table>

		Single-storey, stone-walled dwelling with a two-pitched interlocking tile roof. The dwelling was approximately 15 m long and 9 m wide. The windows were uPVC. A flat-roofed conservatory was attached to the western side of the dwelling, and a small felt-roofed porch was attached to the eastern side. Soffit boxes were present, and lead flashing was located around the chimneys. The surrounding land featured woodland, arable fields and hedgerows.
	Activity Surveys	Access wasn't granted for further survey.
	Bat evidence	None recorded.
B102A Negligible BRP	No Further Survey	
B103A Negligible BRP	No Further Survey	
B104A Moderate BRP		
	Description	Grid reference: NZ 17222 98684 A block of two terraced single-storey dwellings with brick and rendered walls and double-pitched tiled roofs. The building was approximately 22 m long and 10 m wide, and the windows were framed by uPVC. Soffit boxes and barge boards were present, and lead flashing was located around the chimneys. The surrounding land featured woodland, arable fields and hedgerows.
	Activity Surveys	An emergence survey was completed on 29 August 2017. A re-entry survey was completed on 19 September 2017.
	Bat evidence	None recorded.
B105A Negligible BRP	No Further Survey	

<table>
<tr><td rowspan="4">B106A
Moderate BRP</td><td colspan="2"> 
Image taken from Google Earth Pro</td></tr>
<tr><td>Description</td><td>Grid reference: NZ 17189 98677
A block of two terraced single-storey dwellings with brick and rendered walls and two-pitched tiled roofs. The building was approximately 22 m long and 10 m wide, and the windows were uPVC. Soffit boxes and barge boards were present, and lead flashing was located around the chimneys.
The surrounding land featured woodland, arable fields and hedgerows.</td></tr>
<tr><td>Activity Surveys</td><td>An emergence survey was completed on 29 August 2017. A re-entry survey was completed on 19 September 2017.</td></tr>
<tr><td>Bat evidence</td><td>None recorded.</td></tr>
<tr><td>B107A
Low BRP</td><td colspan="2">No Further Survey</td></tr>
<tr><td>B108A
Moderate BRP</td><td colspan="2">Building scoped out due to distance</td></tr>
<tr><td rowspan="2">B109A
Moderate BRP</td><td colspan="2"> 
Image taken from Google Earth Pro</td></tr>
<tr><td>Description</td><td>Grid reference: NZ 18564 95146
A single-storey brick building with a two-pitched, slate covered roof. The building was approximately 4 m long and 3 m wide. The windows had wooden frames.
The surrounding land featured open farmland, with hedgerows approximately 25 m away.</td></tr>
</table>

	Activity Surveys	An emergence survey was completed on 26 June 2017. A re-entry survey was completed on 18 July 2017.
	Bat evidence	None recorded.
B110A Low BRP	No Further Survey	
B111A Low BRP	No Further Survey	

APPENDIX D: EMERGENCE AND RE-ENTRY SURVEY DETAILS

Building Emergence and Re-entry Survey Results

Building Reference number	Date	Sunset or sunrise time	Start time	End time	Wind start/end[33]	Cloud (out of 8) start/end	Rainfall start/end	Temperature start/end	Species recorded roosting	Species recorded foraging
B4A	Visit 1									
	25/06/2017	21:51	21:21	23:51	Calm/calm	8/8	Dry/light rain	14.3/14.5	One common pipistrelle	Common pipistrelle, soprano pipistrelle, noctule, *Myotis* species
	Visit 2									
	12/07/17	21:41	21:11	23:41	Light/calm	8/8	Dry/dry	12/10	One common pipistrelle	Common pipistrelle, noctule, brown long-eared bat
	Visit 3									
	31/08/17	06:11	04:11	06:26	Calm/calm	1/7	Dry/dry	12.5/9.7	-	Common pipistrelle, soprano pipistrelle
B84A	Visit 1									
	04/07/17	21:46	21:16	23:46	Light/light	8/8	Light/light	12/11	One brown long-eared bat	Common pipistrelle, soprano pipistrelle, brown long-eared bat
	Visit 2									
	29/08/17	20:07	19:37	22:07	Light/light	8/6	Dry/Dry	13/10	One soprano pipistrelle	Common pipistrelle, brown long-eared bat
	Visit 3									
	20/09/17	06:48	04:48	07:03	Calm/calm	6/8	Dry/Dry	12/11	One common pipistrelle	Common pipistrelle, soprano pipistrelle, noctule, *Myotis* species
B86A	Visit 1									
	26/06/2017	21:50	21:36	23:51	Light/light	8/8	Dry/dry	16.5/14.5	-	Common pipistrelle, soprano pipistrelle,

[33] Wind was measured as calm/light/moderate/strong.

Building Reference number	Date	Sunset or sunrise time	Start time	End time	Wind start/end[33]	Cloud (out of 8) start/end	Rainfall start/end	Temperature start/end	Species recorded roosting	Species recorded foraging
										noctule, *Myotis* species, brown long-eared bat
	Visit 2									
	11/07/2017	04.39	02:39	04:54	Calm/calm	(8/8)/(8/8)	Light/dry	12/11	Two soprano pipistrelle	Common pipistrelle, soprano pipistrelle, *Myotis* species
	Visit 3									
	30/08/2017	06:09	04:09	06:24	Calm/calm	(8/8)/(7/8)	Dry/dry	11.1/7.3	-	Soprano pipistrelle, *Myotis* species
B104A	Visit 1									
	29/08/2017	20:07	19:37	22:07	Calm/calm	(6/8)/(2/8)	Dry/dry	14/11	-	Common pipistrelle, soprano pipistrelle, noctule, *Myotis* species
	Visit 2									
	19/09/17	06:44	04:44	06:59	Light/calm	(0/8)/(0/8)	Dry/dry	6/3	-	none
B106A	Visit 1									
	29/08/2017	20:07	19:37	22:07	Light/light	(6/8)/(2/8)	Dry/dry	14/11	-	Common pipistrelle, soprano pipistrelle, noctule, *Myotis* species
	Visit 2									
	19/09/17	06:44	04:44	06:46	Light/Light	(0/8)/(0/8)	Dry/dry	6/3	-	none
B109A	Visit 1									
	26/06/2017	21:50	21:35	23:50	Calm/calm	(8/8)/(8/8)	Dry/light rain	13/11	-	Common pipistrelle
	Visit 2									
	18/07/2017	04:42	02:52	05:07	Calm/calm	(0/8)/(0/8)	Dry/dry	12/11	-	Common pipistrelle

Tree Emergence and Re-entry Survey Results

Tree Reference number	Date	Sunset or sunrise time	Start time	End time	Wind Start/end	Cloud start/end	Rainfall start/end	Temperature start/end	Species recorded roosting	Species recorded foraging
T36A	Visit 1									
	20/06/2017	21:49	21:19	23:49	Light/calm	(1/8)/(6/8)	Dry/dry	15/13	-	Common pipistrelle, soprano pipistrelle, *Nyctalus* species
	Visit 2									
	13/07/2017	04:44	02:44	04:59	Calm/light	(1/8)/(1/8)	Dry/dry	10/8	-	Common pipistrelle, soprano pipistrelle
T45A	Visit 1									
	27/06/2017	21:50	21:21	23:51	Light/calm	(8/8)/(8/8)	Light rain/dry	12/11	-	Common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat
T51A	Visit 1									
	27/06/2017	21:50	21:20	23:50	Light/light	(8/8)/(8/8)	Light rain/dry	12/12	-	Common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat
T54A	Visit 1									
	27/06/2017	21:50	21:20	23:50	Calm/calm	(8/8)/(8/8)	Light rain/dry	13.1/13	-	Common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat
T56A	Visit 1									
	20/06/2017	21:49	21:20	23:50	Light/moderate	(3/8)/(5/8)	Dry/dry	15/13	-	Common pipistrelle, soprano pipistrelle, Myotis species, noctule, brown long-eared bat
T112A	Visit 1									
	27/06/2017	21:50	21:23	23:53	Light/calm	(8/8)/(8/8)	Light rain/dry	12/11	-	Common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat
	Visit 2									
	12/07/2017	04:44	02:44	04:59	Calm/calm	(2/8)/(1/8)	Dry/dry	10/9	-	Soprano pipistrelle
	Visit 3									
	08/08/2017	20:57	20:27	22:57	Light/calm	(6/8)/(6/8)	Light rain/ light rain	13/13	-	Common pipistrelle, soprano pipistrelle, *Myotis* species
T128A	Visit 1									

Tree Reference number	Date	Sunset or sunrise time	Start time	End time	Wind Start/end	Cloud start/end	Rainfall start/end	Temperature start/end	Species recorded roosting	Species recorded foraging
	26/06/2017	21:50	21:20	23:50	Calm/calm	(8/8)/(8/8)	Dry/light rain	14/14	-	Common pipistrelle, soprano pipistrelle *Myotis* species, brown long-eared bat
T131A	Visit 1									
	25/05/2017	4:41	02:40	04:56	Calm/calm	(0/8)/(0/8)	Dry/Dry	12/10	-	Common pipistrelle, soprano pipistrelle *Myotis* species
T136A	Visit 1									
	24/05/2017	21:24	20:54	23:24	Calm/calm	(1/8)/(1/8)	Dry/Dry	18/12	Three soprano pipistrelle	Common pipistrelle, soprano pipistrelle, *Myotis* species
	Visit 2									
	27/06/2017	21:50	21:20	23:50	Calm/calm	(8/8)/(8/8)	Light rain/dry	15/11	-	Common pipistrelle, soprano pipistrelle *Myotis* species, brown long-eared bat
	Visit 3									
	12/07/2017	21:41	21:11	23:41	Calm/calm	(6/8)/(5/8)	Dry/dry	14/11	-	Common pipistrelle, *Myotis* species, noctule, brown long-eared bat
T147A	Visit 1									
	28/06/2017	04:28	02:32	04:43	Calm/calm	(8/8)/(8/8)	Dry/Dry	11.4/10.9	One common pipistrelle	Soprano pipistrelle
	Visit 2									
	12/07/2017	04:44	02:44	04:59	Calm/calm	(1/8)/(2/8)	Dry/dry	10/8	One soprano pipistrelle	Common pipistrelle, soprano pipistrelle, *Myotis* species
	Visit 3									
	8/08/2017	20:57	20:27	22:57	Light/light	(8/8)/(7/8)	Light rain/light rain	18.5/11	-	Common pipistrelle
T148A	Visit 1									
	27/06/2017	21:50	21:30	23:47	Calm/calm	(8/8)/(8/8)	Dry/dry	12/10.6	-	Soprano pipistrelle
	Visit 2									
	13/07/2017	04:44	02:44	4:59	Calm/calm	(1/8)/(1/8)	Dry/dry	9/8	-	*Myotis* species
	Visit 3									

Tree Reference number	Date	Sunset or sunrise time	Start time	End time	Wind Start/end	Cloud start/end	Rainfall start/end	Temperature start/end	Species recorded roosting	Species recorded foraging
	8/08/2017	05:27	03:27	05:42	Calm/calm	(2/8)/(7/8)	Dry/dry	11/10	-	Common pipistrelle, soprano pipistrelle, *Myotis* species
T152A	Visit 1									
	4/07/2017	21:46	21:16	23:46	Calm/calm	(8/8)/(8/8)	Light rain/light rain	14/11.9	-	Common pipistrelle, soprano pipistrelle, *Myotis* species
T156A	Visit 1									
	28/06/2017	04:28	02:28	04:43	Calm/calm	(8/8)/(8/8)	Dry/dry	11/11	-	-
T201A	Visit 1									
	04/07/2017	21:46	21:15	23:46	Light/light	(8/8)/(8/8)	Light rain/light rain	13/12	-	-
T203A	Visit 1									
	11/07/2017	21:44	21:14	23:44	Calm/calm	(5/8)/(2/8)	Dry/dry	12/10	-	Soprano pipistrelle, noctule
	Visit 2									
	08/08/2017	05:27	03:27	05:42	Calm/calm	(6/8)/(6/8)	Dry/dry	9/8	-	*Myotis* species
208A	Visit 1									
	30/08/2017	06:09	04:09	06:24	Calm/light	(2/8)/(4/8)	Dry/dry	8/7	-	Common pipistrelle, *Myotis* species
209A	Visit 1									
	11/07/2017	21:42	21:12	23:42	Calm/calm	(6/8)/(6/8)	Dry/dry	13/11	-	Common pipistrelle, soprano pipistrelle, *Myotis* species
210A	Visit 3									
	18/07/2017	21:35	21:05	23:35	Light/calm	(8/8)/(8/8)	Dry/dry	15/14	-	Common pipistrelle, soprano pipistrelle, *Myotis* species

211A	Visit 1									
	11/07/2017	21:42	21:12	23:42	Calm/light	(2/8)/(2/8)	Dry/dry	13/11	-	Common pipistrelle, noctule
215A	Visit 1									
	31/08/2017	20:04	19:34	22:04	Calm/calm	(1/8)/(1/8)	Dry/dry	11/09	-	Soprano pipistrelle, *Myotis* species.
	Visit 2									
	19/09/2017	19:15	18:45	21:15	Calm/calm	(1/8)/(2/8)	Dry/dry	14/10	-	Common pipistrelle, soprano pipistrelle, noctule
	Visit 3									
	03/10/2017	18:48	18:08	20:48	Light/moderate	(8/8)/(8/8)	Dry/dry	11/08	-	Soprano pipistrelle
216A	Visit 1									
	31/08/2017	20:04	19:34	22:04	Calm/calm	(1/8)/(1/8)	Dry/dry	15/08	-	Common pipistrelle, soprano pipistrelle, noctule
217A	Visit 1									
	31/08/2017	20:04	19:34	22:04	Calm/calm	(1/8)/(1/8)	Dry/dry	15/08	-	Common pipistrelle, soprano pipistrelle, noctule
220A	Visit 1									
	07/08/2017	20:59	20:29	22:59	Calm/calm	(4/8)/(4/8)	Dry/dry	18/13	Two soprano pipistrelle	Common pipistrelle, soprano pipistrelle
	Visit 2									
	20/09/2017	06:48	04:48	07:03	Calm/calm	(7/8)/(7/8)	Dry/dry	12/12	-	Common pipistrelle, soprano pipistrelle
	Visit 3									
	02/10/2017	18:40	18:10	20:40	Moderate/moderate	(0/8)/(0/8)	Dry/dry	14/14	-	Common pipistrelle, soprano pipistrelle, *Myotis* sp., brown long-eared bat.

APPENDIX E: BAT ACTIVITY TRANSECT SURVEY DETAILS

Visit	Date	Start (S) and End (E) Point Counts[34]					Weather and Environmental Variables				
		Team 1	Team 2	Team 3	Team 4	Team 5	Temp (oC)	Wind (m/s)	Cloud Cover (eighths)	Rain	Moon phase (quarters)
	11-Apr-17	S1, E12	S13, E25	S26, E27	S38, E50	S51, E62	5.7 - 12	0.2 - 1.2	2 - 8	Dry	4
1	12-Apr-17	S63, E75	S76, E87	S87, E100	S101, E112	S113, E124	9 - 14	2 - 4	1	Dry	4
	02-May-17	S7, E18	S19, E31	S32, E43	S44, E56	S57, E68	5.8 - 12	0.1 - 0.4	7 - 8	Dry	2
2	03-May-17	S69, E81	S82, E93	S94, E106	S107, E118	S119, E6	7.3 - 11	0.1 - 0.2	1 - 8	Dry	2
	21-Jun-17	S4, E15	S16, E27	S29, E40	S41, E54	S55, E65	16.1 - 18	0	4	Dry	3
3	22-Jun-17	S66, E78	S79, E90	S91, E99	S104, E115	S116, E3	14 - 16	1.4 - 2.6	8	Dry	3
	05-Jul-17	S2, E10*	S14, E26	S27, E38	S39, E51	S52, E63	12 - 13	0	8	Dry	3
4	06-Jul-17	S64, E79	S80, E94	S95, E110	S111, E124	N/A	14.8 - 18	0	1 - 3	Dry	3
	16-Aug-17	S6, E17	S18, E30	S31, E42	S43, E55	S56, E67	14 - 17	1	7 - 8	Dry - Light	2
5	17-Aug-17	S68, E80	S81, E92	S93, E105	S106, E116*	S5 to 1 then 124 to: E118	16 - 18	0 - 3.4	1 - 4	Dry	2
	13-Sep-17	S3, E10**	S15, E22**	S28, E34**	S40, E48**	S53, E61**	8 - 14.5	0	8	Dry - Heavy	2
6	14-Sep-17	S65, E81	S82, E94	S95, E107	S108, E2	N/A	9 - 13	0	3 - 7	Dry - Light	3
	10-Oct-17	S5, E16	S17, E29	S30, E41	S42, E54	S55, E66	11 - 14.2	0 - 4.1	7 - 8	Dry	3
7	11-Oct	S67, E79	S80, E91	S92, E104	S105, E116	S4, E117	9 - 14	2.5 - 4.2	1 - 7	Dry - Light	3

*NB Transect was cut short due to access constraints

**NB Transect was cut short due to rain

[34] For ease of viewing point count numbers are shown as the numeral only without the preceding PC. For example, S1, E12 would identify that the transect started with a five minute sample at PC1, and ended following the same at PC12.

Visit	Date	Start (S) and End (E) times				
		Team 1	Team 2	Team 3	Team 4	Team 5
	11-Apr-17	S20:04, E22:55	S20:04, E22:44	S20:04, E22:43	S20:04, E22:35	S20:04, E22:32
1	12-Apr-17	S20:06, E22:52	S20:06, E22:42	S20:06, E22:43	S20:06, E22:25	S20:06, E22:42
	02-May-17	S20:46, E23:27	S20:45, E23:16	S20:46, E23:05	S20:46, E23:04	S20:31, E23:00
2	03-May-17	S20:48, E23:46	S20:48, E23:20	S20:48, E23:38	S20:48, E23:26	S20:35, E22:54
	21-Jun-17	S21:52, E00:51	S21:52, E00:35	S21:52, E00:51	S21:52, E00:29	S21:52, E23:32
3	22-Jun-17	S21:52, E00:44	S21:52, E23:04	S21:52, E23:43	S21:52, E00:25	S21:52, E00:12
	05-Jul-17	S21:49, E23:57*	S21:49, E00:57	S21:49, E00:26	S21:49, E00:17	S21:49, E00:24
4	06-Jul-17	S21:48, E01:28	S21:48, E00:49	S21:48, E01:45	S21:48, E00:43	N/A
	16-Aug-17	S20:37, E23:15	S20:37, E23:14	S20:37, E00:15	S20:37, E22:37	S20:37, E22:45
5	17-Aug-17	S20:35, E23:42	S20:36, E22:44	S20:36, E23:30	S20:35, E23:09*	S20:35, E22:47
	13-Sep-17	S19:30, E21:25**	S19:30, E21:04**	S19:30, E21:30**	S19:30, E21:20**	S19:30, E21:07**
6	14-Sep-17	S19:28, E23:00	S19:28, E22:37	S19:28, E22:37	S19:27, E22:58	N/A
	10-Oct-17	S18:19, E21:12	S18:19, E20:31	S18:19, E20:46	S18:19, E20:38	S18:19, E20:19
7	11-Oct	S18:19, E20:59	S18:17, E20:35	S18:17, E21:36	S18:18, E20:55	S18:17, E20:21

*NB Transect was cut short due to access constraints

**NB Transect was cut short due to rain

APPENDIX F: HABITAT ASSOCIATED WITH POINT COUNTS AND STATIC DETECTOR LOCATIONS

Bat Activity Transect point counts present in each habitat type.

