



Greater Cambridge Partnership

Cambourne to Cambridge

Appendix TR5.5 - 2022 Bat Activity Report





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2022 Bat Activity Report

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1 Introduction

1.1 Project Background

- 1.1.1. The Cambourne to Cambridge project (C2C) is a proposed new 13.6km public transport route linking Cambourne and Cambridge. It will include a dedicated busway serving communities in Cambourne and the proposed Bourn Airfield development, as well as in Hardwick, Coton and the West Cambridge campus. A service road, to be used as a path for active travel, particularly by cyclists and pedestrians, will run alongside the busway. A new travel hub will be provided at Scotland Farm.
- 1.1.2. Scheme details are provided in the main report to the Environmental Statement (ES).

1.2 Ecological Background

- 1.2.1. WSP was commissioned in 2021 to complete a suite of bat activity surveys following recommendations set out by Mott MacDonald Ecology Specification (Mott MacDonald, 2019) and gap analysis of data from previous surveys for the Scheme.
- 1.2.2. Previous surveys and reports were completed by Cambridge Ecology and Thomson Environmental Consultants, as listed below:
 - C2C Bat Activity Survey Summary (Thomson Environmental Consultants, 2021); and
 - Stage 2 Bat Activity Survey Report 2019-20 final (Cambridge Ecology, 2020).
- 1.2.3. In summary, previous surveys completed by Cambridge Ecology identified 12 species of bat utilising linear features within the survey area and surveys completed by Thomson Environmental Consultants identified 10 species of bat using the survey area. Common Pipistrelle *Pipistrellus pipistrellus* and Soprano Pipistrelle *Pipistrellus pygmaeus* were the most prevalent species recorded during bat activity surveys previously undertaken. However, of note, results of all previous surveys completed identified high levels of Barbastelle *Barbastella barbastellus* at numerous locations along the survey area, with key areas identified:
 - A hedgerow south of Madingley Wood SSSI; and
 - A hedgerow south of Cambridge University Sports Ground in the east of the survey area leading to a conclusion that a roost site was present within close proximity to the Scheme.
- 1.2.4. Barbastelle is also cited as a qualifying feature, for being present during the maternity season, at Eversden and Wimpole Woods Special Area of Conservation (SAC), located approximately 7km southwest of the survey area (Cambridge Ecology, 2020, Thomson Environmental Consultants, 2021).

1.3 Brief and Objectives

- 1.3.1. WSP UK Ltd was commissioned by Greater Cambridge Partnership (GCP) to undertake a suite of bat activity surveys required to inform the impact assessments for the Scheme. The requirement for these surveys followed the gap analysis in 2021 and included a number of summer bat activity surveys and a comprehensive suite of winter bat activity surveys, with the following objectives:
- Crossing point surveys – to identify potentially important commuting routes and to identify the behaviour of bats along linear features (woodland, hedgerows, treelines, waterways and ditches) at risk of severance by the Scheme;
 - Winter automated detector surveys - to gain a representative sample of activity to assess the species assemblages and distribution of winter activity at numerous locations across the Scheme (as defined in **Section 3.3**); and
 - Summer automated detector surveys - to gain a representative sample of activity to assess the species assemblages and distribution of summer activity at numerous locations across the Scheme (as defined in **Section 3.3**).
- 1.3.2. Results will be used to inform the Scheme’s impact assessment and development of mitigation for commuting and foraging bats across the Scheme. Details of the impact assessment and mitigation will be included within the Biodiversity Chapter of the Environmental Statement for the Scheme.

1.4 Survey Area

- 1.4.1. The areas covered by each of the survey types are hereafter referred to as the ‘Survey Areas’. The Survey Areas are detailed in **Table TR5-5-1-1** below.

Table TR5-5-1-1 - Summary of Survey Areas for bat activity surveys completed in 2021/2022

Survey type	Survey area
Crossing Point Surveys	Scheme boundary and connected habitats at risk of severance from the Scheme.
Winter Automated Detector Surveys	Scheme boundary and connected habitats at risk of severance from the Scheme.
Summer Automated Detector Surveys	Scheme boundary and connected habitats at risk of severance from the Scheme, that were not covered by previous surveys.

2 Relevant Legislation

- 2.1.1. Bats and their roosts are afforded a high level of protection under the Conservation of Habitats and Species Regulations 2017 (Her Majesty's Stationary Office (HMSO), 2017) and the Wildlife and Countryside Act 1981 (HMSO, 1981). The full legislation should be referred to for detail.
- 2.1.2. Certain species of bats are also listed as a Species of Principal Importance (SPI) for the Conservation of Biodiversity in accordance with Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (HMSO, 2006). Under Section 40 of the NERC Act, public bodies (including local planning authorities) have a duty to have regard for the conservation of SPI when carrying out their functions, including determining planning applications.
- 2.1.3. The Barbastelle is a rare bat and is an Annex II species and is listed as a rare and threatened species in the European and British Data Books of rare and endangered animal species.
- 2.1.4. Barbastelle are afforded specific protection as follows:
 - Annex II and IV of the Habitats Directive;
 - Wildlife and Countryside Act 1981 (Schedule 5);
 - Near Threatened on the IUCN Red List of threatened species; and
 - Species of Principal Importance (SPI) under section 41 of the Natural Environment and Rural Communities Act 2006 (NERC).

3 Methodology

3.1 Overview

- 3.1.1. The methodology applied for all survey techniques and bat call analysis was completed with reference to best practice guidance and industry standards; Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn) (Collins, 2016), British Bat Calls: A Guide to Species Identification (Russ J. , 2012), and Development of a Cost Effective Method for Monitoring the Effectiveness of Mitigation for Bats Crossing Linear Transport Infrastructure (Berthinussen & Altringham, 2015).
- 3.1.2. Crossing point surveys were undertaken by surveyors sat in static positions and using thermal imaging or infra-red technology to identify the behaviour of bats at linear habitat features (woodland, hedgerows, treelines, waterways and ditches) due to be intersected by the Scheme. Observations were made regarding height, distance from feature and direction of flight, behaviour and time after sunset or before sunrise.
- 3.1.3. Automated detector surveys were placed at numerous locations across the survey area to assess the to gain a representative sample of activity, species assemblages and distribution of bat activity relative to the Scheme.

3.2 Desk Study

- 3.2.1. An updated desk study exercise was completed in March 2022. The objective of the desk study was to review information held by Cambridgeshire & Peterborough Environmental Records Centre (CPERC) and identify any nearby bat records likely to be impacted by the Scheme. The following information was requested from CPERC:
 - Barbastelle records within 10km of the Scheme; and
 - All other bat species records within a 5 km radius of the Scheme.

3.3 Crossing point surveys

Surveys

- 3.3.1. A series of crossing point bat surveys were completed between the months of May to September (inclusive) during 2022. Undertaken with reference to the DEFRA guidelines (Berthinussen & Altringham, 2015) these were intended to contribute to the overall bat activity dataset, and specifically gather qualitative information such as number of bats, species, species behaviour, bat flight height, and activity information for all species, across the Scheme.
- 3.3.2. A total of 21 crossing point survey locations were surveyed in 2022, the location of these survey locations are presented in **Figure TR5-5-1-1** in **Annex A**. A review of previous survey data identified that Thomson Environmental Consultants completed four crossing point surveys at six linear features within the current Scheme boundary in 2021. These

surveys were undertaken at Crossing Points 1, 2, 5, 6, 9 and 10 (see **Figure TR5-5-1-1, Annex A**) (Thomson Environmental Consultants, 2021). The selection of these locations was determined using static bat detector data collected by Cambridge Ecology in 2019 and 2020 (Cambridge Ecology, 2020). A threshold of 50 Barbastelle passes over the deployment period was used to determine whether crossing point surveys were required.