Habitat	Point Counts[35]
Next to the A1	3, 4, 7, 10, 11, 17, 30, 35, 40, 51, 52, 54, 65, 75, 80, 87, 88, 92, 96, 115, 124
Arable	7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 20, 22, 25, 28, 29, 30, 31, 33, 34, 35, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 70, 73, 74, 75, 76, 77, 79, 80, 82, 83, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123
Pasture	2, 3, 4, 1, 5, 6, 17, 18, 23, 25, 26, 27, 35, 36, 55, 56, 60, 61, 62, 71, 72, 74, 78, 88, 111, 112, 113
Centre of field	2, 18, 36, 47, 50, 56, 76, 97, 103, 105, 113
Woodland edge	1, 3, 6, 10, 12, 13, 15, 17, 32, 34, 37, 38, 41, 49, 51, 58, 60, 61, 62, 67, 68, 69, 71, 72, 73, 78, 80, 82, 84, 86, 87, 89, 111, 114, 116, 119, 121, 123, 124
Woodland centre	57, 59, 63, 64, 65, 66, 110
Adjacent to hedgerow	3, 4, 5, 7, 8, 9, 11, 14, 15, 16, 19, 22, 24, 25, 26, 27, 28, 30, 31, 33, 35, 38, 39, 40, 42, 43, 45, 46, 48, 49, 52, 53, 73, 77, 83, 90, 91, 92, 95, 96, 98, 99, 100, 101, 102, 104, 106, 107, 108, 109, 111, 117, 118, 120, 122
Adjacent to stream / river	20, 37, 53, 57, 58, 68, 69, 74, 92, 93, 110, 112
Scrub	20, 21, 23, 55, 81, 93, 94
Houses	9, 21, 24, 29, 44, 45, 66, 67, 68, 69, 70, 79, 84, 85, 86, 89, 107

NB some point counts were located in more than one habitat type. Where this was the case all applicable habitat types were recorded.

[35] For ease of viewing point count numbers are shown as the numeral only without the preceding PC. For example, 3, 4, 7, 10 would indicate PC3, PC4, PC7, and PC10.

Habitat within the vicinity of Static Detector locations (recorded as within 2, 25, 50, or 100 m)

Habitat Feature	Static Detector[36] 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Known roost																				
Buildings	100	50											25	50	20			50		50
Gardens		25													100			50		25
Major road				100		100					50					50		50	100	25
Minor road	100		50										100		50					
Lighting																				
Wind turbine																				
Amenity grassland		50												50				100		25
Arable		2	25	100	25		2	2					25			25	25		2	50
Improved grassland	2		2									2				2		50		
Poor semi-improved grassland				2		2	25						2	25	25		25	50	2	50
Semi-improved grassland																				
Marshy grassland						25														
Grazed by sheep												2						50		
Grazed by cattle				2													25	50	2	
Grazed by horses																		50		
Broadleaved woodland			2							2		2				2	2	2		2
Coniferous woodland										100										
Mixed woodland	2				2						2			2	2					
Plantation woodland	2		2		2					100	2			2	2					
Semi-natural woodland										2		2				2				
Scattered broadleaved trees				25		25			2				2	50			50	50	1	25

[36] For ease of viewing static detector numbers are shown as the numeral only without the preceding SD.

Habitat Feature	Static Detector[36] 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Scattered coniferous trees									2					50						
Scattered mixed trees		25							2					50						
Intact hedgerow			50	100	100	100	2		100			25			1					2
Defunct hedgerow																	25		2	
Hedge and trees		2				100		2												25
Dense scrub		2		2					100										25	
Scattered scrub				25		100	50	50		25					25			2	2	2
Tall ruderal			25	2	2	2					25	2	2	25		25	2	5	2	25
Bracken																		2		
Heathland																				
Running water				25		25		2		2		5		25		2	2	2		
Standing water														2					2	

APPENDIX G: DEFRA STYLE TRANSECT SURVEY DETAILS

Bat Passes Recorded and Weather Data

Route	Direction*	Date	Distance (m)	Sunset	Start time	Common pipistrelle	*Myotis* sp.	Soprano pipistrelle	Brown long-eared bat	Nathusius' pipistrelle	*Nyctalus* sp.	Temperature	Wind	Habitat
1	A		0	20:24	20:54	2	0	0	0	0	4	16.5	7	3
1	A		100	20:24	21:05	6	0	0	0	0	2	16.5	7	3
1	A		200	20:24	21:16	0	0	1	0	0	2	16.5	0	3
1	A		300	20:24	21:27	3	0	0	0	0	69	16.5	0	2
1	A		400	20:24	21:38	0	0	0	0	0	65	16.5	0	2
1	A		500	20:24	21:50	2	1	0	0	0	55	16.5	0	2
1	A		600	20:24	22:01	2	0	0	0	0	1	16.5	0	2
1	A		700	20:24	22:13	0	0	0	0	0	1	16.5	0	2
1	A		800	20:24	22:25	0	1	0	0	0	0	16.5	0	3
1	A		900	20:24	22:37	3	2	0	0	0	0	16.5	2	2
1	A		1000	20:24	22:48	0	0	0	0	0	1	16.5	2	2
2	T		1400	20:23	20:53	0	0	3	0	0	0	20.2	0	2
2	T		1300	20:23	21:54	6	0	3	0	0	0	20.6	0	3
2	T		1200	20:23	21:15	2	3	2	0	0	0	19.4	0	3
2	T		1100	20:23	21:26	1	0	1	0	0	1	19.1	0	3
2	T		1000	20:23	21:37	20	0	2	0	0	3	19.1	0	1
2	T		900	20:23	21:51	2	0	2	0	0	0	17.8	0	3
2	T		800	20:23	22:03	14	0	0	0	0	0	18.2	1	3
2	T		700	20:23	22:15	6	0	3	0	0	0	18	0	3
2	T		600	20:23	22:26	13	0	2	0	0	1	18	0	3
2	T		500	20:23	22:37	1	0	1	0	0	0	18.8	0	3
2	T		400	20:23	22:49	0	0	6	0	0	0	18.9	1	3
2	T		300	20:23	23:00	0	0	0	0	0	0	17.3	0	3
2	T	22	200	20:23	23:11	2	0	0	0	0	0	17.4	0	3
2	T	Aug	100	20:23	23:22	1	0	2	0	0	0	17.4	0	2
2	T	2017	0	20:23	23:33	1	0	0	0	0	1	18.2	0	2
3	A		0	20:21	20:51	0	0	0	0	0	1	14	0	2
3	A		100	20:21	21:02	2	1	20	0	0	0	14	0	3
3	A		200	20:21	21:13	3	0	13	0	0	0	14	0	3
3	A		300	20:21	21:25	4	0	6	0	0	0	14	0	3
3	A		400	20:21	21:36	4	1	1	0	0	0	14	0	3
3	A		500	20:21	21:47	1	0	0	0	0	0	14	0	3
3	A		600	20:21	21:59	1	0	4	0	0	0	14	0	2
3	A	23	700	20:21	22:10	8	2	6	1	0	0	14	0	2
3	A	Aug	800	20:21	22:21	13	0	4	0	0	0	14	0	2
3	A	2017	900	20:21	22:32	11	3	1	0	0	0	14	0	4

Route	Direction*	Date	Distance (m)	Sunset	Start time	Common pipistrelle	*Myotis* sp.	Soprano pipistrelle	Brown long-eared bat	Nathusius' pipistrelle	*Nyctalus* sp.	Temperature	Wind	Habitat
3	A		1000	20:21	22:43	0	2	8	0	0	0	14	0	4
3	A		1100	20:21	22:54	8	4	6	0	0	0	14	0	5
3	A		1200	20:21	23:05	5	0	3	0	0	1	14	0	1
3	A		1300	20:21	23:17	1	0	6	0	0	0	14	0	1
3	A		1400	20:21	23:29	0	0	0	0	0	0	14	0	2
4	T		1100	20:21	20:51	3	0	5	0	0	0	17	0	4
4	T		1000	20:21	21:03	1	0	9	0	0	0	17	0	4
4	T		900	20:21	21:14	17	2	1	0	0	0	17	0	4
4	T		800	20:21	21:25	0	1	1	0	0	0	16.5	1	5
4	T		700	20:21	21:37	0	0	3	1	0	0	16.6	0	5
4	T		600	20:21	21:49	0	0	5	0	0	0	16.5	0	5
4	T		500	20:21	22:00	0	2	2	0	0	0	16.4	0	5
4	T		400	20:21	22:12	3	0	0	0	0	0	15.6	0	5
4	T		300	20:21	22:23	0	0	1	0	0	0	15.5	0	5
4	T		200	20:21	22:34	0	0	8	0	0	0	15.6	0	5
4	T		100	20:21	22:46	4	2	1	0	0	0	14.8	0	2
4	T		0	20:21	22:57	3	0	2	0	0	0	14.2	0	2
5	A		0	20:21	20:57	0	0	0	0	0	0	15.2	2	2
5	A		100	20:21	21:02	0	0	1	0	0	0	15.2	1	2
5	A		200	20:21	21:13	2	0	0	0	0	0	15.1	0	2
5	A		300	20:21	21:24	2	0	1	0	0	0	14.9	0	2
5	A		400	20:21	21:36	0	2	3	0	0	0	14.5	0	3
5	A		500	20:21	21:48	2	1	1	0	0	0	15.2	1	2
5	A		600	20:21	21:59	3	0	1	0	0	0	14.9	0	5
5	A		700	20:21	22:10	1	0	4	0	0	0	14.3	1	2
5	A		800	20:21	22:22	2	0	1	0	0	0	13.6	0	2
5	A		900	20:21	22:33	1	1	2	0	0	0	13.7	0	3
5	A		1000	20:21	22:45	3	2	18	0	0	0	12.9	0	3
6	T		1000	20:21	20:51	3	0	3	0	0	0	16	0	5
6	T		900	20:21	21:02	3	2	3	0	0	0	16	0	5
6	T		800	20:21	21:14	2	0	1	0	0	0	16	0	5
6	T		700	20:21	21:28	0	2	1	0	0	0	16	1	4
6	T		600	20:21	21:40	0	0	1	0	0	0	16	0	4
6	T		500	20:21	21:52	2	0	0	0	0	0	16	0	4
6	T		400	20:21	22:04	1	0	0	0	0	1	16	0	5
6	T		300	20:21	22:16	3	0	6	0	0	0	16	0	5
6	T		200	20:21	22:28	0	1	0	0	0	0	16	0	5
6	T		100	20:21	22:40	0	0	0	0	0	0	15	0	5
6	T		0	20:21	22:51	3	0	4	0	0	1	15	0	5
7	A		0	20:21	20:51	0	0	0	0	0	0	16	6	2
7	A		100	20:21	21:02	1	0	4	0	0	0	16	2	5

Route	Direction*	Date	Distance (m)	Sunset	Start time	Common pipistrelle	*Myotis* sp.	Soprano pipistrelle	Brown long-eared bat	Nathusius' pipistrelle	*Nyctalus* sp.	Temperature	Wind	Habitat
7	A		200	20:21	21:14	2	1	2	0	0	0	16	2	5
7	A		300	20:21	21:25	2	0	0	0	0	0	16	2	2
7	A		400	20:21	21:36	3	0	1	0	0	0	16	6	2
7	A		500	20:21	21:48	1	1	1	0	0	0	16	6	2
7	A		600	20:21	22:00	0	2	0	0	0	0	16	6	2
7	A		700	20:21	22:11	0	0	0	0	0	0	16	6	2
7	A		800	20:21	22:22	0	0	0	0	0	2	16	6	2
7	A		900	20:21	22:33	0	1	0	0	0	0	16	6	2
7	A		1000	20:21	22:45	3	0	1	0	0	0	16	6	2
8	T		1000	20:24	20:54	1	0	1	0	0	1	17	3	2
8	T		900	20:24	21:05	0	1	0	0	0	1	17	3	2
8	T		800	20:24	21:17	2	0	3	0	0	0	17	3	2
8	T		700	20:24	21:29	3	9	1	0	0	1	17	3	4
8	T		600	20:24	21:41	12	5	5	0	0	1	17	3	3
8	T		500	20:24	21:53	14	7	0	0	0	0	17	3	2
8	T		400	20:24	22:05	7	2	0	0	0	0	17	3	2
8	T		300	20:24	22:17	2	0	0	0	0	1	17	3	3
8	T		200	20:24	22:29	4	0	1	0	0	0	17	3	2
8	T		100	20:24	22:41	6	1	3	0	0	0	17	3	2
8	T		0	20:24	22:53	5	0	1	0	0	0	17	3	2
9	A		0	20:24	20:54	0	0	0	0	0	1	17	4	2
9	A		100	20:24	21:06	0	0	1	0	0	0	16.5	4	2
9	A		200	20:24	21:16	0	0	1	0	0	0	16.5	4	2
9	A		300	20:24	21:27	1	0	1	0	0	0	16.5	4	2
9	A		400	20:24	21:39	0	0	0	0	0	0	16.5	4	2
9	A		500	20:24	21:51	0	0	0	0	0	0	16.5	4	2
9	A		600	20:24	22:02	2	0	0	0	0	0	16	4	2
9	A		700	20:24	22:12	0	1	2	0	0	0	16	4	2
9	A		800	20:24	22:24	0	0	0	0	1	0	16	1	2
9	A		900	20:24	22:36	4	0	0	0	0	0	16	0	1
9	A		1000	20:24	22:48	3	0	1	0	0	0	16	0	1
10	T		1000	20:23	21:26	8	1	3	0	0	1	16	2	2
10	T		900	20:23	21:38	1	0	0	0	0	1	16	2	2
10	T		800	20:23	21:50	2	0	0	0	0	0	16	2	2
10	T		700	20:23	22:02	0	0	1	0	0	0	16	2	2
10	T		600	20:23	22:14	0	0	0	0	0	1	16	2	2
10	T		500	20:23	22:26	0	0	3	0	0	0	15	6	1
10	T		400	20:23	22:27	0	0	1	0	0	0	15	2	3
10	T	22	300	20:23	22:57	1	0	0	0	0	2	16	2	2
10	T	Aug	200	20:23	23:11	1	0	0	0	0	0	16	2	2
10	T	2017	100	20:23	23:24	2	1	0	0	0	0	16	1	2

Route	Direction*	Date	Distance (m)	Sunset	Start time	Common pipistrelle	*Myotis* sp.	Soprano pipistrelle	Brown long-eared bat	Nathusius' pipistrelle	*Nyctalus* sp.	Temperature	Wind	Habitat
10	T		0	20:23	23:37	2	0	2	0	0	4	16	2	1

*****Away from the existing A1 (A); Towards the existing A1 (T)

Overall effects

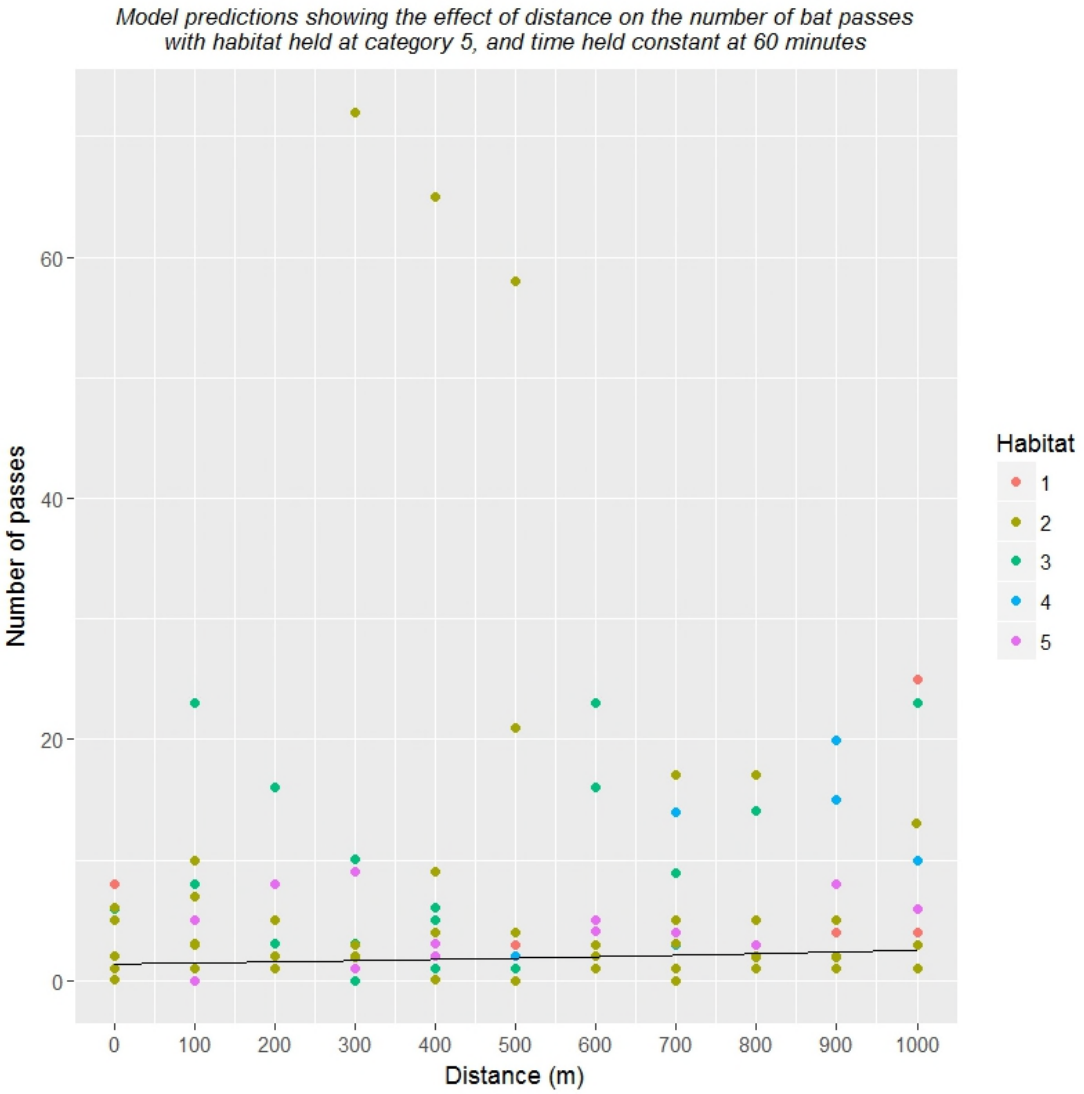
Results from the GEE analysis modelling log (1 + number of bat passes) as a function of distance from the road (m).

	Estimate	Std.err	Wald	Pr(>|W|)
Intercept[37]	1.3142360	0.2072228	40.223	2.27e-10
Distance	0.0006106	0.0003000	4.142	0.048*

Significance Codes (: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 GEE, generalised estimating equations

	Estimate	Std.err
(Intercept)	0.8017	0.1487
Alpha	0.5079	0.06618

Number of clusters: 10 Maximum cluster size: 11



[37] NB the intercept is the base level of activity adjacent to the road.

Species Specific Results

Six species / genera were recorded in total during the transects. Of these noctule, common pipistrelle, soprano pipistrelle, and *Myotis* species were recorded at more than 20% of the point counts.

Common pipistrelle

For common pipistrelle, the model with the lowest QICu value only included distance as an explanatory variable. Distance was not found to have a significant effect on the number of common pipistrelle bats recorded ($p<0.13$, $\chi^2 = 2.28$).

	Estimate	Std.err	Wald	Pr(>|W|)
(Intercept)	0.697154	0.162590	18.39	1.8e-05 ***
Distance	0.000401	0.000266	2.28	0.13

Signif. Codes (: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 GEE, generalised estimating equations

	Estimate	Std.err
(Intercept)	0.662	0.0876
Alpha	0.392	0.0876

Number of clusters: 10 Maximum cluster size: 11

Noctule

For noctule the model with distance only was the best fitting model. Distance was not found to have a significant effect on the number of NSL species bats recorded ($p=0.292$, $\chi^2 = 1.11$).

	Estimate	Std.err	Wald	Pr(>|W|)
(Intercept)	0.475117	0.268756	3.13	0.077
Distance	-0.000238	0.000226	1.11	0.292

Signif. Codes (: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 GEE, generalised estimating equations

	Estimate	Std.err
(Intercept)	0.561	0.361
Alpha	0.718	0.552

Soprano pipistrelle

For soprano pipistrelle, the best fitting model contains both the distance and habitat terms. Distance has a significant positive increase on the number of soprano pipistrelle bats ($p= 0.0049$, $\chi2 = 7.92$) but no significant effects were found for the habitat categories.