- 3.3.3. Two surveys were completed in June 2021 and two further surveys were completed between September and October 2021 at each of the six predetermined crossing point locations. As such, a further two surveys were required at each of these locations to adhere to the DEFRA guidelines (Berthinussen and Altringham, 2015). These additional surveys were undertaken by WSP Ltd in July and August 2022 to ensure a full coverage of the bat activity period (particularly post maternity dispersal flight period that was previously missed). Furthermore, an additional survey was completed at three of the six locations within the May to September survey period to compensate for the surveys completed in October by which is outside of the season in accordance with best practice (Berthinussen and Altringham, 2015).
- 3.3.4. The review of existing survey data and aerial imagery also identified a total 15 additional linear features intersected by the Scheme which were not covered in the 2021 crossing point surveys conducted by Thomson Environmental Consultants. These locations required surveys in line with the DEFRA guidelines. As such, two scoping crossing point surveys at each of these locations were conducted to determine the requirement for whether the additional four surveys were required.
- 3.3.5. Seven of the additional locations are located within the likely Core Sustenance Zone (CSZ) for juvenile Barbastelle bats from Madingley Wood SSSI (a known breeding colony) and as such a full suite of six surveys were conducted in these locations. This was to ensure that they were monitored through the maternity period and ensure that bats emerging from Madingley Wood were detected at the crossing point locations during this period. At crossing point locations outside the CSZ, where more than ten bats were recorded commuting along a linear feature, or 1-5 for rare species (depending on rarity, such as one Barbastelle) a further four surveys were undertaken to make a total of six crossing point surveys per location. The full suite of six survey was not completed at crossing point 13, this was due to high levels of white light pollution from the adjacent street lighting along Cambridge Road and the very low levels of bat activity recorded at this location on the first three surveys.
- 3.3.6. The aim of the surveys was to use visual observation and to use thermal and infrared imagery to determine the direction of flight, flight heights and behaviour of bats in relation to the linear features as well as species and number of bats, with particular consideration for Barbastelle as a rare bat species.
- 3.3.7. Surveys were undertaken for 90 minutes after sunset or for 90 minutes before dawn to survey and record bat activity. Specialist thermal imaging or infra-red equipment was used for these surveys to aid visual identification of flight heights and behaviour.

- 3.3.8. Dates, start and end times, and meteorological data of these surveys are provided in **Table TR5-5-2-1, Annex B**. The survey set-up from west to east, is detailed in **Table TR5-5-3-1**.
- 3.3.9. During each survey the surveyors noted the bat species heard and seen, including the time, location, and where possible gathered commentary on number of bats, behaviour and flight direction. In addition, where bats were observed by the surveyor, approximate height of flight and distance from feature was noted. Flight heights and distance from feature were estimated using predetermined fixed points, where bats were clearly observed. Surveyors were equipped with full spectrum bat detectors (EchoMeter Touch (EMT) Pro and Batlogger M2) to listen to and record bat activity. Calls registered by the bat detectors were recorded for later analysis using specialist computer software Kaleidoscope Pro, details are provided below.
- 3.3.10. As well as bat detectors, surveyors were equipped with a thermal imaging camera (model used was FLIR E95) or an infrared imaging camera (model Canon XA11 Compact Full HD Camcorder) to enable bats to be visualised after dark. Infrared cameras were used in conjunction with high powered infrared lamps to enable sufficient lighting coverage. As part of the analysis, the thermal and infra-red imaging footage was matched with seen/heard bats documented by the surveyor in order to comment on the likely behaviour (i.e., commuting/foraging), direction and height of flight, if not detected in the field.

Data analysis

- 3.3.11. Analysis of crossing point survey data focussed on Barbastelle and any field recordings where data was not able to be recorded in the field.
- 3.3.12. Bat call data recorded on detectors during these surveys were analysed manually by ecologists with experience in bat call analysis. Where both surveyors on a crossing point survey detected and/or recorded a bat species at the same time, this was recorded as a single individual to prevent duplication.
- 3.3.13. During this analysis, all call files (including noise files) were manually checked for Barbastelle. The times of calls were recorded and compared with surveyor notes on bats seen/heard to produce a document of Barbastelle call times and observed activity on each survey occasion.
- 3.3.14. In addition to this, the thermal and infra-red imaging camera footage was analysed by ecologists. The footage was checked at the times when Barbastelle were recorded by surveyors or by the detectors in order to pick up the behaviour of these bats (e.g., commuting/foraging, direction of flight, flight height and distance from feature, if not recorded). Camera footage was also reviewed where data was not recorded in the field (e.g., where height data or numbers were unclear). All sound files were subject to a quality assurance (QA) process.

Table TR5-5-3-1 - Summary of bat crossing point survey locations (relating to Figure TR5-5-1-1, Annex A)

Reference	Location	Feature	Month/year surveyed	Surveyor setup	Location Survey objective
Crossing point 23	The footpath south of Bristol Drive, Cambourne	Public footpath bounded by hedgerow on north and south side.	07/06/2022 21/06/2022	Two surveyors sitting along Scheme alignment approximately 15m away from each other, either side of the hedgerow, bordering the north of the public footpath. Both surveyors facing west and in contact with radio-transmitters.	To determine the nature of use by bats, their height and direction of flight in relation to the hedgerows north and south of the public footpath running east to west south of Bristol Drive, Cambourne.
Crossing point 10	West access road to Bourn Airfield from Broadway.	The treeline along the access track of Bourn Airfield and the hedgerow running along the northwest aspect of Bourn Airfield.	16/06/2022 15/08/2022	Surveyors sitting along Scheme alignment next to each other, one surveyor facing north to monitor bat activity along the hedgerow along north west boundary of Bourn Airfield and one surveyors facing east to monitor bat activity utilising the tree lines along the access track to Bourn Airfield.	To determine the nature of use of the access track tree line and the hedgerow running along the west boundary of Bourn Airfield by bats, and the height and direction of flight.

Reference	Location	Feature	Month/year surveyed	Surveyor setup	Location Survey objective
Crossing point 9	On land south of A428 and north of St Neots Road.	Plantation scrub along the south border of A428 and hedgerow bordering the north of St Neots Road.	31/08/2022 09/08/2022	Surveyors sitting along Scheme alignment, sitting facing west of the tree line feature.	To determine the nature of used of scrub and hedgerows to be intersected by the Scheme, by bats, their height and direction of flight.
Crossing point 22	On land south of A428 and north of St Neots Road, adjacent to Balancing Pond.	Plantation scrub along the south border of A428	16/06/2022 29/06/2022	Two surveyors sitting together south of the Scheme alignment, one looking east and one looking west along Scheme alignment.	To determine the nature of use of scrub bordering the A428 adjacent to the north of Balancing Pond, by bats, their height and direction of flight.
Crossing point 20	Hedgerow along the east of Scotland Road.	Hedgerow.	31/05/2022 30/06/2022	Two surveyors sitting approximately 40m apart, facing towards each other along the hedgerow, one surveyor facing north and one surveyor facing south. Surveyors in contact with radio-transmitters.	To determine the nature of use of the hedgerow by bats. This survey data will be used to inform mitigation design in this location for the proposed access to the park and ride east of Scotland Road.

Reference	Location	Feature	Month/year surveyed	Surveyor setup	Location Survey objective
Crossing point 19	Hedgerow intersection bordering the south of St Neots Road	Hedgerow intersection	30/05/2022 06/07/2022 20/07/2022 02/08/2022 30/08/2022 26/09/2022	Two surveyors sitting approximately 20m away from each other and in contact with radio-transmitter. One surveyor located north of the hedgerow running east to west along St Neots Road, facing east and the other surveyor located south of the hedgerow running east to west of St Neots Road, facing east towards the hedgerows running north to south.	To determine the nature of use of the hedgerow running east to west, south of St Neots Road and the hedgerow running north to south within the agricultural field, to be intersected by the Scheme alignment by bats.
Crossing point 18	Hedgerows either side of along Long Road.	Hedgerows either side of Long Road	23/06/2022 11/07/2022 25/07/2022 10/08/2022 14/09/2022 26/09/2022	Two surveyors sitting either side of the Scheme alignment and either side of Long Road, approximately 40m away from each other, in contact with radio-transmitters.	To determine the nature of use of the hedgerows running north to south, either side of Long Road, which are to be intersected by the Scheme alignment.

Reference	Location	Feature	Month/year surveyed	Surveyor setup	Location Survey objective
Crossing point 17	Hedgerow south of Madingley Road	Hedgerow within agricultural fields running north to south, south of Madingley Road	15/07/2022 21/07/2022 17/08/2022 05/09/2022 21/09/2022	Two surveyors sitting either side of the Scheme approximately 40m away from each other, facing each other and in contact with radio-transmitters.	To determine the nature of use by bats (their flight height and direction) of the hedgerow running north to south, south of Madingley Road which is to be intersected by the Scheme alignment. Secondly to determine potential habitat connectivity between Eversden and Wimpole SAC and Madingley Wood by Barbastelle bats.
Crossing point 6	Ditch south of Madingley Road	Ditch separating agricultural fields running north to south, south of Madingley Road	27/07/2022 03/08/2022 15/08/2022	Two surveyors sitting either side of the Scheme approximately 40m away from each other, facing each other and in contact with radio-transmitters.	To determine the nature of use by bats (their flight height and direction) of the ditch running north to south, south of Madingley Road which is to be intersected by the Scheme alignment. Secondly to determine potential habitat connectivity between Eversden and Wimpole

Reference	Location	Feature	Month/year surveyed	Surveyor setup	Location Survey objective
					SAC by Barbastelle bats and Madingley Woods.
Crossing point 16	Hedgerow south of Madingley Road	Hedgerow within agricultural fields running north west to south east, south of Madingley Road	14/07/2022 25/07/2022 17/08/2022 07/09/2022 21/09/2022 27/09/2022	Two surveyors sitting either side of the hedgerow south of the Scheme alignment (due to access constraints along the Scheme alignment) approximately 15m away from each other, both facing north and in contact with radio-transmitters.	To determine the nature of use by bats (their flight height and direction) of the hedgerow south of Madingley Road which is to be intersected by the Scheme alignment. Secondly to determine potential habitat connectivity between Eversden and Wimpole SAC and Madingley Wood by Barbastelle bats.
Crossing point 15	Hedgerow south of Madingley Road	Hedgerow within agricultural fields running north west to south east, south of Madingley Road	01/08/2022 17/08/2022	Two surveyors sitting either side of the hedgerow south of the Scheme alignment (due to access constraints along the Scheme alignment) approximately 10m away from each other, both facing north and in	To determine the nature of use by bats (their flight height and direction) of the hedgerow south of Madingley Road which is to be intersected by the Scheme alignment. Secondly to determine potential habitat

Reference	Location	Feature	Month/year surveyed	Surveyor setup	Location Survey objective
				contact with radio-transmitters.	connectivity between Eversden and Wimpole SAC and Madingley Wood by Barbastelle bats.
Crossing point 5	Hedgerow south of Madingley Road and north of Coton	Hedgerow within agricultural fields running north west to south east, south of Madingley Road and north of Coton.	14/07/2022 24/08/2022 13/09/2022	Two surveyors west of the of the hedgerow either side of the Scheme alignment approximately 60m away from each other facing towards each other and in contact with radio-transmitters.	To determine the nature of use by bats (their flight height and direction) of the hedgerow south of Madingley Road which is to be intersected by the Scheme alignment. Secondly to determine potential habitat connectivity between Eversden and Wimpole SAC and Madingley Wood by Barbastelle bats.
Crossing point 14	Hedgerow south of Madingley Road and north of Coton	Hedgerow within agricultural fields running north west to south east, south of Madingley Road	30/05/2022 28/06/2022 20/07/2022 02/08/2022 30/08/2022	Two surveyors sitting either side of the hedgerow along the Scheme alignment approximately 40m away from each other facing towards each other and in	To determine the nature of use by bats (their flight height and direction) of the hedgerow south of Madingley Road which is to be intersected by the Scheme alignment.

Reference	Location	Feature	Month/year surveyed	Surveyor setup	Location Survey objective
		and north of Coton.	15/09/2022	contact with radio-transmitters.	Secondly to determine potential habitat connectivity between Eversden and Wimpole SAC and Madingley Wood by Barbastelle bats.
Crossing point 13	Hedgerow along west boundary of Coton Orchard, adjacent to Cambridge Road.	Hedgerow running north east to south west, along west boundary of Coton Orchard.	21/07/2022 08/08/2022 23/08/2022	Two surveyors sitting either side of the hedgerow along the Scheme alignment approximately 40m away from each other facing towards each other and in contact with radio-transmitters.	To determine the nature of use by bats (their flight height and direction) of the hedgerow along the boundary of Coton Orchard which is to be intersected by the Scheme alignment.
Crossing point 4	Hedgerow within Coton Orchard.	Hedgerow running north east to south west, within Coton Orchard.	26/07/2022 08/08/2022	Two surveyors sitting either side of the hedgerow along the Scheme alignment approximately 30m away from each other facing towards each other and in contact with radio-transmitters.	To determine the nature of use by bats (their flight height and direction) of the hedgerow within Coton Orchard which is to be intersected by the Scheme alignment.

Reference	Location	Feature	Month/year surveyed	Surveyor setup	Location Survey objective
Crossing point 3	Hedgerow within Coton Orchard.	Hedgerow running north east to south west, within Coton Orchard.	26/07/2022 04/08/2022	Two surveyors sitting either side of the hedgerow along the Scheme alignment approximately 40m away from each other facing towards each other and in contact with radio-transmitters.	To determine the nature of use by bats (their flight height and direction) of the hedgerow within Coton Orchard which is to be intersected by the Scheme alignment. This survey data will be used to inform mitigation design in this location.
Crossing point 2	Rectory Farm tree line along east boundary of Coton Orchard.	Tree line running north to south, along east boundary of Coton Orchard.	21/07/2022 04/08/2022	Two surveyors sitting east directly adjacent to the east of the tree line, either side of the Scheme alignment approximately 30m away from each other facing towards each other and in contact with radio-transmitters.	To determine the nature of use by bats (their flight height and direction) of the tree line along the boundary of Coton Orchard which is to be intersected by the Proposes Scheme alignment. This survey data will be used to inform mitigation design in this location.

Reference	Location	Feature	Month/year surveyed	Surveyor setup	Location Survey objective
Crossing point 12	Rectory Farm tree line bordering M11 corridor	Tree line along east boundary of Rectory Farm	20/06/2022 07/07/2022	Two surveyors sitting either side of the Scheme alignment to the west of the tree along east boundary Rectory Farm. Surveys located approximately 20m apart facing each other and in contact with use of radio-transmitters.	To determine the nature of use by bats (their flight height and direction) of the tree line along the boundary of Rectory Farm which is to be intersected by the Scheme alignment. This survey data will be used to inform mitigation design in this location.
Crossing point 21	Woodland west of AVEVA Cambridge, adjacent to M11	Woodland strip	07/07/2022 22/06/2022	Two surveyors sitting approximately 100m apart facing each other, either side of the Scheme alignment within the woodland strip. Surveyors in contact with each other through use of radio-transmitters.	To determine the nature of use of the woodland by bats, their flight and direction. This survey data will be used to inform mitigation design in this location.
Crossing point 1	Hedgerow south of Cambridge University Sports Ground	Hedgerow and plantation woodland strip	12/07/2022 18/08/2022 13/09/2022	Two surveyors sitting either side of the hedgerow to be severed by the Scheme Alignment, both facing east toward an intersecting hedgerow and plantation	To determine the use of the hedgerows and plantation woodland strip by bats, including behaviour, height and direction of flight. Survey data will feed into

Reference	Location	Feature	Month/year surveyed	Surveyor setup	Location Survey objective
				woodland. Surveyors sitting approximately 20m apart and in contact with radio-transmitters.	the mitigation design at this location.
Crossing point 11	Bin Brook west of Cambridge University Rugby Union Football Club	Bin Brook	13/06/2022 05/07/2022	Surveyors sitting either side of Bin Brook approximately 50m apart, facing towards each other, either side of the Scheme alignment. Surveyors in contact with use of radio-transmitters.	To determine the nature of use of Bin Brook by bats, their height and direction of flight. This survey data will be used to inform mitigation design in this location.

3.4 Automated Detector Survey

Winter Surveys

- 3.4.1. Automated detector surveys were carried out across the Scheme using static bat detectors (Song Meter 4 (SM4) detectors). The microphones used were multi-directional, however, they were placed pointing along the feature under survey, at a height between 1.5 – 2m.
- 3.4.2. A total of 26 locations were identified along the proposed route which could provide important corridors for commuting and foraging bats. The locations for the winter static bat detectors were based on professional judgement looking at habitat on satellite maps and included the locations which Thomson Environmental Consultants surveyed using summer crossing point surveys in 2021 (Thomson Environmental Consultants, 2021). It should be noted that no previous dedicated winter survey data exists for the Survey Areas.
- 3.4.3. Static detectors were deployed between November 2021 and April 2022 across the length of the Scheme. Detectors were placed within habitat features (hedgerows, woodland, ditches and lines of trees) that were considered suitable for commuting and foraging bats where these features were intersected or impacted by the Scheme.
- 3.4.4. Automated detector locations were surveyed every month between November - April inclusive, for five nights in each month.
- 3.4.5. The automated detectors were set to commence recording at least 30 minutes before sunset and cease recording 30 minutes after sunrise.
- 3.4.6. The locations of the detectors are described in **Table TR5-5-3-2** from east to west and are presented in **Figure TR5-5-1-2, Annex A**. A description of the Scheme layout at these locations is also included for reference.