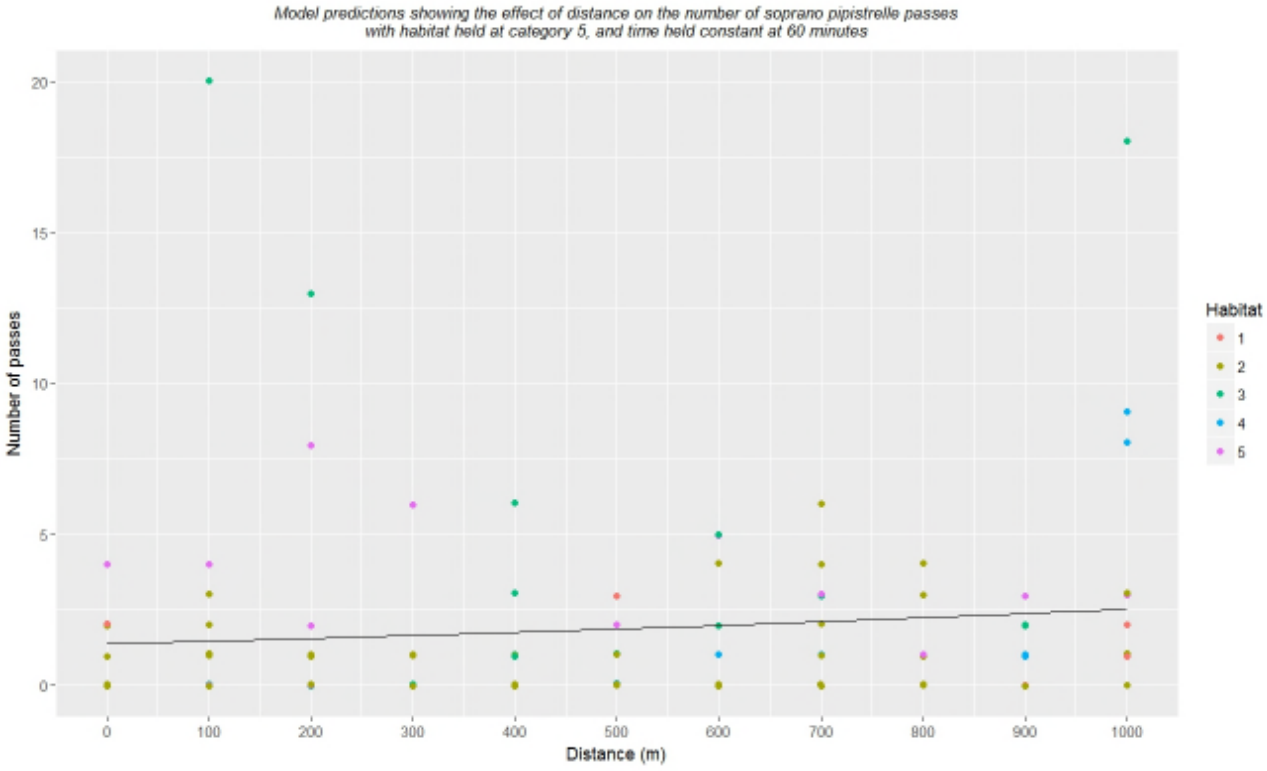
	Estimate	Std.err	Wald	Pr(>|W|)
(Intercept)	7.62e-01	2.43e-01	9.81	0.0017 **
Distance	2.70e-04	9.61e-05	7.92	0.0049 **
Habitat 2	-4.38e-01	2.54e-01	2.97	0.0849 .
Habitat 3	1.05e-01	2.76e-01	0.15	0.7030
Habitat 4	-6.35e-03	2.82e-01	0.00	0.9821
Habitat 5	1.41e-01	2.49e-01	0.32	0.5721

Signif. Codes (: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 GEE, generalised estimating equations

	Estimate	Std.err
(Intercept)	0.482	0.056

Alpha	0.154	0.0812

Number of clusters: 10 Maximum cluster size: 11



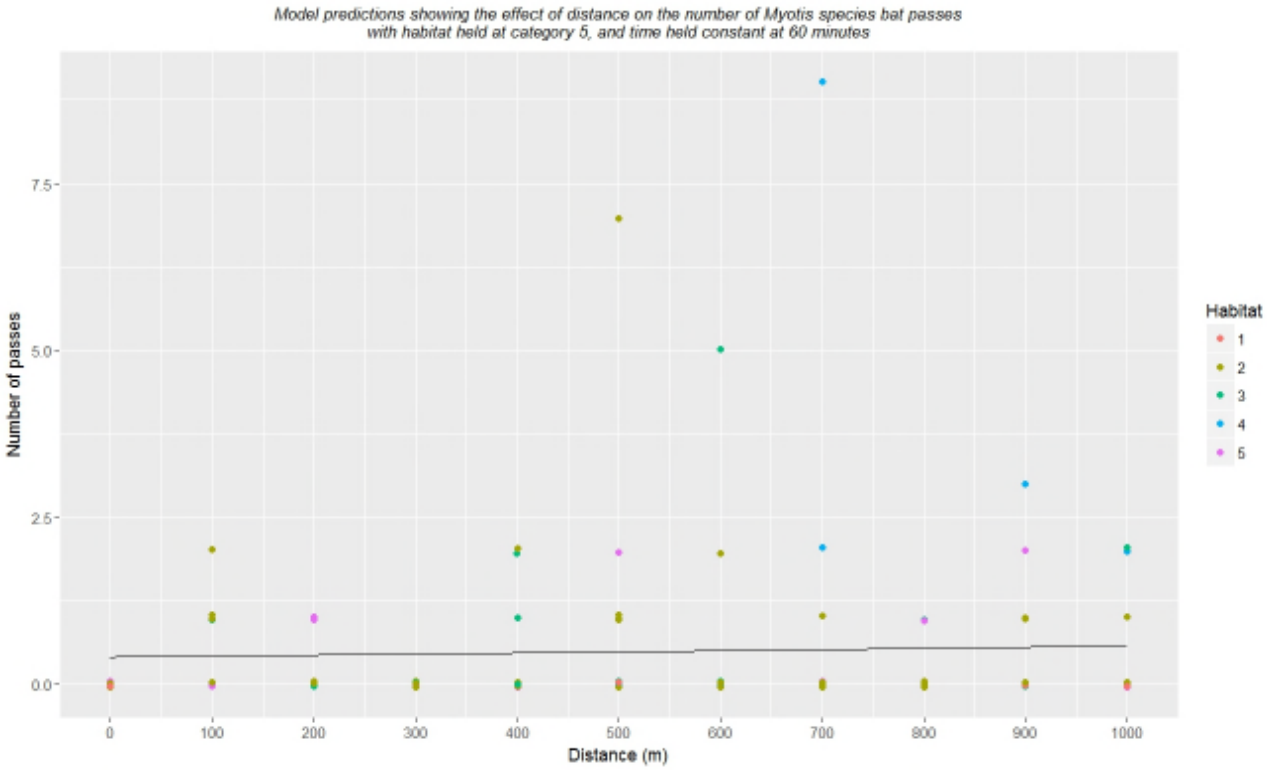
Myotis species

For *Myotis* species bats the model with distance as the only explanatory variable is the best fitting model. Distance was found to have a significant effect on the number of *Myotis* species bats recorded (p=<0.0005, $\chi 2$ =18.13).

	Estimate	Std.err	Wald	Pr(>|W|)
(Intercept)	1.08e-01	4.51e-02	5.76	0.016 *
Distance	3.44e-04	8.09e-05	18.13	2.1e-05 ***

	Estimate	Std.err
(Intercept)	0.239	0.0699
Alpha	0.268	0.272

Number of clusters: 10 Maximum cluster size: 11



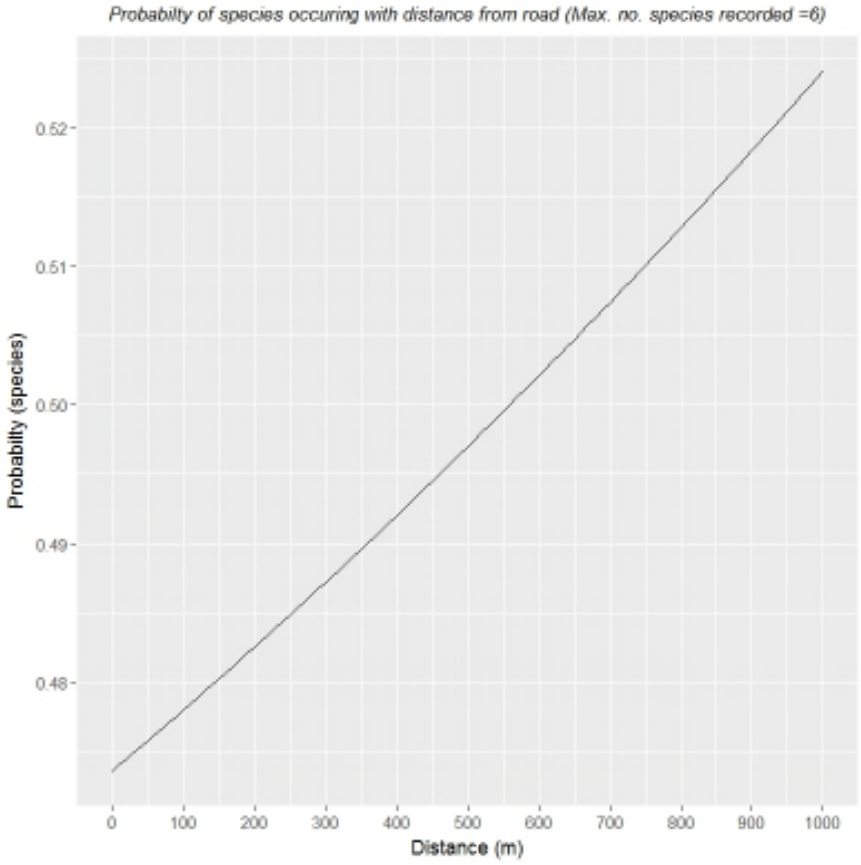
Species prediction model

A total of six species were recorded during the transects. The number of species recorded at each point count was transformed into proportion data and models fitted. The model with the lowest QICu contained only the distance explanatory variable term. Distance was found to have a significant effect on the probability of recording higher numbers of bat species (p=<0.0046, χ^2 =8.5).

	Estimate	Std.err	Wald	Pr(>|W|)
(Intercept)	-1.085297	0.111793	94.25	<2e-16 ***
Distance	0.000484	0.000171	8.05	0.0046 **

	Estimate	Std.err
(Intercept)	0.106	0.00887
Alpha	0.246	0.0828

Number of clusters: 10 Maximum cluster size: 11


Probabilty of species occuring with distance from road (Max. no. species recorded =6)
Probability (species)
0.52
0.51
0.50
0.49
0.48
0
100
200
300
400
500
600
700
800
900
1000
Distance (m)

APPENDIX H: RAINFALL INDEX SCORE AND PEERSONIC STATIC DETECTOR SURVEY DETAILS

Rainfall Index Score

The Rainfall Index Score defined whether the precipitation recorded within a single hour was: no rain; light rain; moderate rain; or heavy rain. This was based on the methodology used for Cumulus weather data software[38] and defined as stated in the table below.

Rainfall Rate (mm/h)	Rainfall Category
0-0.25	No rain
0.26-1	Light rain
1.01-4	Moderate rain
>4	Heavy rain

The rain category for the first hour and the maximum for any other single hour within each night were then identified and used to calculate a rainfall index score as per the table below.

Rainfall index score	First hour after sunset	Rest of the night
1	**Heavy**	**Moderate - heavy rain**
2	**Heavy**	**No rain - light rain**
3	**Moderate**	**Moderate - heavy rain**
4	**Moderate**	**No rain - light rain**
5	**Light**	**Moderate - heavy rain**
6	**Light**	**Light**
7	**No rain**	**Moderate - heavy rain**
8	**Light**	**No rain**
9	**No rain**	**Light**
10	**No rain**	**No rain**

[38] http://wiki.sandaysoft.com/a/Rain_measurement

Peersonic Static Detector Details

The Peersonic static detector survey details are shown in the tables below. NB 'DNR' in the date column indicates that the detector did not record data.

SD1									
Month	date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
July	DNR								
	17	31	4	16	1	12	1	10	14.2
	18	11	9	24	0	30	0	10	12.4
August	19	27	8	20	1	22	0	10	12.8
	14	72	20	8	2	669	0	10	14.2
	15	272	144	11	0	350	0	10	12.4
September	16	651	129	35	0	453	0	10	12.8
	11	2	1	0	0	0	0	10	8.2
October	12	16	13	0	0	0	0	10	11.4

SD2									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	0	0	0	0	0	0	10	16.1
July	19	1	3	0	0	0	0	8	16.4
	17	25	55	5	0	1	0	10	14.2
	18	0	7	1	0	3	0	10	12.4
August	19	3	10	1	0	0	0	10	12.8
September	DNR								
	11	0	0	0	0	0	0	10	8.2
	12	0	3	0	0	0	0	10	11.4
October	13	2	0	0	2	0	0	10	12.5

SD3									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	1	0	0	0	0	0	10	16.1
	19	0	0	0	0	0	0	8	16.4
	20	8	1	0	0	0	0	2	9.7
July	21	1	0	0	0	0	0	8	14.9
	17	13	0	5	0	2	0	10	14.2
	18	131	0	44	0	0	0	10	12.4
August	19	886	639	308	0	1	0	10	12.8
	14	497	628	142	1	2	0	10	8.6
	15	288	456	1	0	0	0	10	8.8
September	16	49	27	9	0	1	0	10	9.4
	11	98	1046	145	0	0	0	10	8.2
	12	61	235	515	0	0	0	10	11.4
October	13	236	33	53	0	0	0	10	12.5

SD4									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	1	1	0	0	0	0	10	16.1
	19	2	1	0	0	0	0	8	16.4
July	20	0	0	1	0	0	0	2	9.7
	17	16	13	38	0	5	1	10	14.2
	18	6	8	1	0	2	0	10	12.4
	19	8	3	1	0	1	0	10	12.8
August	20	11	8	0	0	12	1	10	9.4
September	14	12	1	27	0	0	0	10	8.6

	15	4	0	40	0	0	0	10	8.8
	16	9	6	71	0	1	0	10	9.4
	11	0	2	0	0	0	0	10	8.2
October	12	0	9	3	0	0	0	10	11.4

SD5									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	0	0	0	0	0	0	10	16.1
	19	0	0	0	0	0	0	8	16.4
July	20	0	1	0	0	0	0	2	9.7
August	DNR								
	14	491	16	6	0	0	0	10	8.6
	15	11	119	10	0	0	0	10	8.8
September	16	7	4	11	1	0	0	10	9.4
October	DNR								

SD6									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	0	120	10	0	0	0	10	16.1
	19	0	68	5	0	0	0	8	16.4
	20	0	0	0	0	0	0	2	9.7
July	21	4	167	8	0	0	0	8	14.9
	17	13	37	3	0	6	0	10	14.2
	18	2	21	0	0	4	0	10	12.4
	19	8	14	0	0	3	0	10	12.8
August	20	4	10	1	0	5	0	10	9.4

	14	0	3	1	3	0	0	10	8.6
	15	2	0	2	5	0	0	10	8.8
September	16	0	4	2	0	0	0	10	9.4
October	DNR								

SD7									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	0	0	0	0	0	0	10	16.1
	19	11	7	2	0	2	0	8	16.4
July	20	1	0	0	0	0	0	2	9.7
August	DNR								
	14	77	15	1	0	0	0	10	8.6
	15	18	14	4	0	0	0	10	8.8
September	16	18	2	2	0	0	0	10	9.4
	11	1	6	0	0	0	0	10	8.2
	12	3	0	0	1	0	0	10	11.4
October	13	7	4	9	0	2	0	10	12.5

SD8									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	0	0	0	0	0	0	10	16.1
July	19	0	0	0	0	0	0	8	16.4
	17	9	21	5	0	2	0	10	14.2
	18	9	30	5	0	1	0	10	12.4
	19	4	27	2	0	3	0	10	12.8
August	20	14	24	4	0	4	0	10	9.4
	14	13	0	0	0	0	0	10	8.6
September	15	8	9	0	0	0	0	10	8.8

	16	1	1	0	0	0	0	10	9.4
	17	3	2	0	0	0	0	10	8.5
October	DNR								

SD9									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
July	DNR								
	17	2	58	1	5	0	6	10	14.2
	18	0	89	0	4	0	7	10	12.4
	19	0	3	0	2	0	5	10	12.8
August	20	0	56	0	8	0	5	10	9.4
September	DNR								
	11	0	2	0	0	0	0	10	8.2
	12	0	11	0	1	0	0	10	11.4
October	13	0	0	0	0	0	0	10	12.5

SD10									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
July	DNR								
August	17	102	1576	553	0	1	0	10	14.2
September	DNR								
	11	1	28	100	0	0	0	10	8.2
October	12	4	38	147	0	0	0	10	11.4

	13	0	12	234	0	0	0	10	12.5

SD11									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	0	0	0	0	0	0	10	16.1
July	19	0	0	0	0	0	0	8	16.4
	17	2	68	0	0	0	0	10	14.2
	18	48	62	1	0	0	0	10	12.4
	19	47	46	4	1	0	0	10	12.8
August	20	16	181	0	0	0	0	10	9.4
	14	5	10	4	0	0	0	10	8.6
	15	13	14	5	1	0	0	10	8.8
	16	1	2	6	0	0	0	10	9.4
September	17	0	6	4	0	0	0	10	8.5
	11	2	199	1	0	0	0	10	8.2
	12	6	70	6	0	0	0	10	11.4
October	13	3	303	4	0	0	0	10	12.5

SD12									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	1	18	0	0	0	0	10	16.1
	19	0	5	0	0	0	0	8	16.4
	20	0	1	0	0	0	0	2	9.7
July	21	0	40	1	0	0	0	8	14.9
	17	2	72	0	0	0	0	10	14.2
	18	9	24	18	0	0	0	10	12.4
August	19	2	53	1	0	0	0	10	12.8

	20	0	13	0	0	0	0	10	9.4
	21	1	7	5	1	0	0	10	15.2
	22	15	66	3	0	0	0	10	14.9
September	DNR								
	11	195	81	34	0	0	0	10	8.2
	12	11	49	12	0	0	0	10	11.4
October	13	12	263	138	0	3	0	10	12.5

SD13									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	1	0	0	0	0	0	10	16.1
	19	1	0	0	0	1	0	8	16.4
	20	0	0	0	0	0	0	2	9.7
July	21	0	0	0	0	0	0	8	14.9
	17	4	3	2	0	0	0	10	14.2
	18	1	0	0	0	0	0	10	12.4
	19	0	0	0	0	0	0	10	12.8
August	20	2	3	2	0	0	0	10	9.4
	14	2	1	1	0	1	0	10	8.6
	15	3	0	1	0	0	0	10	8.8
September	16	13	3	0	1	0	0	10	9.4
	11	0	0	1	0	0	0	10	8.2
	12	1	0	1	0	0	0	10	11.4
October	13	6	0	1	0	0	0	10	12.5

SD14									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature

July	DNR								
August	DNR								
	14	17	406	71	2	0	0	10	8.6
	15	4	664	79	8	0	0	10	8.8
	16	9	276	258	4	0	0	10	9.4
September	17	9	325	130	0	1	1	10	8.5
	11	0	0	0	0	0	0	10	8.2
	12	0	0	0	0	0	0	10	11.4
October	13	0	1	1	0	0	0	10	12.5

SD15									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	0	0	0	0	0	0	10	16.1
	19	0	0	0	0	0	0	8	16.4
	20	0	0	1	0	0	0	2	9.7
July	21	0	0	0	0	0	0	8	14.9
August	DNR								
	14	8	5	0	0	0	0	10	8.6
	15	128	15	0	0	0	0	10	8.8
September	16	26	16	0	0	0	2	10	9.4
	11	0	0	0	0	0	0	10	8.2
	12	2	0	4	0	0	0	10	11.4
October	13	1	1	1	1	0	0	10	12.5