Table TR5-5-3-2 - Winter Static Detector Locations

Detector Location	Location Description	Scheme Description at Location.
Point 28	Located within woodland along footpath in Cambourne, south of Vickers Way.	The path will be converted into a busway and habitats potentially affected.
Point 19	Located within a line of trees running east to west at the west entrance of Bourn Airfield, off Broadway Road. The detector was located within the south line of trees.	The busway will follow the access track with alterations and lighting added to junctions on Broadway.
Point 18	Located approximately central within hedgerow running east to the west,	The Scheme route will run parallel to the hedgerow.

Detector Location	Location Description	Scheme Description at Location.
	bounding the north of Bourn Airfield and south side of A428.	
Point 23	Located with hedgerow running north to south within a field adjacent to the east of Bourn Airfield.	The Scheme will dissect the hedgerow approximately 35m north and also the connecting hedgerow which runs east to west, approximately 65m north east of Point 23.
Point 17	Located within the east of an area of woodland present between St Neots Road slip way, connecting to A428 and Wellington Way.	The Scheme will intersect the area of woodland, resulting in the removal a small on the east end of the woodland.
Point 24	Located within an area of scrub bordering the south side of the A428, where a boundary hedgerow of cottages north of the roundabout along St Neots Road meets the scrub.	The Scheme route runs in line with the strip of scrub bordering the south of the A428, resulting in the removal of this area of scrub. Mitigation is also planned south of this area.
Point 16	Located within scrub bordering the south of the A428, approximately 640m east of Point 24. A balancing pond is located approximately 50m south of the scrub.	The Scheme route runs in line with the strip of scrub bordering the south of the A428, resulting in the removal of this area of scrub. Mitigation is also planned south of this area.
Point 27	Located within a hedgerow bordering the east of Scotland Road opposite PX Farms, north of the roundabout with the A428. The detector was located within the hedgerow extending north to south, between Scotland Road and an agricultural field.	The proposed access to the Park and Ride east of Scotland Road. This will result in the hedgerow being dissected.
Point 14	Located along south boundary of agricultural field east of Scotland Road and north of A428. The detector is located within hedgerow bounding agricultural field. Scrub is located directly south of the hedgerow, between the hedgerow and A428.	The Park and Ride car park is proposed to be located within the agricultural field north of the hedgerow. Lighting is proposed within the car park.

Detector Location	Location Description	Scheme Description at Location.
Point 15	Located approximately half way within a hedgerow running north to south, along the east boundary of Scotland Road.	A cycle track is proposed to run parallel to this hedgerow.
Point 22	Located within hedgerow bounding west side of agricultural field located south of A428 and St Neots Road, east of Hardwick and Cambridge Road, Hardwick.	This area was initially designated as a construction compound and drainage pond.
Point 21	Located south of St Neots Road, along hedgerow bounding agricultural field, east of houses located between Hardwick and Long Road.	The new busway will diverge from the existing St Neots Road, south, passing through the agricultural field the hedgerow bounds.
Point 13	Located at the hedgerow intersection with a hedgerow running north to south within an agricultural field and a hedgerow running east to west south of south of St Neots Road	The Scheme will diverge from the existing St Neots Road, south, passing through the agricultural field and intersecting the hedgerows.
Point 12	Located within a hedgerow running north to south, bordering the west of Long Road.	The Scheme will intersect the hedgerow, as well as the hedgerow on the opposite side of Long Road, resulting in the removal of a small area of both hedgerows.
Point 11	Located within a ditch running north west to south east between Madingley Road and Coton.	The Scheme will intersect the ditch.
Point 20	Located within a ditch running north west to south east between Madingley Road and Coton, The ditch connected Madingley Wood and Coton.	The Scheme will intersect the ditch. Mitigation is proposed north and south of this area.
Point 10	Located within hedgerow running north west to south east, within agricultural fields south of Madingley Road. The hedgerow is located south east of Madingley Woods.	The Scheme will intersect the hedgerow resulting in removal of a small area of hedgerow.

Detector Location	Location Description	Scheme Description at Location.
Point 9	Located within a hedgerow intersecting agricultural fields north of Coton.	The Scheme will intersect the hedgerow resulting in removal of a small area of hedgerow.
Point 8	Located within hedgerow running north east to south west, on opposite side Cambridge Road, Coton, to west boundary of Coton Orchard.	The Scheme will intersect this hedgerow and the hedgerow directly opposite Cambridge Road, Coton, which bounds the west edge of Coton Orchard.
Point 7	Located with hedgerow running north east to south west, within Coton Orchard.	The Scheme will intersect the hedgerow resulting in the removal of a small area of hedgerow.
Point 6	Located with hedgerow running north east to south west, within Coton Orchard.	The Scheme will intersect the hedgerow resulting in the removal of a small area of hedgerow.
Point 5	Located within a line of trees along the east boundary of Coton Orchard, south of Rectory Farm.	The Scheme will intersect the line of trees, resulting in the removal of a small section of the line of trees, as well as an area of traditional orchard adjacent to the west.
Point 4	Located within a strip of woodland bordering the east of the Rectory Farm, adjacent to the west of the M11.	The Scheme will intersect the woodland, resulting in the removal of a small area of woodland.
Point 3	Located within a strip of woodland bordering the east of the M11.	The Scheme will intersect the woodland, resulting in the removal of a small area of woodland.
Point 2	Located within a hedgerow south of the University Sports Ground. The hedgerow runs east to west, and the detector was located within the hedgerow at the point north of an area of plantation woodland and south of a smaller area of woodland.	The Scheme will cross through the hedgerow and smaller area of woodland north of the hedgerow from the north and will diverge east. This will result in the removal of a section of hedgerow and small area of the woodland.
Point 1	Located within a hedgerow adjacent to Bin Brook, west of the Cambridge University Rugby Union Football Club. The hedgerow borders the brook on both sides, running north to south.	The Scheme will cross over the brook, resulting in the removal of a small section of hedgerow.

Summer Surveys

- 3.4.7. Automated detector surveys were carried out across the Scheme using static bat detectors (Song Meter 4 (SM4) detectors). The microphone attached to the detector were multi-directional, however, they were placed pointing along the feature under survey, at a height between 1.5 – 2m.
- 3.4.8. Ten summer static detectors were deployed across the Scheme. The number of detectors was determined based on gaps within the existing data for the Scheme, collected by Cambridge Ecology in 2019 and 2020 (Cambridge Ecology, 2020), the data of which is considered to still be valid to support the impact assessment for the Scheme in combination with the results within this report. The summer static locations include the proposed site compounds, park and ride, a proposed non-motorised user route along Scotland Road and any linear features (hedgerows and lines of trees) that were not surveyed using static detectors during the Cambridge Ecology surveys in 2019 and 2020 (Cambridge Ecology, 2020).
- 3.4.9. Static detectors were deployed for five nights between April and October 2022 across the length of the Scheme. Detectors were placed within habitat features (such as within Coton Orchard, along hedgerows and within woodland) that were considered suitable for commuting and foraging bats where these features were intersected or impacted by the Scheme. The automated detectors were set to commence recording at least 30 minutes before sunset and cease recording 30 minutes after sunrise.
- 3.4.10. The locations of the detectors are described in **Table TR5-5-3-3** from east to west and are presented in **Figure TR5-5-1-3, Annex A**. A description of the Scheme layout at these locations is also included for reference.

Table TR5-5-3-3 - Summer Static Detector Locations

Detector Location	Location Description	Scheme Description at Location.
Point 28	Located within woodland along footpath in Cambourne, south of Vickers Way.	The path will be converted into a busway and woodland will be lost as part of the Scheme.
Point 27	Located to the east of Scotland Road opposite PX Farms, north of the roundabout with the A428. The detector was located within the hedgerow extending north to south, between Scotland Road and an agricultural field.	The proposed access to the Park and Ride east of Scotland Road.

Detector Location	Location Description	Scheme Description at Location.
Point 14	Located along south boundary of agricultural field east of Scotland Road and north of A428. The detector is located within hedgerow bounding agricultural field. Scrub is located directly south of the hedgerow, between hedgerow and A428.	The Park and Ride car park is proposed to be located within the agricultural field north of the hedgerow.
Point 22	Located within hedgerow bounding west side of agricultural field located south of A428 and St Neots Road, east of Hardwick and Cambridge Road, Hardwick.	This area was proposed for the construction compound and drainage.
Point 21	Located south of St Neots Road, along hedgerow bounding agricultural field, east of houses located between Hardwick and Long Road.	The new busway will diverge from the existing St Neots Road, south, passing through the agricultural field the hedgerow bounds.
Point 13	Located at the hedgerow intersection with a hedgerow running north to south within an agricultural field and a hedgerow running east to west south of south of St Neots Road	The Scheme will diverge from the existing St Neots Road, south, passing through the agricultural field and intersecting the hedgerows
Point 10	Located within hedgerow running north west to south east, within agricultural fields south of Madingley Road. The hedgerow is located south east of Madingley Woods.	The Scheme will intersect the hedgerow.
Point 8	Located within hedgerow running north east to south west, on opposite side Cambridge Road, Coton, to west boundary of Coton Orchard.	The Scheme will intersect this hedgerow and the hedgerow directly opposite Cambridge Road, Coton, which bounds the west edge of Coton Orchard.
Point 7	Located with hedgerow running north east to south west, within Coton Orchard.	The Scheme will intersect the hedgerow.
Point 6	Located with hedgerow running north east to south west, within Coton Orchard.	The Scheme will intersect the hedgerow.

Data Analysis

- 3.4.11. The recordings of bat echolocation calls collected during the surveys were analysed using Kaleidoscope Pro. The analysis enabled confirmation of species or species group based on call parameters, and the relative activity of different species of bats by counting the minimum number of bats recorded within discrete sound files. Once triggered by ultrasound, the SM4 detectors record sound files with a duration of 15 seconds, which may contain a number of individual bat calls (or passes), or discrete groups of ultrasound ‘pulses’. The assessment of relative bat activity between species is based on the relative abundance of recorded calls of each species within each survey period (i.e., each walked transect survey or period of static monitoring per month) and across the combined study period.
- 3.4.12. It should be recognised that a series of separate sound files may represent a series of different bats commuting within the range of an automated detector, or an individual or smaller number of bats foraging up and down a feature repeatedly triggering the detector.
- Where possible, bat calls were identified to species level. However, species of the genus *Myotis* were only identified to genus level as their calls are similar in structure and have overlapping call parameters, making species identification problematic (Russ, 2013).
- 3.4.13. Identification of the genus *Nyctalus* (noctule *Nyctalus noctula* and Leisler’s bat *Nyctalus leisleri*) was based on the following parameters:
- Noctule <20 kHz; and
 - *Nyctalus* spp. (noctule or Leisler’s bat) >20 kHz.
- 3.4.14. The following parameters were used to manually identify *Pipistrellus* species:
- Common pipistrelle *Pipistrellus pipistrellus* ≥42 and ≤50 kHz;
 - Soprano pipistrelle *Pipistrellus pygmaeus* >50 kHz; and
 - Nathusius’ pipistrelle *Pipistrellus nathusii* ≤38 kHz.
- 3.4.15. In addition to these parameters, other distinguishing features of bat calls were used to identify species, including the call structure and social calls.
- 3.4.16. The process for bat call analysis is summarised below:
- Bat calls were run through Kaleidoscope-Pro using the ‘Auto-ID’ function, which classifies the bat calls to species/species groups based on call parameters;
 - Bat calls were then manually checked by ecologists competent in analysing bat calls and experienced in the use of Kaleidoscope software. Where the Auto-ID label was incorrect, the correct species label was manually attributed to the call;
 - Sound files that were identified by the software as ‘No-ID’ were also manually checked and labelled with the correct species or labelled as noise;
 - Each file may contain calls of multiple bat species; however, the Auto-ID function is only capable of labelling one species. This was corrected during manual checks by duplicating the file and labelling each species separately; and

- To allow standardisation and comparison of automated detector survey results the number of bat passes recorded per night (ppn) was used, as explained below (Collins, 2016).

$$\text{Bat ppn} = \frac{\text{Total bat passes recorded at a SM4 location}}{\text{Number of nights SM4 Surveyed}}$$

- 3.4.17. All of the sound files that were labelled as 'Noise' by the Auto-ID classifier within the static data collected between April and July were manually checked. This was necessary to check for quiet species (such as Barbastelle) whose calls are typically missed by the Auto ID classifier. For data collected between August and October, the process for analysing noise files was adapted due to the vast number of noise files caused by invertebrates that were recorded by the detectors in those months. Ten percent of the noise files were manually checked and if more than five percent of the noise files analysed contained bat calls, all of the remaining noise files for that location would then be checked.
- 3.4.18. Noise files consist of any sound which has triggered the detector, but which has not been recognised as a bat call, such as crickets or rustling vegetation etc. Occasional bat calls may be present with these, although these are usually short sections of calls from bats which are likely to have been further away from the detector and therefore less relevant to the habitat feature under survey. Although slightly higher numbers of calls of all species may be recorded if the noise files were analysed, this would not alter the results in terms of habitat features with highest/lowest levels of bat activity.
- 3.4.19. The analysed sound files were subject to a QA process. Ten percent of sound files for each species which were identified were randomly selected for quality assurance checks. This process was completed by a suitably competent analyst experienced in using Kaleidoscope software.

3.5 Dates of Survey and Personnel

- 3.5.1. The dates of each survey type and the credentials of the personnel completing the surveys are provided in **Table TR5-5-3-4** below.

Table TR5-5-3-4 – Survey Dates and Personnel

Survey Type	Dates of survey	Personnel
Bat Activity Surveys		
Automated Detector Surveys	Deployment of automated detectors was undertaken for two periods: Winter and Summer. Winter deployments were conducted between October 2021 – April 2022 inclusive, and Summer deployments were conducted between May 2022 -September 2022 inclusive, unless stated within Section 3.6 .	Detector deployment was undertaken by ecologists experienced in automated detector deployment and collection.
Crossing Point Surveys	Thermal or infra-red imaging crossing point surveys were completed between May and September 2022. For full list of dates, see Table TR5-5-3-1 .	Crossing point surveys were undertaken by surveyors with experience in conducting bat activity surveys.

3.6 Notes and Limitations

- 3.6.1. Every effort has been made to provide a comprehensive set of survey data; however, the following assumptions and limitations apply to the above referenced surveys.

General

- 3.6.2. Best practice indicates that survey data is generally considered valid for up to 18 months (CIEEM, 2019). The data presented in this report enables an evaluation of bat activity within the Survey Area, which in combination with other surveys is intended to inform an Environmental Impact Assessment of the Scheme. Should the planning submission be delayed, further surveys may be required to verify the baseline data remains representative.

- 3.6.3. In some cases, due to issues such as poor weather conditions or access restrictions, the data was not collected in the month intended. Where this happened, the data was collected as early as possible in the following month, and a gap of at least two weeks left before the next data collection.

Crossing Point Surveys

- 3.6.4. Due to the limited field of view of thermal imaging cameras, bats were frequently recorded by bat detectors but not observed by surveyors or recorded by the thermal imaging cameras. It is assumed that these bats were not using the linear feature or habitat subject to the surveys and therefore data collected is still considered valid and not a limitation to the survey.
- 3.6.5. Due to the speed of flight of bats under observation, an estimation of flight height was not possible on all occasions. However, flight heights were able to be estimated for the majority of observations and therefore the data collected is still considered valid and not a limitation to the survey.
- 3.6.6. Five out of six surveys were completed at crossing point 17. This was due to cancellation of surveys due to poor weather and subsequent restrictions with access. This is not considered to be a significant limitation to the data, given that the full six surveys would have been in excess of the DEFRA guidelines and that the threshold for six surveys was not met on either of the five completed surveys i.e in any given of the five surveys 10 bats (or one Barbastelle) were not identified. In addition, the five surveys completed were completed within the maternity season.
- 3.6.7. The CP11 survey in July 2022 and CP14 survey in June 2022 were undertaken in conditions less than 10 degrees Celsius with survey start temperatures being recorded as 9°C and 8°C respectively. The CP11 survey in July recorded a number of bats, and species representative and typical of that location and as such data collected is still considered valid and not a limitation to data interpretation. The CP14 survey on June 2022 had an end temperature of 10°C and was a dawn survey, as such this is considered a sufficient temperature to conduct the survey and therefore the data collection is still considered valid and not a limitation to data interpretation. In addition, the DEFRA guidelines state that survey should be undertaken in temperatures above 7°C, and all surveys were undertaken within this limit.