SD16									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	28	5	10	0	0	0	10	16.1
July	19	23	1	5	0	0	0	8	16.4

	20	12	18	3	0	0	0	2	9.7
	21	13	18	7	0	0	0	8	14.9
	22	1	0	0	0	0	0	2	13.1
	23	1	0	0	0	0	0	2	13.6
	24	4	1	1	1	0	0	8	13.7
August	17	151	12	117	1	0	0	10	14.2
September	DNR								
	11	3	0	5	0	0	0	10	8.2
	12	35	9	9	0	0	0	10	11.4
October	13	4	7	15	0	0	0	10	12.5

SD17									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	0	0	0	0	0	0	10	16.1
	19	1	1	0	0	0	0	8	16.4
	20	0	0	0	1	0	0	2	9.7
July	21	0	1	0	0	1	0	8	14.9
	17	48	17	10	2	1	0	10	14.2
	18	1	1	0	2	0	0	10	12.4
	19	2	0	0	2	0	0	10	12.8
August	20	10	7	3	4	1	0	10	9.4
	14	25	8	3	8	3	0	10	8.6
	15	18	7	4	1	6	0	10	8.8
September	16	14	6	4	4	2	0	10	9.4
October	DNR								

SD18									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
	18	1	0	0	0	0	0	10	16.1
	19	0	0	0	0	0	0	8	16.4
	20	1	1	1	0	0	0	2	9.7
July	21	0	9	0	0	0	0	8	14.9
	17	72	72	15	0	0	0	10	14.2
	18	375	334	28	5	0	0	10	12.4
	19	798	266	31	9	0	1	10	12.8
August	20	127	97	6	0	0	2	10	9.4
	14	82	182	117	3	0	0	10	8.6
	15	274	291	193	5	0	0	10	8.8
September	16	44	96	76	6	0	0	10	9.4
	11	99	42	3	0	0	0	10	8.2
	12	73	24	4	0	0	0	10	11.4
October	13	62	37	6	0	0	0	10	12.5

SD19									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
July	DNR								
	18	9	3	5	1	5	1	10	14.2
	19	0	1	0	0	4	1	10	12.4
August	20	2	1	0	0	6	0	10	12.8
	14	2	0	0	1	4	0	10	8.6
	15	0	0	1	0	2	0	10	8.8
September	16	1	0	0	1	1	1	10	9.4
October	11	0	0	0	0	1	0	10	8.2

SD20									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	BLE	Rain score	Min. temperature
July	DNR								
	17	0	0	0	0	3	0	10	14.2
	18	2	1	1	0	2	0	10	12.4
	19	0	0	0	0	18	0	10	12.8
August	20	1	0	0	0	5	0	10	9.4
September	DNR								
	11	0	0	0	0	0	0	10	8.2
	12	1	0	0	0	0	0	10	11.4
October	13	1	0	0	0	0	0	10	12.5

APPENDIX I: SM2 STATIC DETECTOR SURVEY DETAILS

The SM2 static detector survey details are shown in the tables below. NB 'DNR' in the date column indicates that the detector did not record data.

SD6									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	Brown long-eared bat	Rain score	Min. temperature
	DNR								
	DNR								
	DNR								
	DNR								
	DNR								
April	DNR								
	25	1	8	1	0	0	0	10	13.1
	26	3	14	1	0	7	0	10	12.2
	27	16	31	5	0	14	0	4	15.1
	28	5	8	1	0	0	0	4	12
May	29	9	6	2	0	4	0	8	12.6
	DNR								
	DNR								
	DNR								
	DNR								
June	DNR								
	DNR								
	DNR								
	DNR								
	DNR								
July	DNR								
	17	19	47	6	0	3	2	10	14.2
	18	2	24	3	0	1	3	10	12.4
August	19	8	13	1	7	1	0	10	12.8

SD6									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	Brown long-eared bat	Rain score	Min. temperature
	20	3	7	2	0	7	0	10	9.4
	21	2	11	10	0	12	0	10	15.2
	14	0	1	1	1	0	0	10	8.6
	15	2	0	5	0	0	0	10	8.8
	16	0	3	1	0	0	0	10	9.4
	17	0	0	0	0	0	0	10	8.5
September	18	0	0	0	0	0	0	10	5.2
	11	0	0	0	1	0	0	10	8.2
	12	0	1	1	2	0	0	10	11.4
	13	0	3	2	0	0	0	10	12.5
October	14	3	1	1	0	0	0	10	11.7

SD9									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	Brown long-eared bat	Rain score	Min. temperature
	24	1	0	0	0	0	0	4	1.8
	25	0	0	0	0	0	0	4	2.4
	26	1	1	1	0	0	0	6	5.4
	27	2	0	0	2	0	0	8	3.4
	28	2	12	0	2	3	1	10	5.9
April	29	3	14	2	4	6	0	10	7.9
	25	1	18	7	1	83	0	10	13.1
	26	11	63	11	1	17	0	10	12.2
	27	1	2	0	0	54	0	4	15.1
	28	4	60	4	1	9	0	4	12
May	29	2	16	5	0	2	0	8	12.6

SD9									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	Brown long-eared bat	Rain score	Min. temperature
	22	0	2	0	0	5	0	10	14.2
	23	1	10	0	0	3	0	10	11.3
	24	1	0	0	0	0	0	10	11.5
	25	1	5	1	0	1	0	10	9.5
	26	9	119	3	0	2	0	10	12
June	27	0	64	1	1	10	0	8	12.3
	DNR								
	DNR								
	DNR								
	DNR								
July	DNR								
	17	1	33	2	0	12	0	10	14.2
	18	0	108	2	0	10	0	10	12.4
	19	0	4	1	0	6	0	10	12.8
	20	1	67	4	0	7	0	10	9.4
August	21	1	125	3	0	12	0	10	15.2
	14	0	2	1	0	0	0	10	8.6
	15	0	13	3	0	0	0	10	8.8
	16	1	16	0	1	0	0	10	9.4
	17	0	11	1	2	0	0	10	8.5
September	18	0	6	0	0	0	0	10	5.2
	11	0	1	0	0	0	0	10	8.2
	12	0	3	1	0	0	0	10	11.4
	13	0	0	0	0	5	0	10	12.5
October	14	0	2	1	0	0	0	10	11.7

SD10									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	Brown long-eared bat	Rain score	Min. temperature
	24	0	0	1	0	0	0	4	1.8
	25	0	0	0	0	0	0	4	2.4
	26	0	1	16	0	0	0	6	5.4
	27	0	5	16	4	1	0	8	3.4
	28	1	7	60	3	12	0	10	5.9
April	29	25	168	62	5	37	0	10	7.9
	25	131	130	178	20	6	1	10	13.1
	26	156	121	202	4	2	0	10	12.2
	27	200	727	477	9	22	0	4	15.1
	28	124	241	275	2	8	0	4	12
May	29	96	11	68	3	87	0	8	12.6
	22	1	463	69	0	5	0	10	14.2
	23	3	122	55	0	2	0	10	11.3
	24	1	322	82	0	2	0	10	11.5
	25	1	382	59	0	0	0	10	9.5
	26	20	0	28	2	3	0	10	12
June	27	0	0	10	0	1	0	8	12.3
	DNR								
	DNR								
	DNR								
	DNR								
July	DNR								
	17	3	932	495	1	1	0	10	14.2
August	18	0	0	0	0	0	0	10	12.4

SD10									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	Brown long-eared bat	Rain score	Min. temperature
	DNR								
	DNR								
	DNR								
	14	2	21	28	2	3	0	10	8.6
	15	3	45	10	0	4	0	10	8.8
	16	1	19	33	0	0	0	10	9.4
	17	0	46	6	1	2	0	10	8.5
September	18	1	4	14	0	0	0	10	5.2
	11	0	0	13	1	0	0	10	8.2
	12	0	2	134	6	48	0	10	11.4
	13	0	4	2	0	3	0	10	12.5
October	14	0	0	0	0	0	0	10	11.7

SD18									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	Brown long-eared bat	Rain score	Min. temperature
	24	0	0	0	0	0	0	4	1.8
	25	0	0	0	0	0	0	4	2.4
	26	103	4	2	0	0	1	6	5.4
	27	60	47	2	1	1	0	8	3.4
April	28	388	15	0	0	1	0	10	5.9
	25	78	143	268	0	8	0	10	13.1
	26	194	257	340	0	0	0	10	12.2
May	27	149	168	290	0	3	5	4	15.1

SD18									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	Brown long-eared bat	Rain score	Min. temperature
	28	93	183	319	0	0	0	4	12
	29	398	279	700	0	0	0	8	12.6
	22	222	838	186	0	1	1	10	14.2
	23	256	703	241	1	0	0	10	11.3
	24	483	796	384	0	0	0	10	11.5
	25	565	664	349	0	0	0	10	9.5
	26	122	501	64	1	0	2	10	12
June	27	331	827	163	0	0	0	8	12.3
	DNR								
	19	7	18	18	0	8	0	8	16.4
	20	113	273	26	0	1	0	2	9.7
	21	213	412	6	2	13	0	8	14.9
July	22	5	1	0	0	19	0	2	13.1
	17	351	33	35	5	0	0	10	14.2
	18	794	265	36	2	0	0	10	12.4
	19	1141	439	47	13	0	0	10	12.8
	20	188	108	13	0	0	0	10	9.4
August	21	21	57	8	9	1	0	10	15.2
	14	0	0	0	0	0	0	10	8.6
	15	0	0	0	0	0	0	10	8.8
	16	0	0	0	0	0	0	10	9.4
	DNR								
September	DNR								
	11	0	0	0	0	0	0	10	8.2
	12	0	0	0	0	0	0	10	11.4
	13	0	0	0	0	0	0	10	12.5
October	14	0	0	0	0	0	0	10	11.7

SD19									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	Brown long-eared bat	Rain score	Min. temperature
	24	0	0	0	0	0	0	4	1.8
	25	0	0	0	0	0	0	4	2.4
	26	0	0	0	0	0	0	6	5.4
	27	0	0	0	0	0	0	8	3.4
	28	3	1	0	2	1	0	10	5.9
April	29	1	0	0	2	3	0	10	7.9
	25	11	4	3	0	13	0	10	13.1
	26	7	0	0	0	4	0	10	12.2
	27	0	0	0	0	0	0	4	15.1
	28	21	8	0	0	12	0	4	12
May	29	4	0	0	0	2	0	8	12.6
	22	2	2	1	0	2	0	10	14.2
	23	1	0	1	0	0	0	10	11.3
	24	0	0	0	0	3	0	10	11.5
	25	1	0	0	0	0	0	10	9.5
	26	6	0	1	0	1	0	10	12
June	27	2	0	1	0	0	0	8	12.3
	18	2	3	0	0	18	0	10	16.1
	19	16	7	2	0	7	0	8	16.4
	20	0	2	1	0	4	0	2	9.7
July	21	0	1	3	0	2	0	8	14.9

SD19									
Month	Date	Common pipistrelle	Soprano Pipistrelle	Myotis species	Nyctalus species	Noctule	Brown long-eared bat	Rain score	Min. temperature
	DNR								
	17	6	3	2	0	4	0	10	14.2
	18	0	1	0	0	2	0	10	12.4
	19	1	0	0	0	4	0	10	12.8
	20	4	4	2	0	6	0	10	9.4
August	21	13	12	2	0	11	0	10	15.2
	14	2	0	1	0	4	0	10	8.6
	15	0	0	0	0	1	0	10	8.8
	16	1	0	0	0	5	0	10	9.4
	17	3	2	0	0	3	0	10	8.5
September	18	1	0	1	0	4	0	10	5.2
	11	0	0	0	0	0	0	10	8.2
	12	0	1	0	0	0	0	10	11.4
	DNR								
	DNR								
October	DNR								

APPENDIX J: CROSSING POINT SURVEY DETAILS

	Height band*	Common pipistrelle	Soprano pipistrelle	Myotis	Noctule	Nyctalus	Brown long-eared bat	Average vegetation height	Average embankment height
	A	0	0	0	0	0	0	17.34375	9.3125
	B	0	0	0	0	0	0	17.34375	9.3125
	C	0	0	0	0	0	0	17.34375	9.3125
CP1	D	4	1	0	1	0	0	17.34375	9.3125
	A	0	0	0	0	0	0	8.566667	0.7
	B	0	0	0	0	0	0	8.566667	0.7
	C	0	0	0	0	0	0	8.566667	0.7
CP2	D	0	0	0	0	0	0	8.566667	0.7
	A	0	0	0	0	0	0	6.8	-1.53846
	B	0	0	0	0	0	0	6.8	-1.53846
	C	0	0	0	0	0	0	6.8	-1.53846
CP3	D	2	0	0	0	0	0	6.8	-1.53846
	A	0	0	0	0	0	0	3	-9
	B	0	0	0	0	0	0	3	-9
	C	3	0	1	1	0	0	3	-9
CP4	D	5	1	0	2	0	0	3	-9
	A	0	0	0	0	0	0	4.41	0
	B	0	0	0	0	0	0	4.41	0
	C	4	0	3	0	0	1	4.41	0
CP5	D	0	0	1	0	0	0	4.41	0
	A	0	0	0	0	0	0	7.666667	-2.83333
	B	0	0	0	0	0	0	7.666667	-2.83333
	C	0	0	0	0	0	0	7.666667	-2.83333
CP6	D	2	0	0	0	0	0	7.666667	-2.83333
CP7	A	0	0	0	0	0	0	5.805556	0

	Height band*	Common pipistrelle	Soprano pipistrelle	Myotis	Noctule	Nyctalus	Brown long-eared bat	Average vegetation height	Average embankment height
	B	0	0	0	0	0	0	5.805556	0
	C	1	0	1	0	0	0	5.805556	0
	D	0	0	0	0	0	0	5.805556	0
	A	0	0	0	0	0	0	2.47619	-1.64286
	B	0	0	0	0	0	0	2.47619	-1.64286
	C	1	1	0	0	0	0	2.47619	-1.64286
CP8	D	0	0	0	0	0	0	2.47619	-1.64286
	A	0	0	0	0	0	0	2.480769	-0.40705
	B	0	0	0	0	0	0	2.480769	-0.40705
	C	4	1	0	0	0	0	2.480769	-0.40705
CP9	D	0	0	0	0	0	0	2.480769	-0.40705
	A	0	0	0	0	0	0	3.068182	0.380114
	B	0	0	0	0	0	0	3.068182	0.380114
	C	1	0	0	0	0	0	3.068182	0.380114
CP10	D	0	0	0	0	0	0	3.068182	0.380114
	A	1	0	0	0	0	0	2.947368	-0.05
	B	0	0	0	0	0	0	2.947368	-0.05
	C	0	1	0	0	0	0	2.947368	-0.05
CP11	D	0	1	0	0	0	0	2.947368	-0.05
	A	0	0	0	0	0	0	5.480769	0
	B	0	0	0	0	0	0	5.480769	0
	C	4	1	0	0	0	0	5.480769	0
CP12	D	0	0	0	0	0	0	5.480769	0
	A	2	4	0	0	0	0	10.17105	-6.7037
	B	0	0	0	0	0	0	10.17105	-6.7037
CP13	C	3	3	1	0	0	0	10.17105	-6.7037

	Height band*	Common pipistrelle	Soprano pipistrelle	Myotis	Noctule	Nyctalus	Brown long-eared bat	Average vegetation height	Average embankment height
	D	0	1	0	1	0	0	10.17105	-6.7037
	A	3	38	1	1	0	2	8.746193	-7.5814
	B	1	3	0	0	0	0	8.746193	-7.5814
	C	12	18	1	6	0	0	8.746193	-7.5814
CP14	D	0	2	0	9	2	1	8.746193	-7.5814
	A	0	0	0	0	0	0	6.766667	3.561905
	B	0	0	0	0	0	0	6.766667	3.561905
	C	5	2	1	0	0	0	6.766667	3.561905
CP15	D	2	6	0	2	0	0	6.766667	3.561905

*A: below road, B: 0-2 m, C: 2-5 m, D: >5 m

Survey Date	CP Locations Surveyed	Start time	End Time	Sunset Time	Rain		Cloud Cover (%)		Temperature (°C)		Wind (Beaufort)	
					Start	End	Start	End	Start	End	Start	End
28.03.2017	CP1, CP2, CP3, CP4, CP5, CP6, CP7, CP8	19:04	21:34	19:34	Light	None	100%	38%	8	8	0	0
29.03.2017	CP9, CP10, CP11, CP12, CP13, CP14, CP15	19:08	21:38	19:38	Light	None	100%	75%	12	14	0	1
26.07.2017	CP8, CP9, CP11, CP12	20:51	23:21	21:21	None	Light	33%	50%	16	13	1	2
27.07.2017	CP13, CP14, CP15	20:49	23:19	21:19	None	None	10%	0%	17	10	0	0
29.07.2017	CP1, CP2, CP3, CP4, CP5, CP6, CP7, CP10	20:50	23:50	21:20	Light	Light	100%	100%	13	12	1	1
25.09.2017	CP2, CP3, CP4, CP5, CP6, CP7, CP8	18:28	20:58	18:58	None	None	100%	100%	15	13	1	0
26.09.2017	CP1, CP9, CP10, CP11, CP12, CP13, CP14, CP15	18:25	20:55	18:55	None	None	100%	100%	16	13	1	1

APPENDIX K: EXTRACT FROM METABARCODING REPORT

Report: 03917JAGS

Metabarcoding Results

Company:	Jacobs UK Ltd
Address:	1180 Eskdale Road, Winnersh, Wokingham, RG41 5TU
Contact:	Greg Slack
Project:	B2104701
Sample type:	Faecal pellet
Date of Report:	1 December 2017
Number of samples:	1

Thank you for sending your samples for analysis by NatureMetrics. Your sample has been metabarcoded following our '**Species from faeces - Bat: Extended**' pipeline.

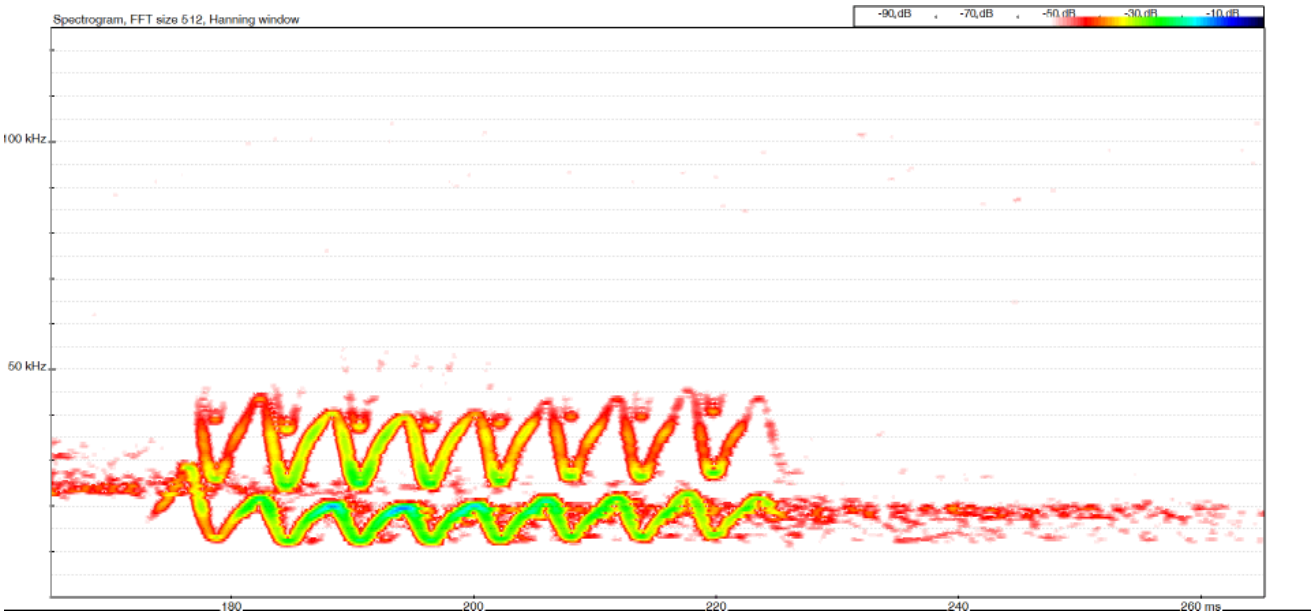
Here we present an overview of the key results, followed by a more detailed report that outlines the steps taken to extract, amplify, sequence, and analyse your DNA.

Overview of results

A total of 15 taxa were detected from the sample - Building 8 A1 (A1_B8): 14 unidentified fungal species and a white-shouldered house moth (*Endrosis sarcitrella*). No bat DNA was detected. Given the disintegrated state of the sample upon arrival it is likely that any exposed bat DNA had degraded beyond the limits of detection.

NatureMetrics Ltd, CABI site, Bakeham Lane, Egham, Surrey, TW20 9TY

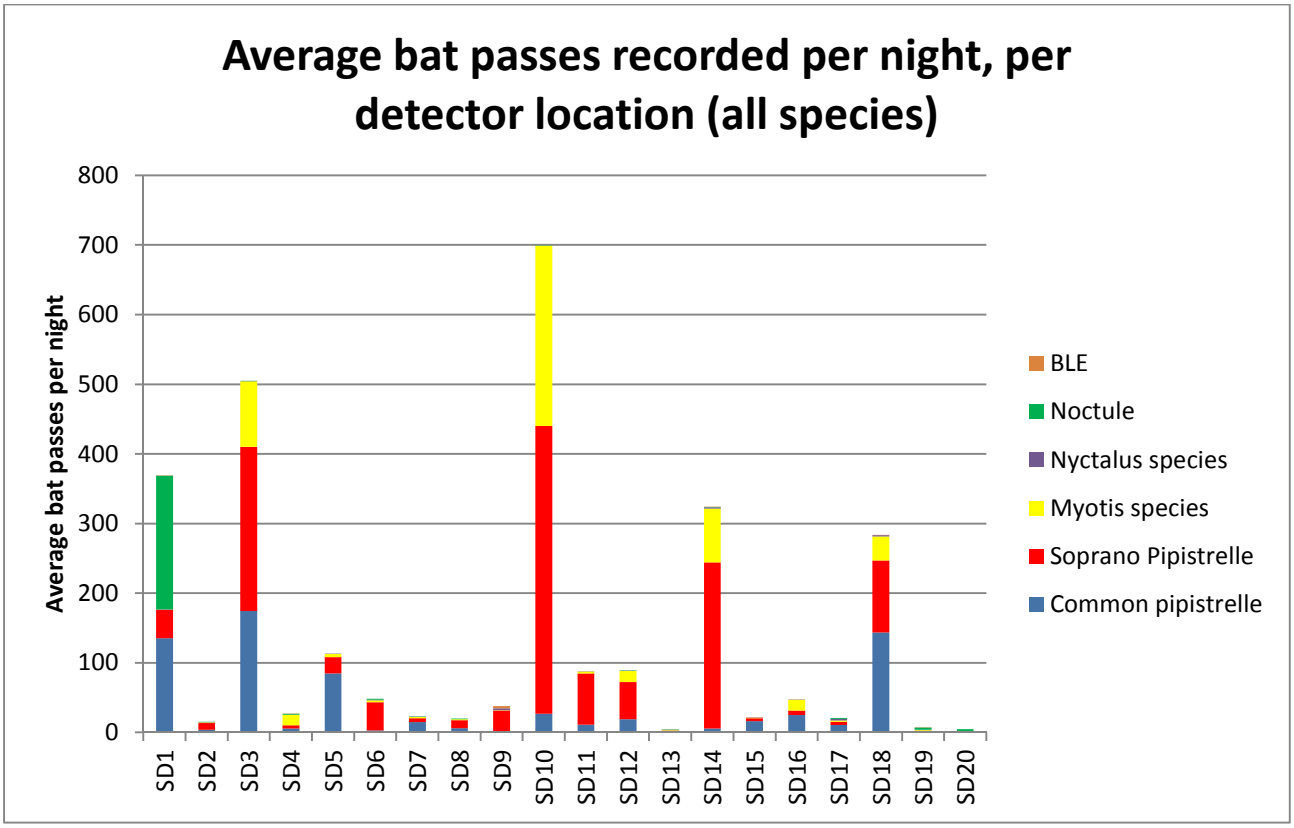
APPENDIX L: EXAMPLE NOCTULE SOCIAL CALL SONOGRAM

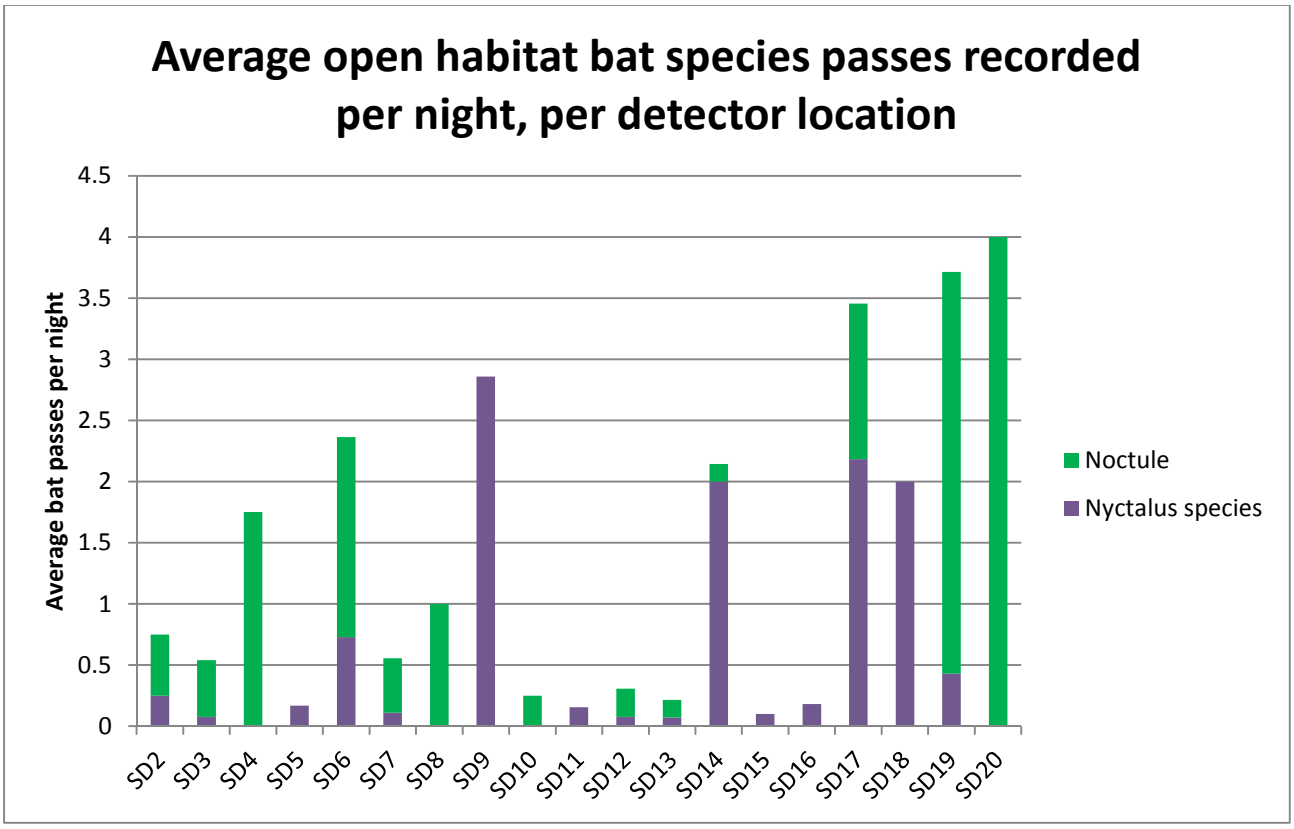


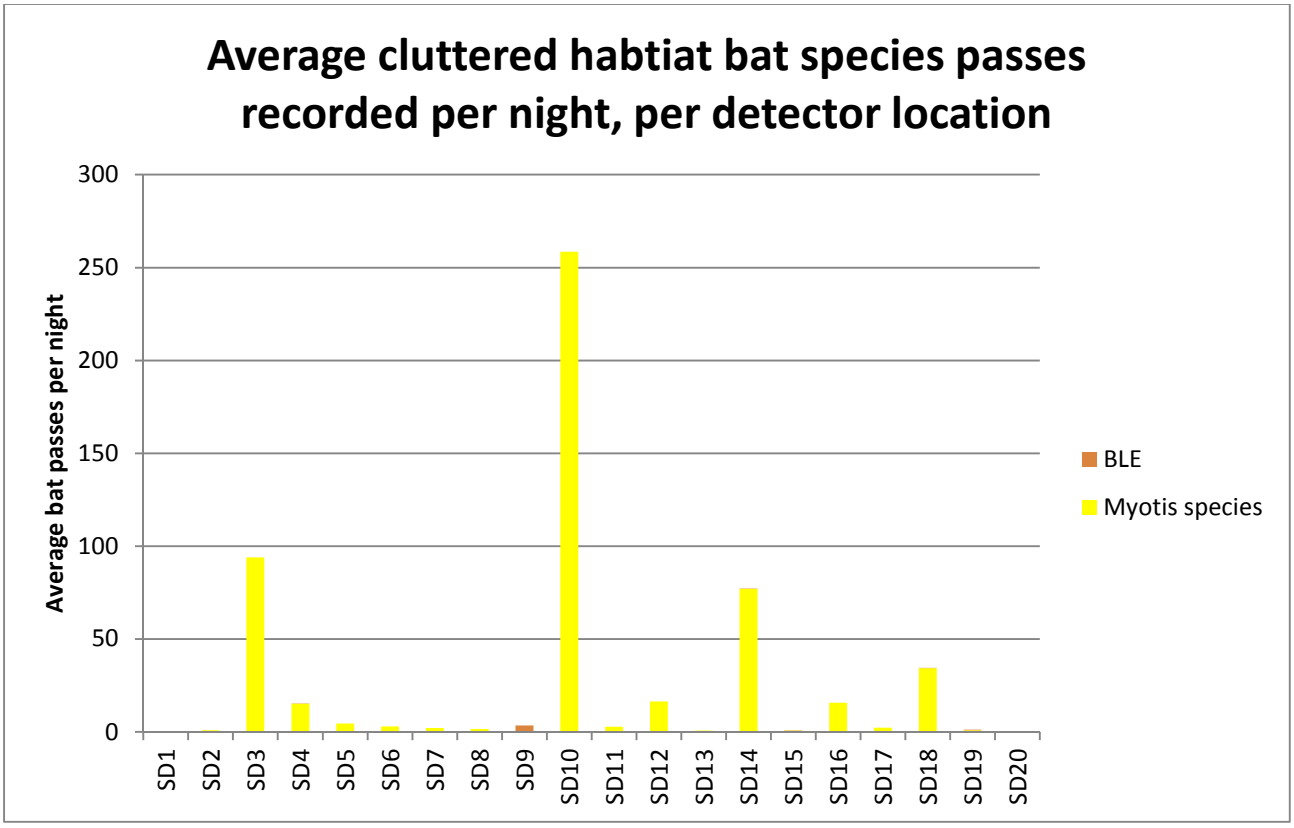
APPENDIX M: GRAPHED PEERSONIC STATIC DETECTOR SURVEY RESULTS

The Peersonic static detector results have been graphed and are shown below. NB brown long-eared bats are denoted by the shortened “BLE”.

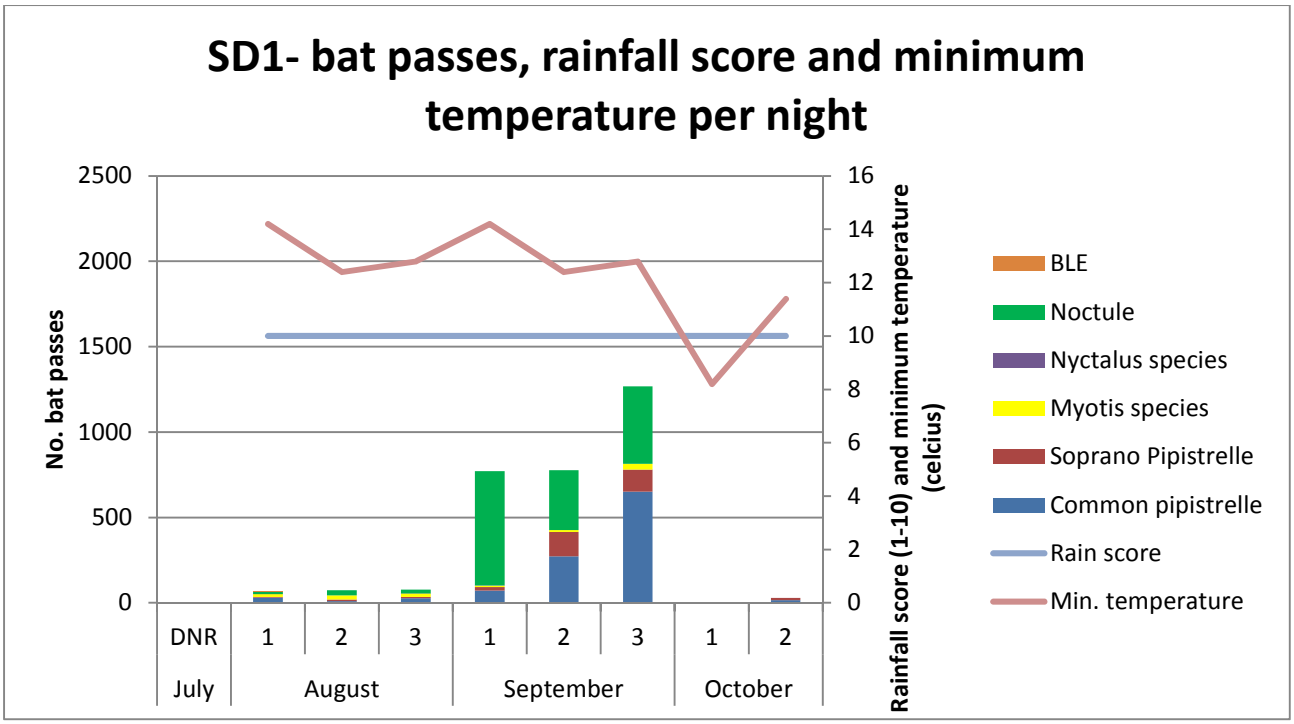
General

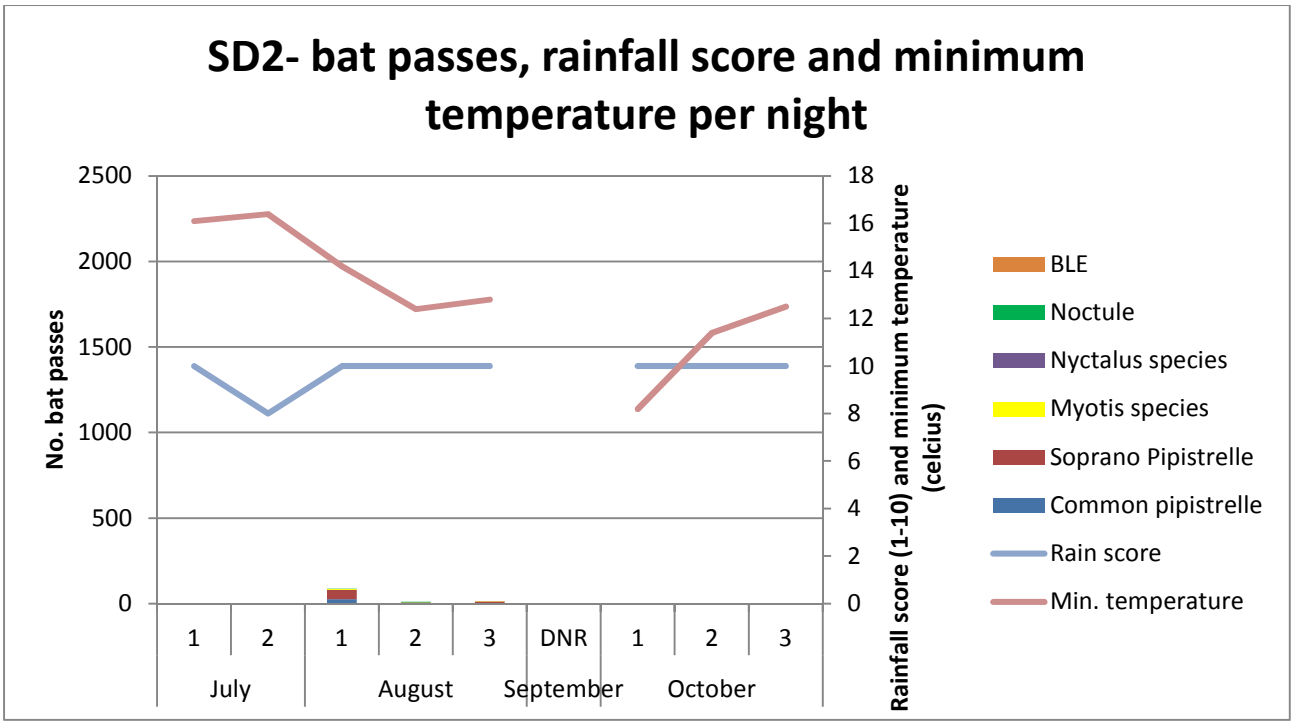


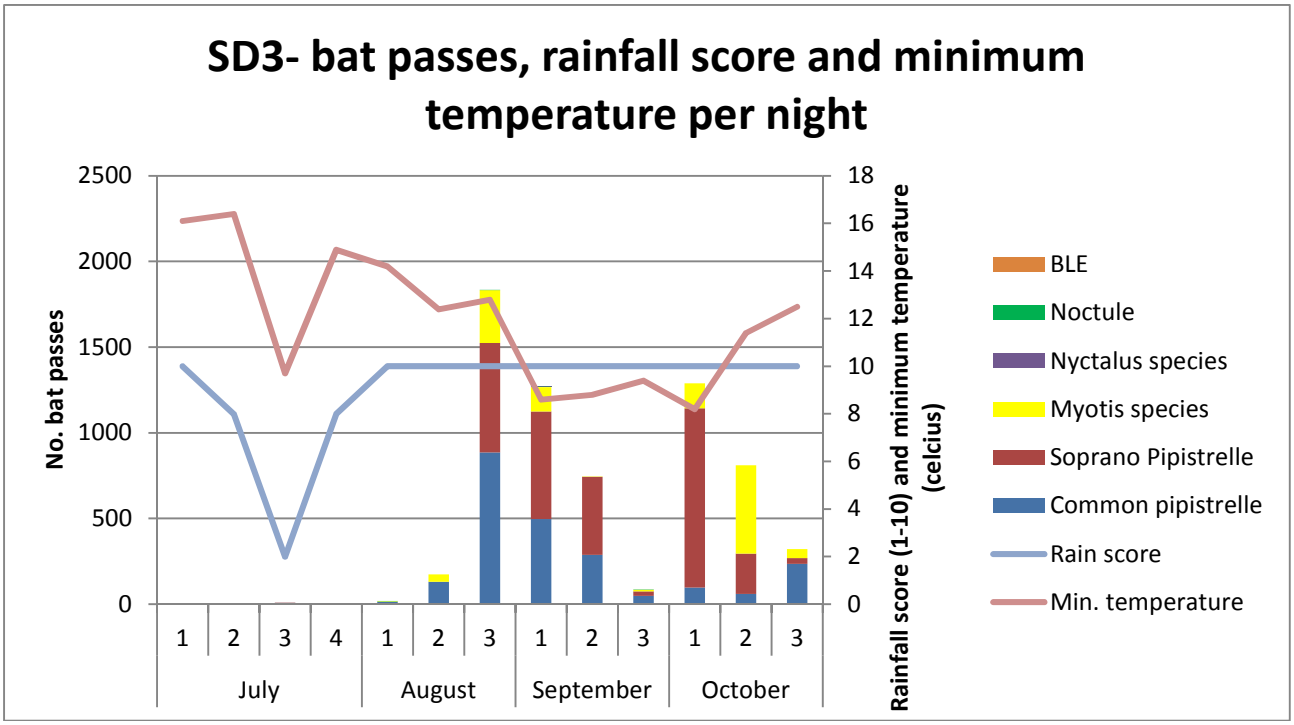

Average open habitat bat species passes recorded per night, per detector location
Average bat passes per night
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
SD2
SD3
SD4
SD5
SD6
SD7
SD8
SD9
SD10
SD11
SD12
SD13
SD14
SD15
SD16
SD17
SD18
SD19
SD20
Noctule
Nyctalus species