Automated Winter Detector Surveys

- 3.6.8. April was included within the Winter deployment dataset and analysis. As a result, some bat data may only apply to that one month given increased bat activity in April as the weather gets warmer and bats exit the hibernation period. This may also skew the activity levels of bats within this dataset.
- 3.6.9. Due to access restrictions, it was not possible to deploy winter automated detectors at all locations in every month. **Table TR5-5-3-5** below shows which locations had winter

deployments (in green) by month, and which locations did not have a deployment (in grey) for that month.

Table TR5-5-3-5 – Deployment of Winter Automated Detectors

Location	Month					
	November	December	January	February	March	April
Point 1						
Point 2						
Point 3						
Point 4						
Point 5						
Point 6						
Point 7						
Point 8						
Point 9						
Point 10						
Point 11						
Point 12						
Point 13						
Point 14						
Point 15						
Point 16						
Point 17						
Point 18						
Point 19						
Point 20						
Point 21						
Point 22						
Point 23						
Point 24						
Point 27						
Point 28						

3.6.10. As a result of access restrictions, 42% of the survey effort was not completed during the winter survey months. This is a limitation and therefore caution should be applied when interpreting data for the purposes of the impact assessment for the Scheme.

Automated summer detector surveys

3.6.11. Due to access restrictions, it was not possible to deploy summer automated detectors at Points 6, 7 (Coton Orchard) and Point 27 (Scotland Road) during the months of May and June. However, data collected in remaining months is considered to be representative of the species utilising the features and comparison can be made where necessary to other



locations relative to the Scheme. However, temporal observations between months should not be made for these locations.

4 Desk Study Results

- 4.1.1. The desk study returned 1,111 records of bat activity within 5km of the Scheme boundary, from the last 10 years. The majority of bat activity records were clustered to the west of the Scheme on or around Bourn Airfield, with a further cluster to the south-east of the Scheme, within and south of Cambridge. A further cluster of bat activity records was reported north of the Scheme, around the villages of Longstanton and Northstowe. Records held by local biological centres are generally collected on a voluntary basis or submitted by consultants after surveying for development; therefore, data may be biased towards areas with public access or land proposed for development and may not reflect true distribution of a species.

Barbastelle

- 4.1.2. The desk study returned 42 records of Barbastelle bat activity within 10km of the Scheme, within the last 10 years. The closest record for Barbastelle activity was on Bourn Airfield within the Scheme boundary, on 14.06.2016.
- 4.1.3. The majority of Barbastelle activity was clustered to the west and south-west of the Scheme around Bourn Airfield, with some further records north of the Scheme along the A14.

Common Pipistrelle

- 4.1.4. The desk study returned 477 records of Common Pipistrelle within 5km of the Scheme Boundary, within the last 10 years. The closest records for Common Pipistrelle were on Bourn Airfield within the Scheme boundary, with multiple records across the last decade.
- 4.1.5. There was a further cluster of Common Pipistrelle records directly south of Cambridge around Trumpington. The rest of the Common Pipistrelle records were scattered to the east of the Scheme, across Cambridge, and north of the Scheme along the A14, notably around the villages of Longstanton and Northstowe.

Soprano Pipistrelle

- 4.1.6. The desk study returned 205 records of Soprano Pipistrelle within 5km of the Scheme boundary, within the last 10 years. The closest records for Soprano Pipistrelle were on Bourn Airfield within the Scheme boundary, all recorded in September 2014.
- 4.1.7. There was a further cluster of Soprano Pipistrelle records directly south of Cambridge around Trumpington. The rest of the Soprano Pipistrelle records were scattered to the east of the Scheme across Cambridge, and north of the Scheme along the A14.

Nathusius' Pipistrelle

- 4.1.8. Only three records of Nathusius' Pipistrelle were returned by the desk study within 5km of the Scheme boundary, and within the last 10 years. The closest records for Nathusius' Pipistrelle were to the east of the Scheme within Cambridge from July 2018. One further record was to the south of the Scheme in Trumpington, from September 2016.

***Pipistrellus* sp.**

- 4.1.9. The desk study returned 88 records attributed to *Pipistrellus* sp (undifferentiated pipistrelle species)., within 5km of the Scheme boundary and within the last 10 years. The majority of these records were clustered to the west of the Scheme, some within the Scheme boundary, on and around Bourn Airfield.

***Myotis* sp.**

- 4.1.10. The desk study returned 77 records of *Myotis* sp. within 5km of the Scheme boundary, within the last 10 years. These comprised 13 Natterer's Bat *Myotis nattereri* records, 12 Daubenton's Bat *Myotis daubentonii* records, and the other 52 records were from undifferentiated *Myotis* species.
- 4.1.11. The closest *Myotis* sp. records were within the Scheme boundary at its western extent on and around Bourn Airfield and the A428, from 2015.

Noctule

- 4.1.12. The desk study returned 85 Noctule records within 5km of the Scheme boundary from the last 10 years. The closest records for Noctule were within the Scheme boundary on Bourn Airfield, all from May 2014.
- 4.1.13. Further records were scattered to the east of the Scheme in Cambridge, and to the north of the Scheme along the A14, near the village of Longstanton.

Leisler's Bat

- 4.1.14. The desk study returned one record of Leisler's Bat within 5km of the Scheme boundary, within the last 10 years. This was located to the south-west of the Scheme, in the village of Bourn.

***Nyctalus* sp.**

- 4.1.15. The desk study returned no further *Nyctalus* sp. records within 5km of the Scheme boundary, within the last 10 years.

Brown Long-eared Bat

- 4.1.16. The desk study returned 53 records of Brown Long-eared Bat within 5km of the Scheme boundary, within the last 10 years. The closest record to the Scheme was located to the east of the Scheme, just north of the boundary in Cambridge. Further records were scattered to the east of the Scheme within Cambridge.
- 4.1.17. There was also a large cluster of records to the south-west of the Scheme, on Bourn Airfield but outside of the Scheme boundary.

Serotine

- 4.1.18. The desk study returned 30 records of Serotine within 5km of the Scheme boundary and within the last 10 years. The majority of these records were clustered to the south-east of the Scheme, just outside of the Scheme boundary in Cambridge.
- 4.1.19. Further records were reported to the north of the Scheme, along the A14.

Unidentified Bat species

- 4.1.20. The desk study also returned 49 records of unidentified bat species within 5km of the Scheme boundary, from the last 10 years. The closest records were on Bourn airfield, just south of the Scheme boundary.
- 4.1.21. The rest of these unidentified bat records were scattered widely around the Scheme, with most east of the Scheme in Cambridge, north of the Scheme along the A14 or south of the Scheme in southern Cambridge.

5 Crossing Point Survey Results

5.1 Survey results – overview

- 5.1.1. At least eight bat species were recorded using habitats within the Survey Area during the crossing point surveys. The following species and species groups were confirmed and will be discussed as follows:
- Barbastelle;
 - Common Pipistrelle;
 - Soprano Pipistrelle;
 - *Myotis* species;
 - Noctule;
 - *Nyctalus* species (Noctule or Leisler's Bat);
 - Brown Long-Eared Bat *Plecotus auritus*;
 - Serotine *Eptesicus serotinus*; and
 - Unidentified bat species.
- 5.1.2. The crossing point surveys concluded that four features; CP5, CP16, CP18, CP19, provided commuting habitat for Barbastelle which all recorded a peak of one commuting Barbastelle in any one survey. A total of 17 commuting bats were recorded at CP1. Two of these bats were recorded commuting over the feature in a north/south direction and 15 were recorded commuting east/west.
- 5.1.3. Crossing point locations CP6, CP10 and CP11 recorded no commuting bats, whilst all remaining crossing point locations provided intermittent commuting habitat for species such as Common and Soprano Pipistrelle, with the most commuting passes observed at CP9, recording a peak of six bat commuting.
- 5.1.4. All features recorded low levels of foraging by bats which was generally associated with bats foraging in adjacent habitats.