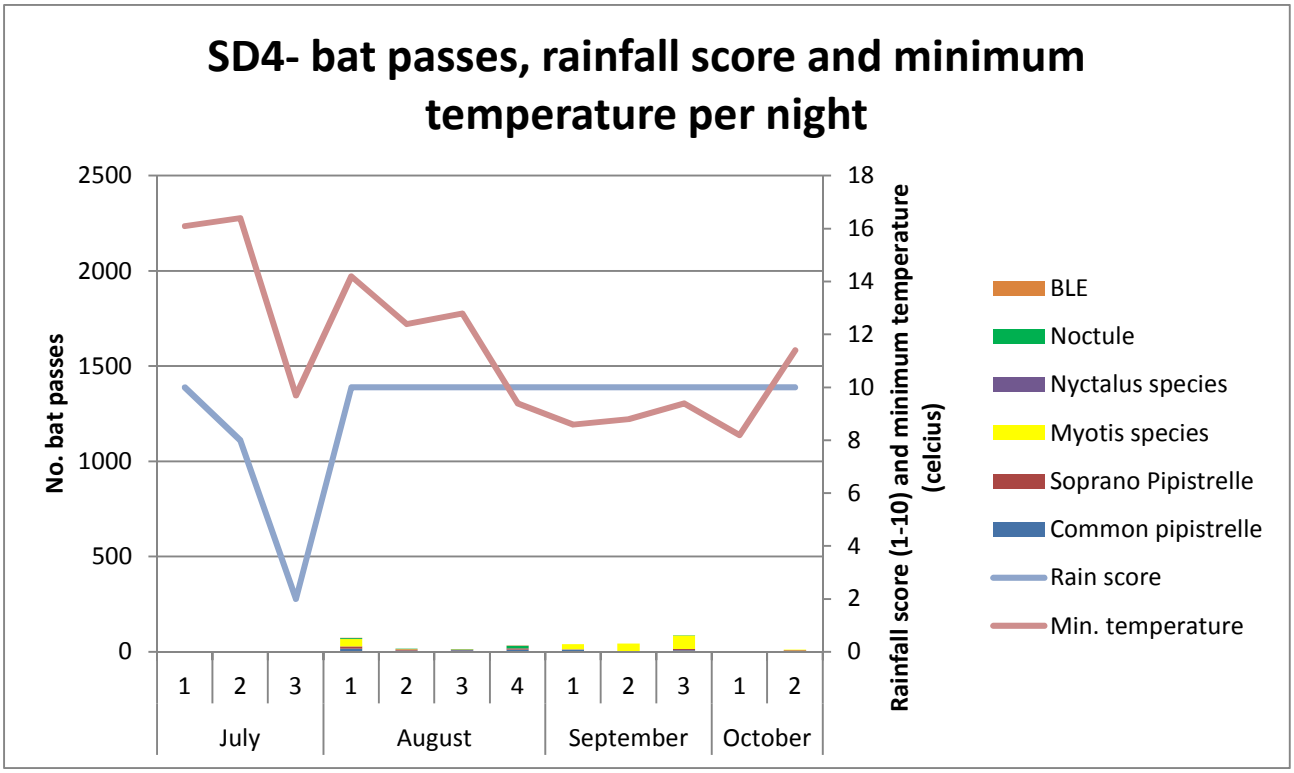

Average cluttered habtiat bat species passes recorded per night, per detector location
Average bat passes per night
300
250
200
150
100
50
0
SD1
SD2
SD3
SD4
SD5
SD6
SD7
SD8
SD9
SD10
SD11
SD12
SD13
SD14
SD15
SD16
SD17
SD18
SD19
SD20
BLE
Myotis species

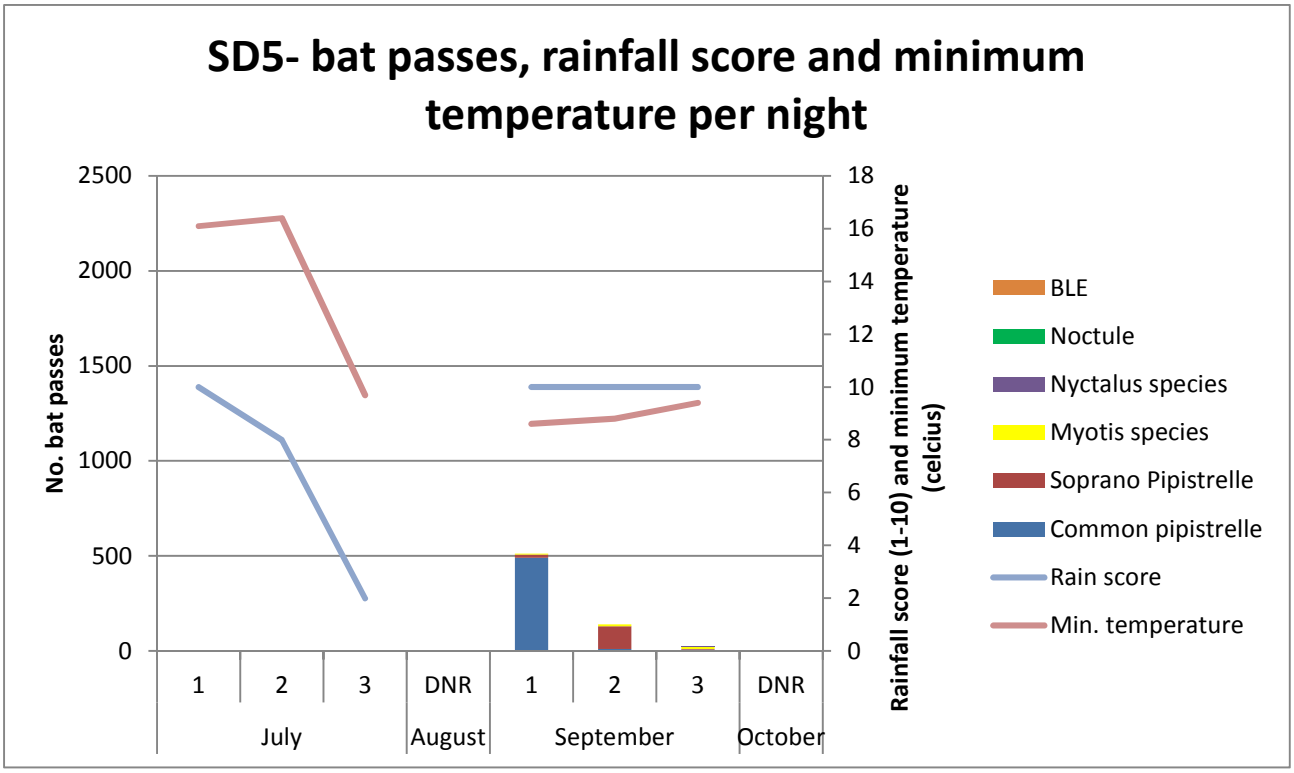
All subsequent graphs have been standardised to a maximum value of 2500 on the X axis unless specifically identified

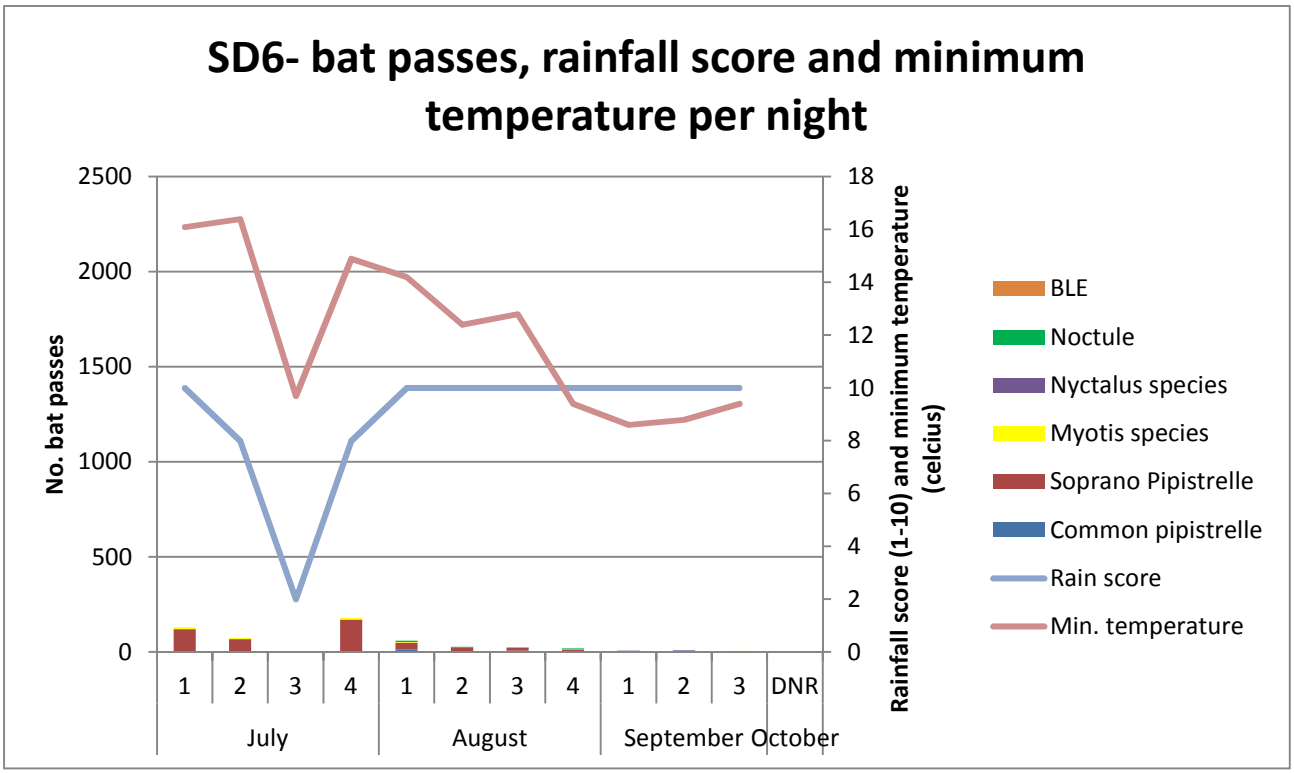


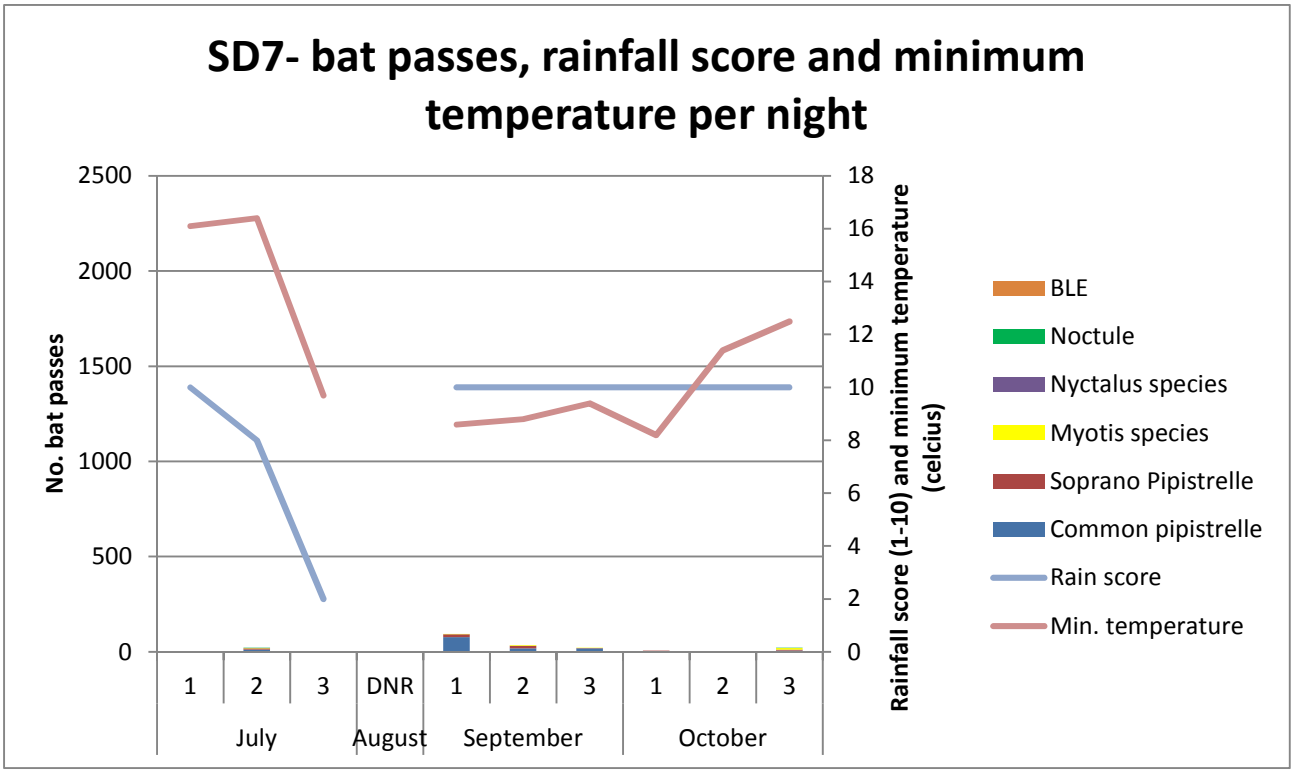


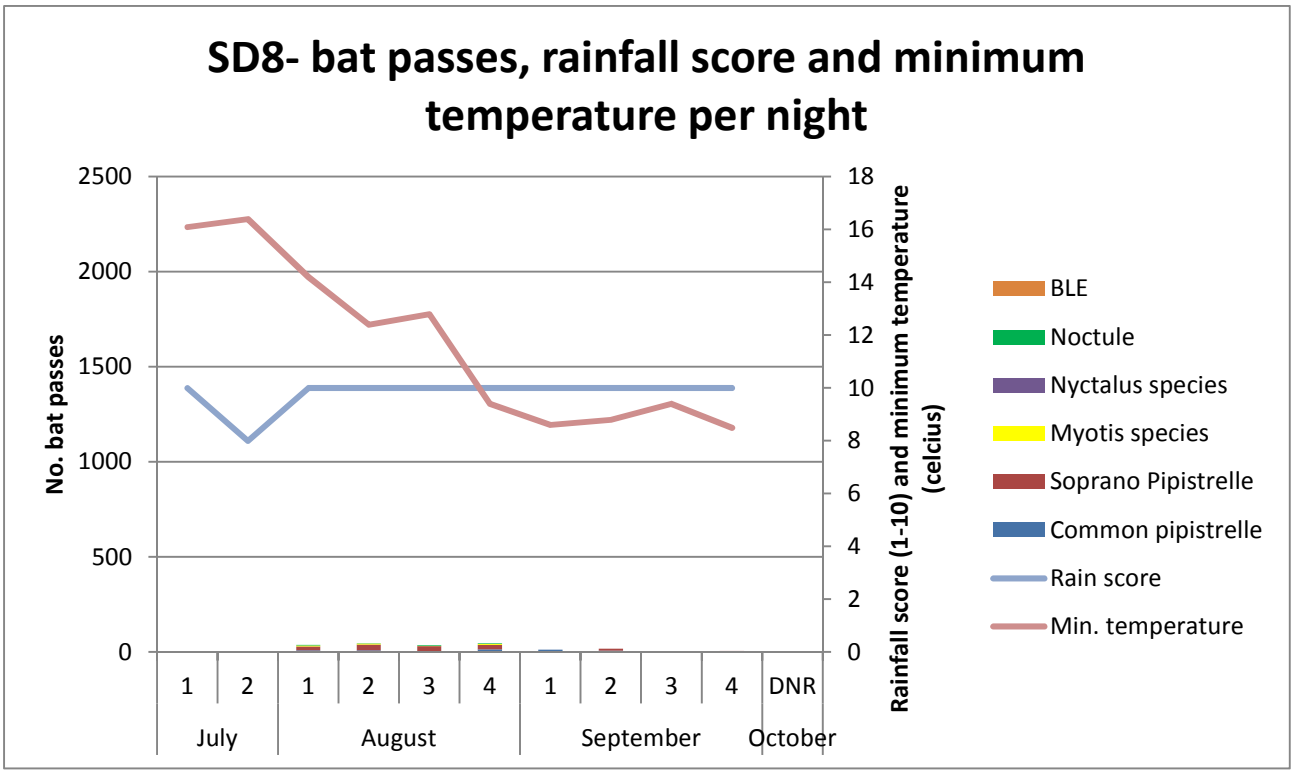

SD3- bat passes, rainfall score and minimum temperature per night
No. bat passes
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
Rainfall score (1-10) and minimum temperature (celcius)
1 2 3 4 1 2 3 1 2 3 1 2 3
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

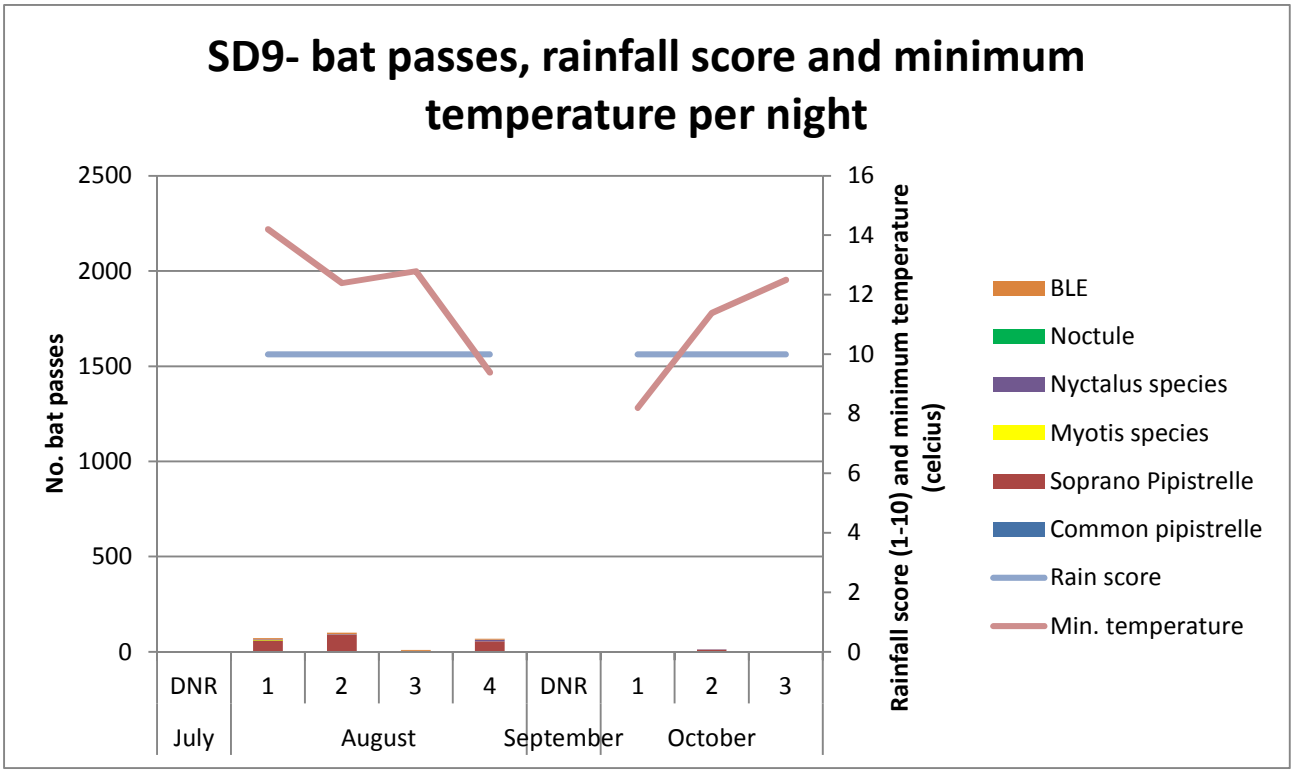

SD4- bat passes, rainfall score and minimum temperature per night
No. bat passes
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
Rainfall score (1-10) and minimum temperature (celcius)
1 2 3 1 2 3 4 1 2 3 1 2
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