5.2 Crossing Point 1

- 5.2.1. There were three surveys undertaken for this crossing point location; 12/07/2022, 18/08/2022 and 13/09/2022.
- 5.2.2. Peak activity recorded at this crossing point was on the 12/07/2022, dominated by Common and Soprano Pipistrelle, however Noctule and Brown Long-eared were also recorded. Of the 17 commuting bats identified only two bat passes were considered to be utilising the feature in a north to south direction during this survey, the lowest flying at 3m from the ground. The remaining 15 bats were commuting in an east to west direction. A majority the commuting bats observed during this survey were identified flying over the hedgerow and towards the woodland adjacent to the feature. Six of the 19 foraging bats observed were considered to be utilising the hedgerow, flying west to east and back between 1-5m in height. A total of 38 bats were heard and not seen during this survey.

- 5.2.3. The survey conducted on 18/08/2022 was also dominated by Common and Soprano Pipistrelle bats however Noctule and *Nyctalus* sp. were also identified. These were either heard and not seen or observed or heard foraging. Four bats including two Soprano Pipistrelle bats, one Common Pipistrelle, one *Nyctalus* sp. were observed foraging over the hedgerow 1-5m high.
- 5.2.4. The survey completed on the 13/09/2022 recorded four commuting bat passes, three of which were Common Pipistrelle, and one was Soprano Pipistrelle. All bats were observed commuting and utilising the hedgerow feature between 4-8m from ground. A total of four foraging bats, all Soprano Pipistrelle were observed utilising the hedgerow. All other bats recorded (11) during this survey were heard and not seen and were assumed to not be utilising the habitat feature.
- 5.2.5. Overall, there was a peak of four commuting bats for this feature and no at-risk or rare species.

5.3 Crossing Point 2

- 5.3.1. There were two surveys undertaken for this crossing point location; 21/07/2022 and 04/08/2022.
- 5.3.2. Peak bat activity at this crossing point was recorded on 21/07/2022, recording 30 bat passes, 21 of which were of bats which were heard not seen, a number of which were recorded foraging, likely behind the surveyors. A majority of these were Soprano or Common Pipistrelle, although does include one Noctule, one *Myotis* sp. and two *Nyctalus* sp. Five bats were recorded commuting, with only one Common Pipistrelle observed commuting along the feature. Other commuting bats were observed utilising the adjacent woodland. Three recordings of Common Pipistrelle bats were observed foraging, two of which were observed circling to and from the trees throughout the survey and were considered to be the same bat. The other foraging bat was not considered to be utilising the feature.
- 5.3.3. The survey conducted on 04/08/2022 recorded seven bat passes, five of which were heard and not seen. One Common Pipistrelle was recorded foraging with six passes and one Soprano Pipistrelle was observed commuting but neither were considered to utilise the feature.
- 5.3.4. Overall, there was a peak of five bats observed commuting along this feature. *Myotis* sp. were heard and not seen during the surveys at this crossing point. No at-risk or rare species were recorded at this crossing point.

5.4 Crossing Point 3

- 5.4.1. There were two surveys undertaken for this crossing point location; 26/07/2022 and 04/08/2022.
- 5.4.2. The survey conducted on 26/07/2022 recorded 11 bat passes. Three of these were identified as commuting bats, two Common Pipistrelle not utilising the feature and one

recording was of two Barbastelle foraging near to the hedgerow and over the orchard trees (one later flying south and one flying west), at a height of 2-4m. An additional Barbastelle was recorded flying up and down the field adjacent to the hedgerow foraging 4m or above but was not considered to be using the crossing point feature or commuting. Three further foraging bats were observed during the survey, a Noctule and two Common Pipistrelles. The Noctule was observed flying at a height of 2m, 1m from the hedgerow and was seen dropping towards the hedgerow to forage. The Common Pipistrelles were not considered to be utilising the hedgerow for foraging. Three bat passes of Common and Soprano Pipistrelle were heard and not seen.

- 5.4.3. Peak activity was recorded on 04/08/2022, recording 37 bat calls, 22 of which were heard and not seen including seven Barbastelle passes. A further two Barbastelle passes were recorded foraging but not utilising the hedgerow, and one Barbastelle was observed foraging near the hedgerow at a minimum height of 4m. Five Common Pipistrelle and three Soprano Pipistrelle were observed commuting with only one Soprano Pipistrelle utilising the hedgerow for commuting, a height of 10m. Of the bats recorded, a single recording of two bats were considered utilising this feature. Two Soprano Pipistrelle bats were recorded along the hedgerow at a height of 3-4m, at least 4m from the feature. In addition, a small number of Common and Soprano Pipistrelle bats were recorded crossing over the hedgerow at the crossing point at heights between 2-7m.

5.5 Crossing Point 4

- 5.5.1. There were two surveys undertaken for this crossing point location; 26/07/2022 and 08/08/2022.
- 5.5.2. Peak activity was recorded on the 26/07/2022, recording a total of 32 bats passes, dominated by Common and Soprano Pipistrelle, however, three Barbastelle were also recorded heard and not seen. Two commuting Common Pipistrelle bats were observed. One bat was recorded commuting and foraging at a minimum height of 3m, 6m from the hedgerow and thus not considered to be utilising the hedgerow. The second bat was recorded utilising the hedgerow, commuting south to north along the west side of the hedgerow, at a height of 5m. A total of ten bats were recorded foraging during the survey, with one, a Common Pipistrelle, observed foraging 1m from the hedgerow at a height of at least 3m. A total of 21 bats were recorded heard and not seen, including three Barbastelle.
- 5.5.3. The survey conducted on 08/08/2022 recorded a total of 16 bat passes, also dominated by Common and Soprano Pipistrelle, with one Noctule also recorded. One bat, a Soprano Pipistrelle, observed commuting south to north along the hedgerow at a height of 6m. In addition, nine Common and Soprano Pipistrelle bats were recorded foraging, however none were considered to be using the hedgerow to forage but were mostly observed foraging west of the hedgerow within the orchard. The remaining six recordings were heard and not seen.

- 5.5.4. Overall, a peak of two bats were observed commuting along the feature. Common and Soprano Pipistrelle were observed utilising the hedgerow to commute. No at-risk or rare species were recorded at this crossing point.

5.6 Crossing Point 5

- 5.6.1. There were three surveys undertaken for this crossing point location; 14/07/2022, 28/04/2022 and 13/09/2022.
- 5.6.2. Peak activity was recorded on 14/07/2022, recording a total of 17 bat passes, including two *Nyctalus* sp. commuting south to north 2m above ground, one approximately 2m from the feature. Two Common Pipistrelle were also recorded foraging, one flying back and forth 3m from hedgerow at a height of 5m and one flying above surveyor at a height of 10m. All other bats (13) were heard and not seen.
- 5.6.3. The survey conducted on the 28/04/2022 recorded 16 bat passes, including Common and Soprano Pipistrelle, Barbastelle and *Nyctalus* sp. Two bats were observed commuting, a Barbastelle commuting north-east to south above 4m, over the hedge and the other bat was a Common Pipistrelle recorded commuting north to south 3m from the feature, at a height of less than 2m from the ground at the lowest point. Three Soprano Pipistrelle bats were observed foraging, with one utilising the hedgerow and flying at a height of 5m, 3m from the hedgerow. The other 11 recordings were heard and not seen.
- 5.6.4. A total of ten bat passes were recorded on 13/09/2022. Three Soprano Pipistrelle bats were recorded commuting, with two utilising the feature flying at a height of 3.5m and 4m. Four bats were observed foraging but not utilising the hedgerow, including three Barbastelle and one Common Pipistrelle. Three recordings were heard and not seen.
- 5.6.5. Overall, a peak of no more than two bats were recorded on a single survey utilising the hedgerow to commute. This included two *Nyctalus* sp on the first survey, a Barbastelle and a Common Pipistrelle on the second survey and two Soprano Pipistrelle on the last survey.