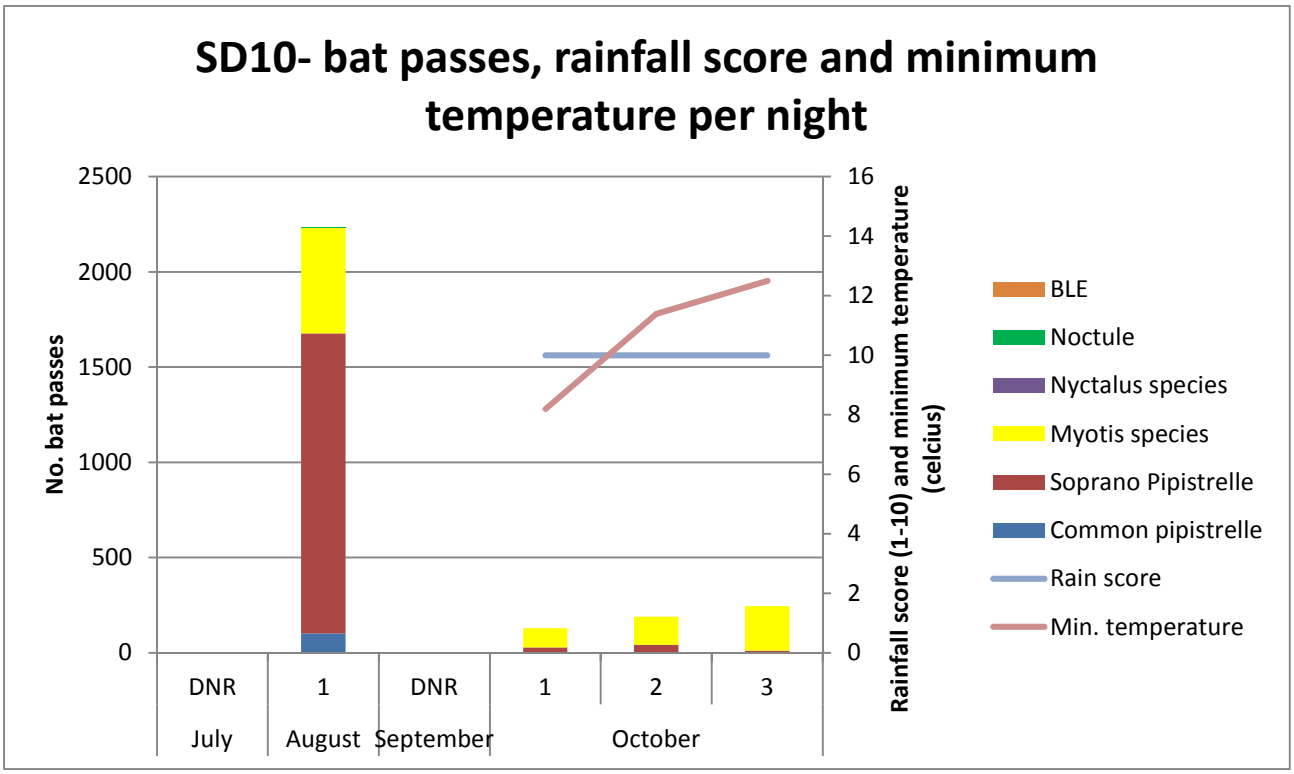

SD5- bat passes, rainfall score and minimum temperature per night
No. bat passes
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
Rainfall score (1-10) and minimum temperature (celcius)
1
2
3
DNR
1
2
3
DNR
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

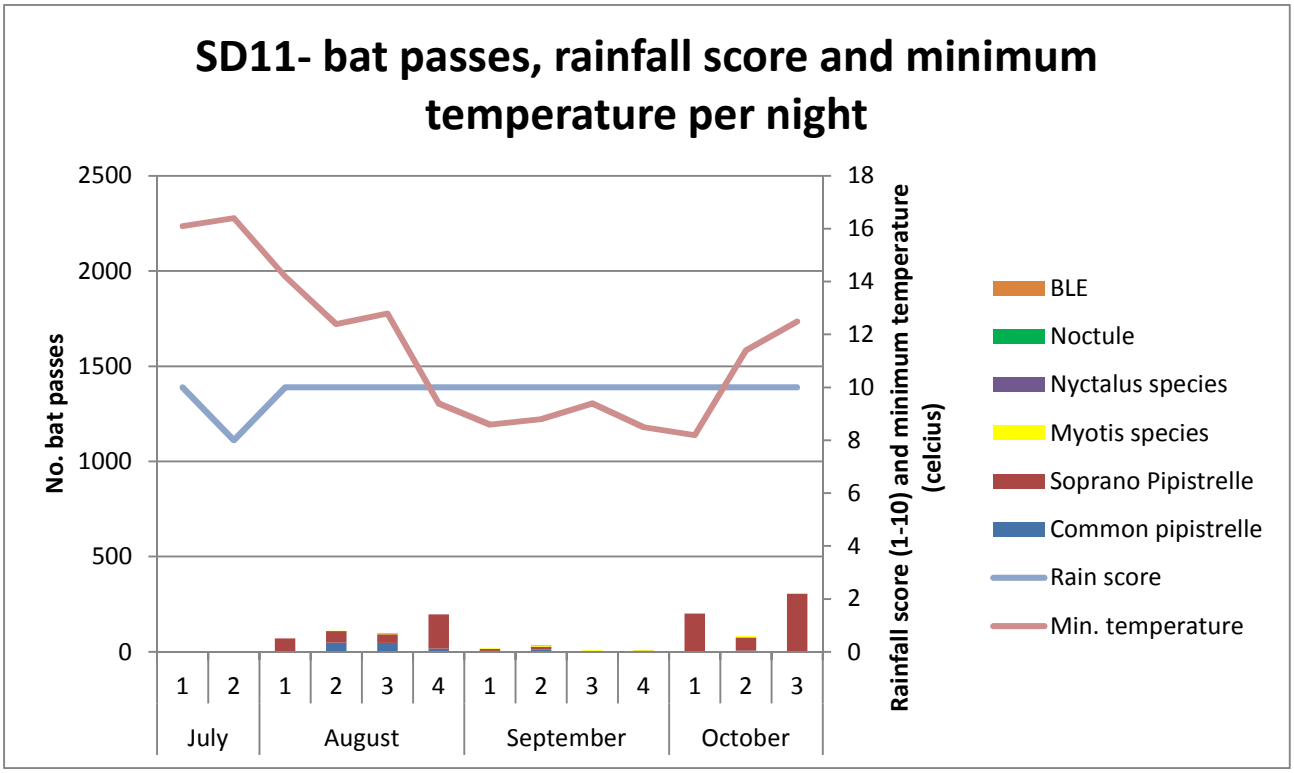

SD6- bat passes, rainfall score and minimum temperature per night
No. bat passes
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
Rainfall score (1-10) and minimum temperature (celcius)
1
2
3
4
1
2
3
4
1
2
3
DNR
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

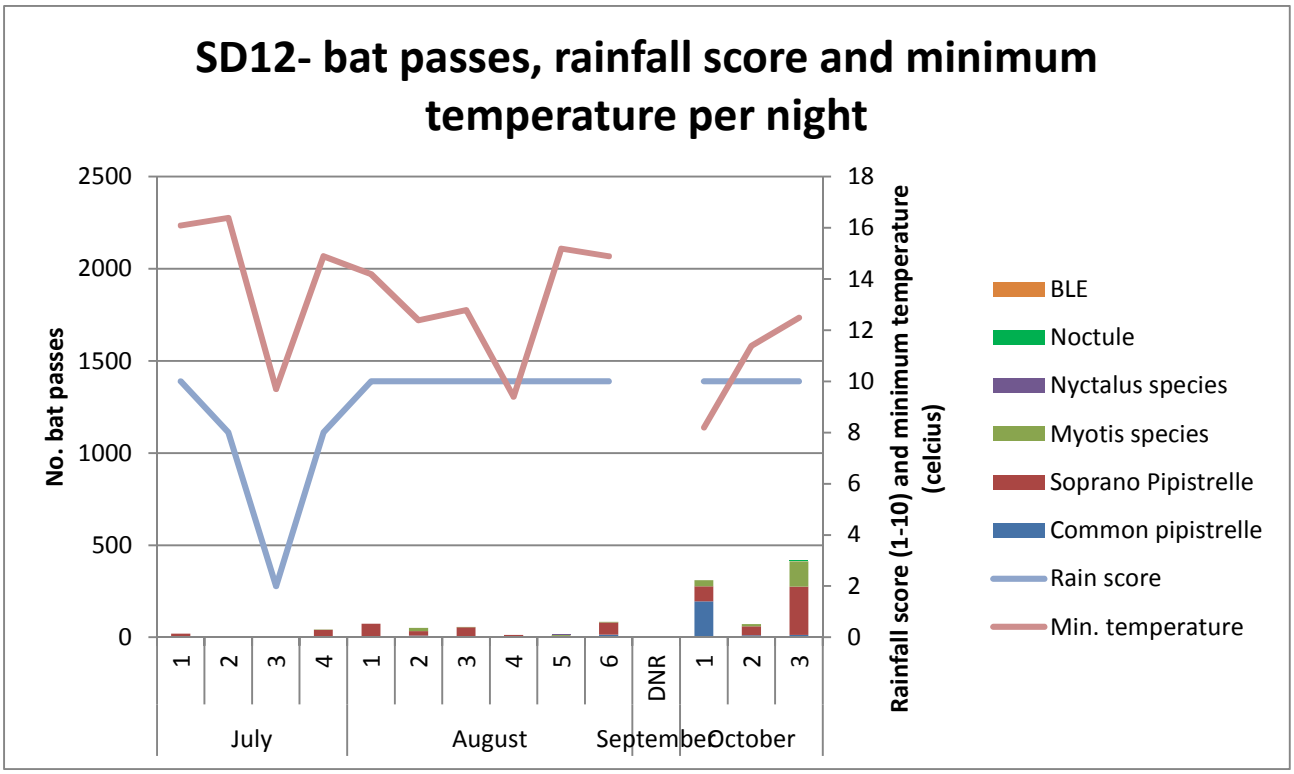

SD7- bat passes, rainfall score and minimum temperature per night
No. bat passes
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
Rainfall score (1-10) and minimum temperature (celcius)
1
2
3
DNR
1
2
3
1
2
3
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

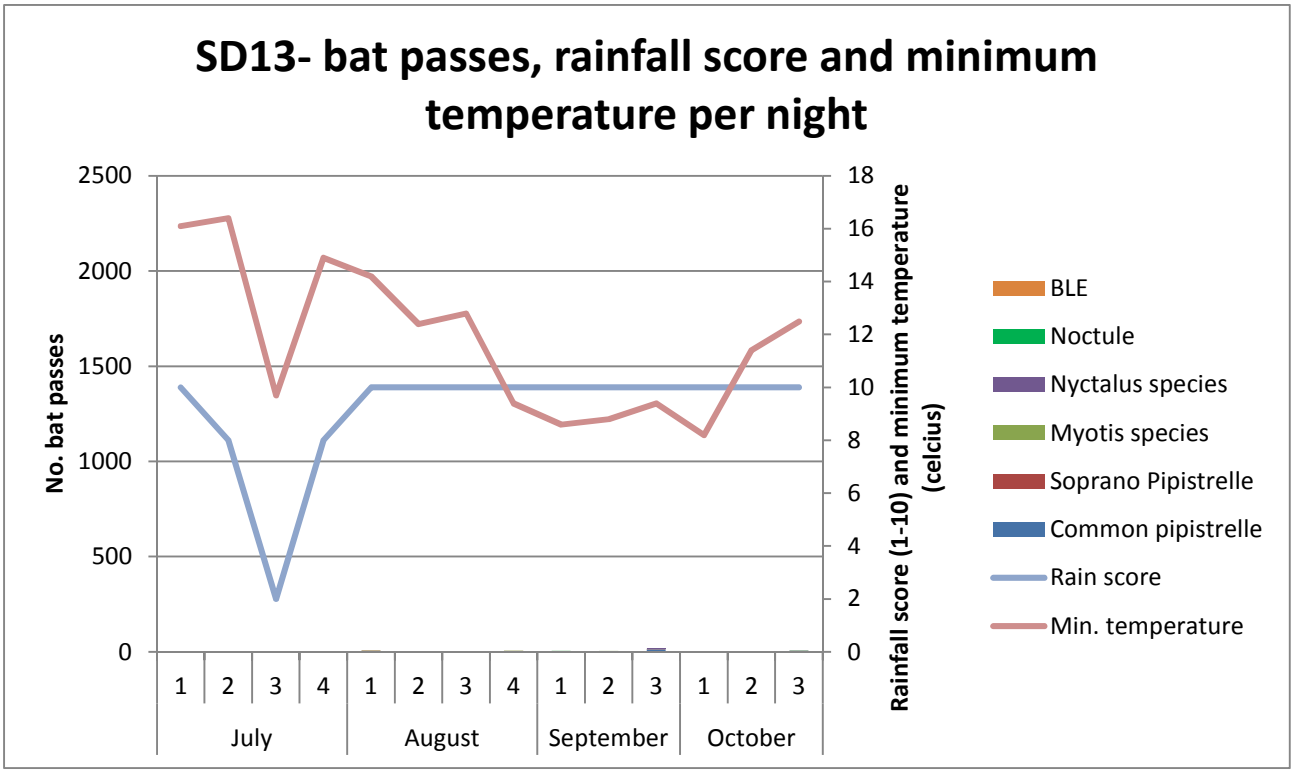

SD8- bat passes, rainfall score and minimum temperature per night
No. bat passes
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
Rainfall score (1-10) and minimum temperature (celcius)
1
2
1
2
3
4
1
2
3
4
DNR
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

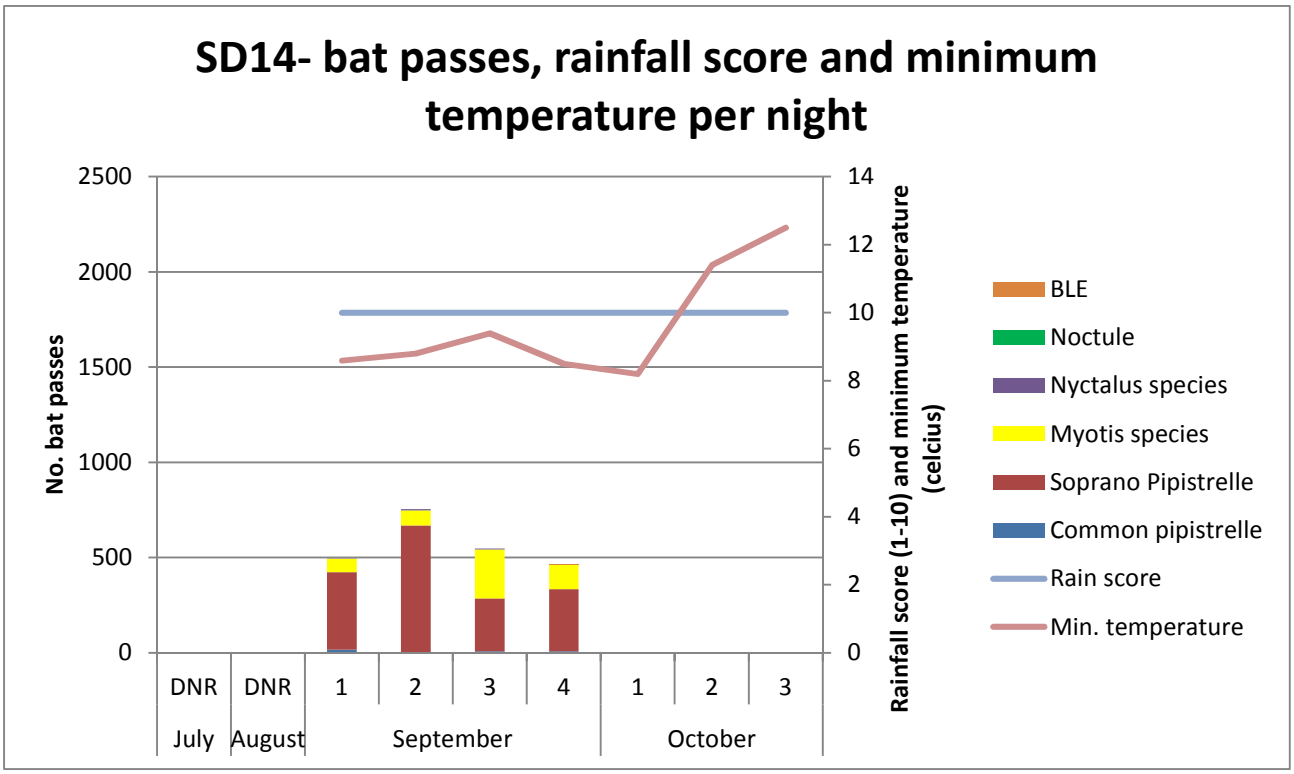

SD9- bat passes, rainfall score and minimum temperature per night
No. bat passes
2500
2000
1500
1000
500
0
16
14
12
10
8
6
4
2
0
Rainfall score (1-10) and minimum temperature (celcius)
DNR
1
2
3
4
DNR
1
2
3
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

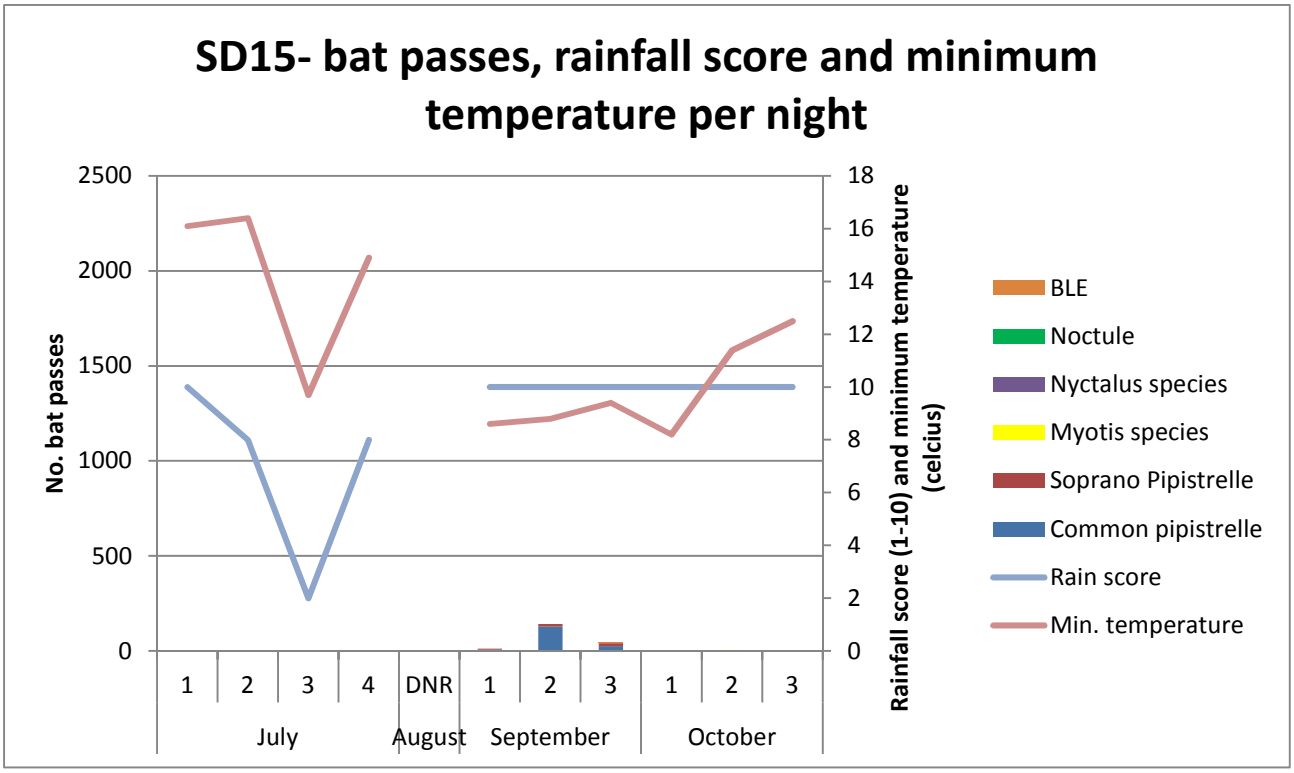

SD10- bat passes, rainfall score and minimum temperature per night
No. bat passes
2500
2000
1500
1000
500
0
16
14
12
10
8
6
4
2
0
Rainfall score (1-10) and minimum temperature (celcius)
DNR
1
DNR
1
2
3
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

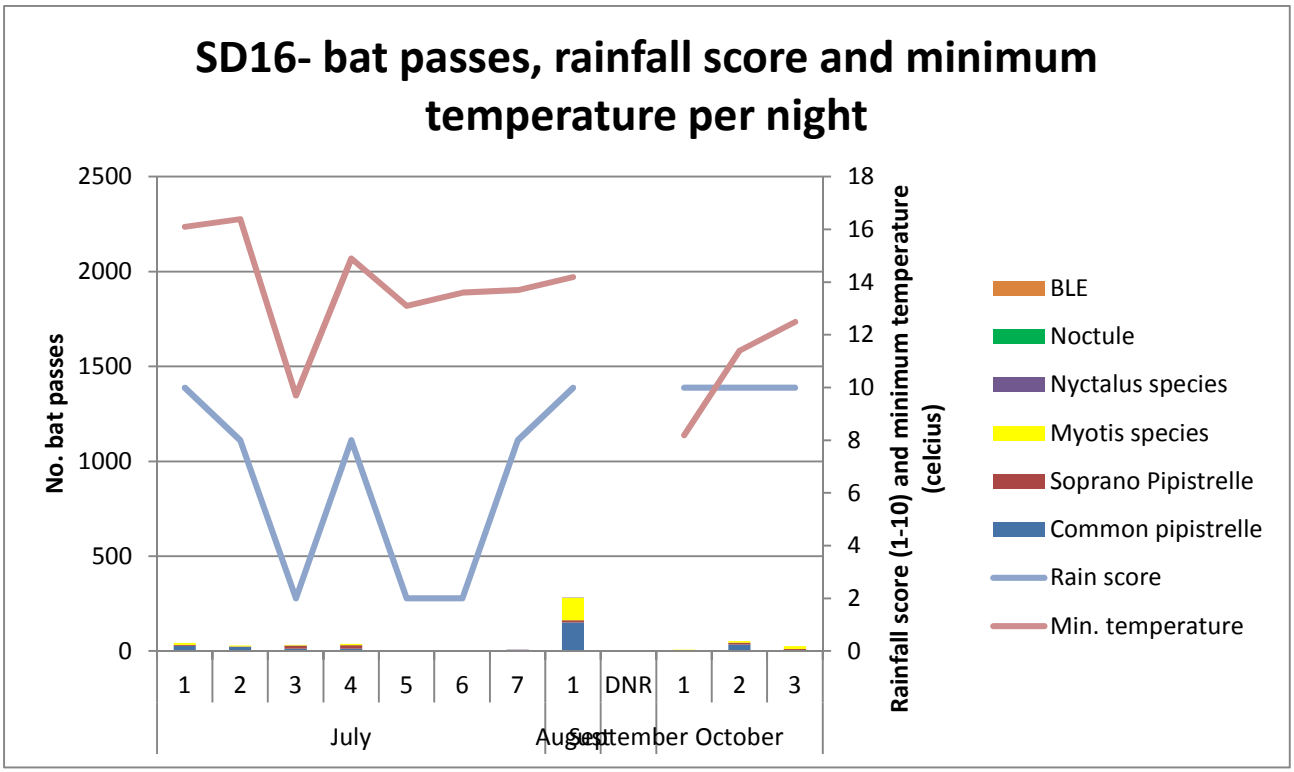

SD11- bat passes, rainfall score and minimum temperature per night
No. bat passes
Rainfall score (1-10) and minimum temperature (celcius)
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
1 2 1 2 3 4 1 2 3 4 1 2 3
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

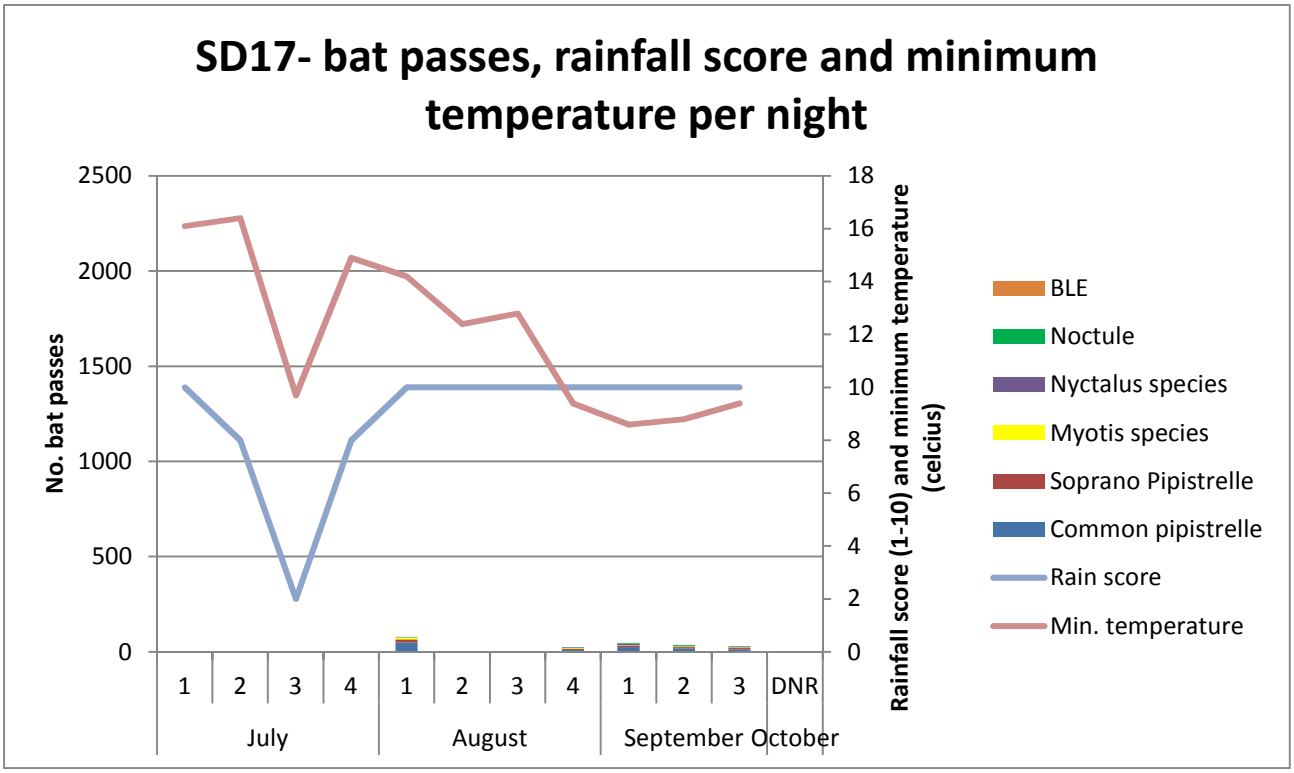

SD12- bat passes, rainfall score and minimum temperature per night
No. bat passes
Rainfall score (1-10) and minimum temperature (celcius)
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
1 2 3 4 1 2 3 4 5 6 DNR 1 2 3
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

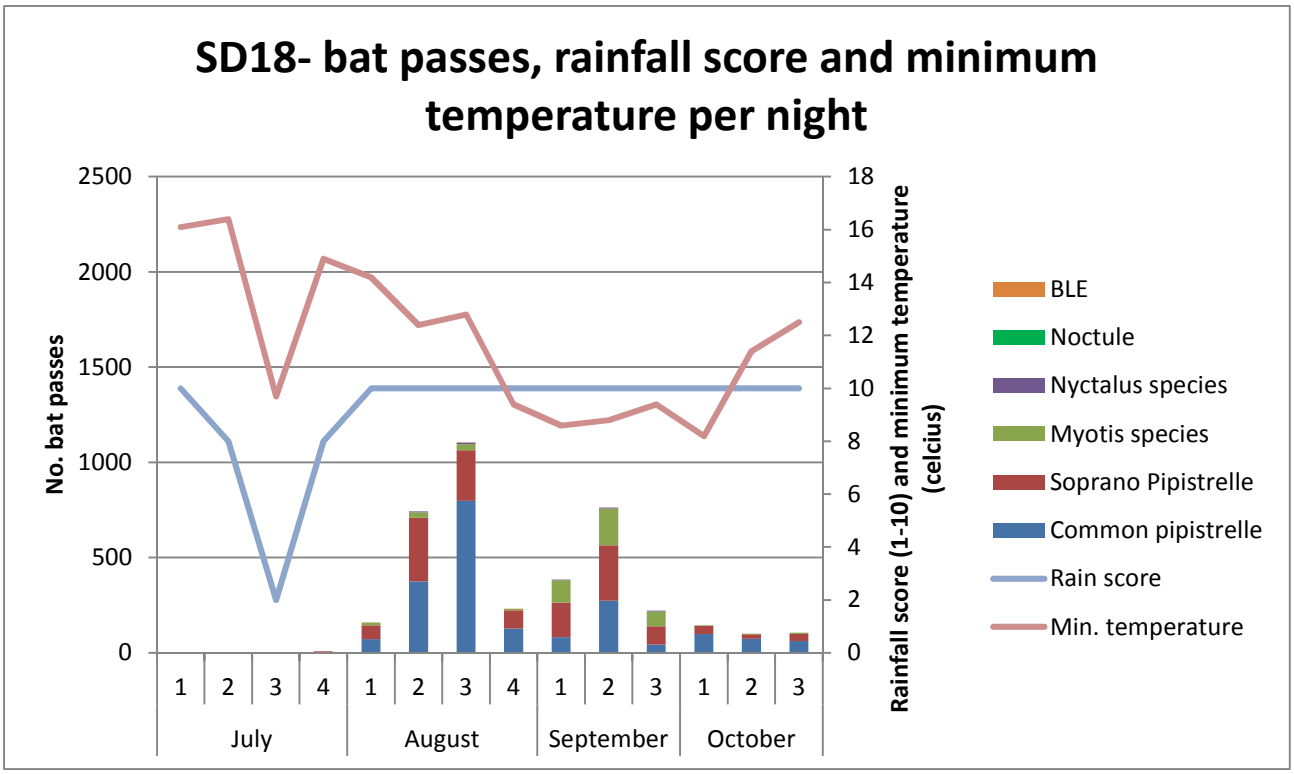

SD13- bat passes, rainfall score and minimum temperature per night
No. bat passes
Rainfall score (1-10) and minimum temperature (celcius)
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
1 2 3 4 1 2 3 4 1 2 3 1 2 3
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

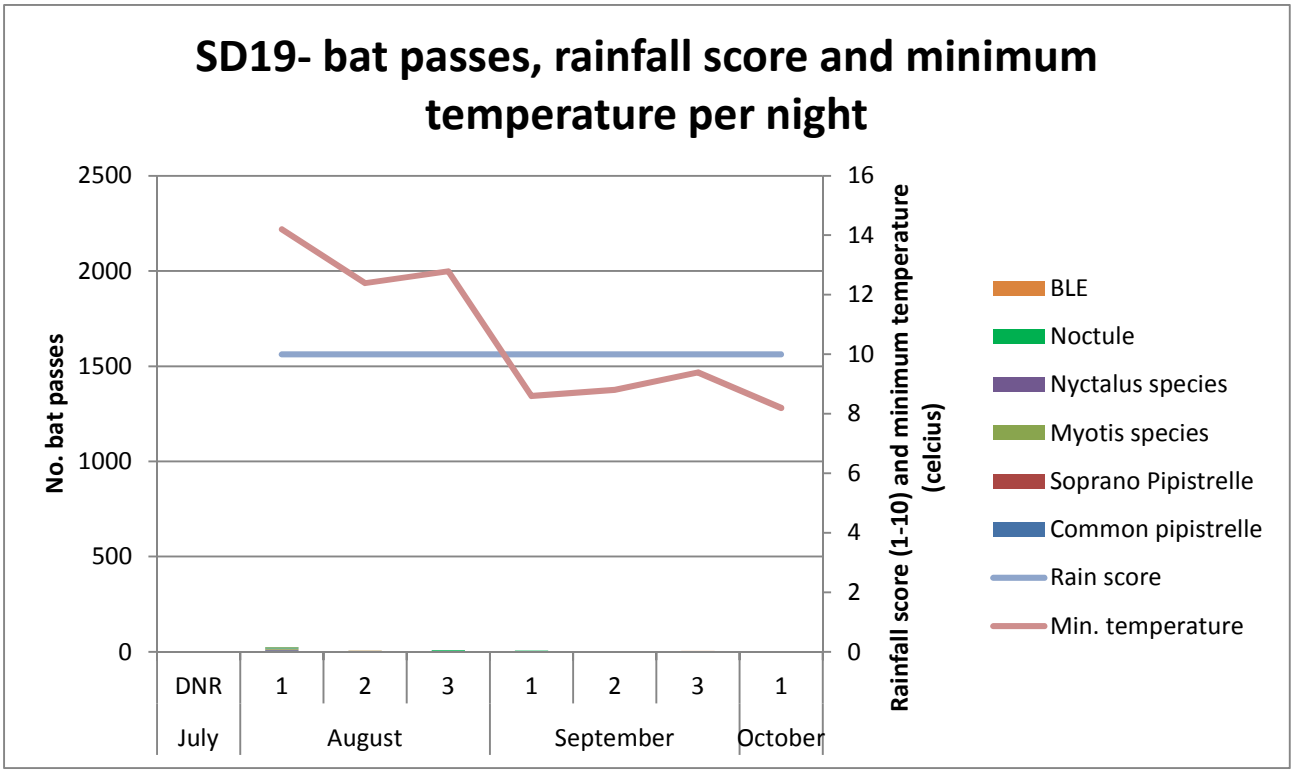

SD14- bat passes, rainfall score and minimum temperature per night
No. bat passes
Rainfall score (1-10) and minimum temperature (celcius)
2500
2000
1500
1000
500
0
14
12
10
8
6
4
2
0
DNR DNR 1 2 3 4 1 2 3
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

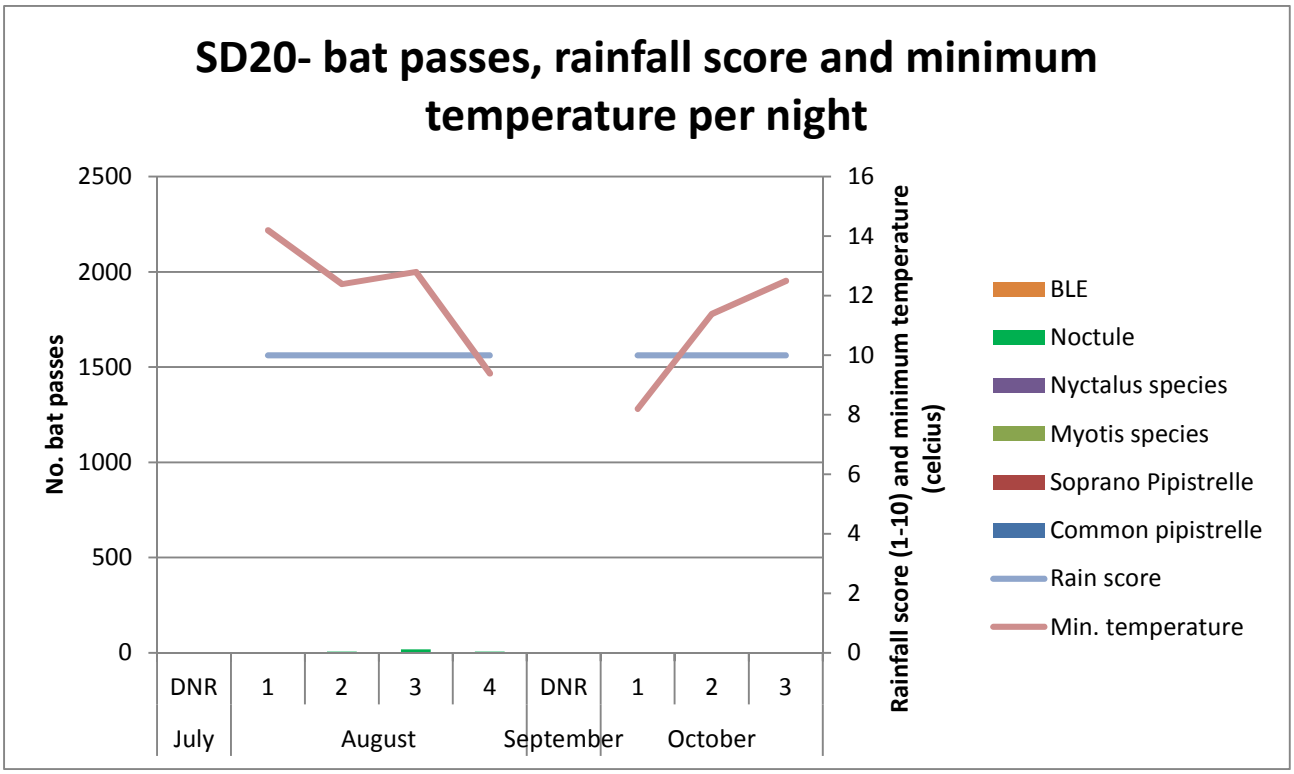

SD15- bat passes, rainfall score and minimum temperature per night
No. bat passes
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
Rainfall score (1-10) and minimum temperature (celcius)
1 2 3 4 DNR 1 2 3 1 2 3
July August September October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature


SD16- bat passes, rainfall score and minimum temperature per night
No. bat passes
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
Rainfall score (1-10) and minimum temperature (celcius)
1 2 3 4 5 6 7 1 DNR 1 2 3
July August September October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature


SD17- bat passes, rainfall score and minimum temperature per night
No. bat passes
Rainfall score (1-10) and minimum temperature (celcius)
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
1 2 3 4 1 2 3 4 1 2 3 DNR
July
August
September October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature


SD18- bat passes, rainfall score and minimum temperature per night
No. bat passes
Rainfall score (1-10) and minimum temperature (celcius)
2500
2000
1500
1000
500
0
18
16
14
12
10
8
6
4
2
0
1 2 3 4 1 2 3 4 1 2 3 1 2 3
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature


SD19- bat passes, rainfall score and minimum temperature per night
No. bat passes
2500
2000
1500
1000
500
0
16
14
12
10
8
6
4
2
0
Rainfall score (1-10) and minimum temperature (celcius)
DNR
1
2
3
1
2
3
1
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature


SD20- bat passes, rainfall score and minimum temperature per night
No. bat passes
2500
2000
1500
1000
500
0
16
14
12
10
8
6
4
2
0
Rainfall score (1-10) and minimum temperature (celcius)
DNR
1
2
3
4
DNR
1
2
3
July
August
September
October
BLE
Noctule
Nyctalus species
Myotis species
Soprano Pipistrelle
Common pipistrelle
Rain score
Min. temperature

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