5.7 Crossing Point 6

- 5.7.1. There were three surveys undertaken for this crossing point location; 27/07/2022, 03/08/2022 and 15/08/2022.
- 5.7.2. Peak activity was recorded on 27/07/2022. A total of eight bat passes, including Common and Soprano Pipistrelle and a Serotine were recorded. No bats were identified as utilising the ditch; however, three Soprano Pipistrelle were observed foraging and a Serotine was observed commuting during the survey, however it was not utilising the feature for this purpose. All other bat passes were of Common and Soprano Pipistrelle and were heard and not seen.
- 5.7.3. Two Common Pipistrelle and two Soprano Pipistrelle bat passes were recorded on 03/08/2022. The Common Pipistrelle passes were heard and not seen. One Soprano Pipistrelle pass was also heard and not seen and the other was identified as a foraging bat north of the surveyor at a height of 2m. No bats were observed utilising the feature.

- 5.7.4. Six bat passes were recorded during the survey conducted on 15/08/2022. This included a Noctule and *Nyctalus* sp. which were heard and not seen. Three passes of Soprano Pipistrelle were recorded, two were of foraging bats above and within the ditch and one was heard and not seen. One Common Pipistrelle was also recorded foraging up and down the ditch. No bats were observed commuting.
- 5.7.5. Across all the surveys for crossing point 8, no bats were observed utilising this hedgerow for commuting and no at-risk or rare species were recorded at this crossing point. The ditch did provide intermittent foraging habitat for Soprano and Common Pipistrelle.

5.8 Crossing Point 9

- 5.8.1. There were two surveys undertaken for this crossing point location; 31/08/2022 and 09/08/2022.
- 5.8.2. Peak activity, with a total of 12 passes were recorded during the survey on 31/08/2022, six of these were commuting, including three Common Pipistrelle, two Soprano Pipistrelle and one unknown species of bat. The closest and lowest bat was a Common Pipistrelle flying less than 2m from the hedgerow in a north west to east direction, at a height of 2-4m. Four further passes were of Soprano Pipistrelle foraging, with one utilising the feature, and the remaining two passes were heard and not seen.
- 5.8.3. The survey conducted on 09/08/2022 recorded a total of ten passes, including three commuting Common Pipistrelle and three commuting Soprano Pipistrelle. Of which, one Soprano Pipistrelle was observed commuting along the feature, at a height of 2m approximately 3m from the feature. A further two Soprano Pipistrelle and a Noctule were recorded foraging throughout the survey, although only one Soprano Pipistrelle was observed using the feature to forage. One Barbastelle was recorded during this survey, and it was heard and not seen. Two bat passes were heard and not seen.
- 5.8.4. Overall, a peak of six bats were observed commuting along the feature. A Barbastelle was recorded at this crossing point although it was heard and not seen and was therefore considered to not be using the feature.

5.9 Crossing Point 10

- 5.9.1. There were two surveys undertaken for this crossing point location; 16/06/2022 and 15/08/2022..
- 5.9.2. Peak activity with a total of 19 bat passes were recorded on 16/06/2022. A majority (16) were heard and not seen, including Common and Soprano Pipistrelle, Brown Long-eared, Serotine and Noctule. The other three passes were Noctule foraging, not utilising the feature.
- 5.9.3. A total of nine bat passes were recorded on 15/08/2022, eight of which were heard and not seen, dominated by Common Pipistrelle but also included one Barbastelle, Brown Long-eared and *Nyctalus* sp. A Soprano Pipistrelle was observed foraging but not utilising the feature.

- 5.9.4. Overall, no bats were observed commuting along this feature. A Barbastelle was recorded at this crossing point although it was heard and not seen.

5.10 Crossing Point 11

- 5.10.1. There were two surveys undertaken for this crossing point location; 11/06/2022 and 05/07/2022.
- 5.10.2. Peak activity, with a total of 14 bat passes were recorded on 13/06/2022, including six commuting Common and Soprano Pipistrelle, although none were utilising the feature. Four bats, all Soprano Pipistrelle were recorded foraging, with one using the hedgerow, 8m above ground. The remaining four passes were seen and not heard.
- 5.10.3. The survey on 05/07/2022 recorded 12 bat passes, eight of which were seen and not heard. Two commuting bats (a Common Pipistrelle and a Soprano Pipistrelle) and two foraging bats (both Soprano Pipistrelle) were observed using the track running perpendicular to Bin Brook crossing point.
- 5.10.4. Overall, no commuting bats were observed utilising Bin Brook and no at-risk or rare species were recorded at this crossing point.

5.11 Crossing Point 12

- 5.11.1. There were two surveys undertaken for this crossing point location; 20/06/2022 and 07/07/2022.
- 5.11.2. Peak activity with a total of 15 bat passes were recorded on 20/06/2022, including Common and Soprano Pipistrelle, Noctule and Serotine. Twelve of these passes were seen and not heard. The remaining three, including two Noctules and a Soprano Pipistrelle were observed commuting but not utilising the feature.
- 5.11.3. The survey conducted on 07/07/2022 recorded seven bats passes including Soprano Pipistrelle and Noctule. Two Noctules were observed foraging but not utilising the feature and two Soprano Pipistrelles were observed commuting, one of which was recorded commuting along the feature at a height of approximately 6m. The remaining three passes were heard and not seen.
- 5.11.4. Overall, a peak of one bat, a Soprano Pipistrelle was observed commuting along the feature. No at-risk or rare species were recorded at this crossing point.

5.12 Crossing Point 13

- 5.12.1. There were three surveys undertaken for this crossing point location; 21/07/2022, 08/08/2022 and 23/08/2022.
- 5.12.2. The survey conducted on 21/07/2022 recorded five bat passes of Common and Soprano Pipistrelle. Four of these were heard and not seen. A Common Pipistrelle was observed flying across the hedgerow (not utilising the feature) towards Cotton Orchard. High levels of

white street lighting was noted during this survey along Cambridge Road, which was considered likely to deter many bat species along the west side of the habitat feature.

- 5.12.3. Peak activity was recorded on 08/08/2022. A total of ten bat passes, all Common or Soprano Pipistrelles were recorded. Three bats (two Common Pipistrelle and a Soprano Pipistrelle) were observed commuting south to north, at a minimum height of 2m, along the hedgerow. Four bats were observed foraging over Coton Orchard. The remaining three passes were heard and not seen.
- 5.12.4. The survey conducted on 23/08/2022 recorded seven bat passes, all Common or Soprano Pipistrelle. Three of these (two Soprano Pipistrelle and one Common Pipistrelle) were observed commuting north to south, at a height of 2m along the hedgerow. Four bats were seen but not heard foraging.
- 5.12.5. Overall, a peak of three bats were observed commuting along the hedgerow, including Common and Soprano Pipistrelle. No at-risk or rare species were recorded at this crossing point.

5.13 Crossing Point 14

- 5.13.1. There were six surveys undertaken for this crossing point location; 30/05/2022, 28/06/2022, 20/07/2022, 02/08/2022, 30/08/2022 and 15/09/2022.
- 5.13.2. A total of four bat passes were recorded on 30/05/2022, all utilising the hedgerow. A Brown Long-eared bat was observed commuting north to south along the hedgerow at a height of 1.5m. Two Soprano Pipistrelle and Common Pipistrelle were observed foraging at a minimum height of 1.5m above the hedgerow.
- 5.13.3. No bats were recorded during the survey conducted on 28/06/2022.
- 5.13.4. Four bats were observed during the survey conducted on 20/07/2022. This including a commuting Brown Long-eared bat, a Soprano Pipistrelle and Common Pipistrelle, all commuting north to south, utilising the feature, at a minimum height of 1.5m. In addition, a foraging Soprano Pipistrelle was observed.
- 5.13.5. Two Soprano Pipistrelle bats were observed foraging around a gap in the hedgerow on 02/08/2022.
- 5.13.6. A Common Pipistrelle and a Brown Long-eared bat were observed commuting along the hedgerow on 30/08/2022. The Common Pipistrelle was observed flying north to south at a height of 2.5m. The Brown Long-eared was observed commuting and foraging at a minimum height of 1m.
- 5.13.7. A total of four bat passes were recorded on 15/09/2022. This included two Soprano Pipistrelle and one Common Pipistrelle utilising the hedgerow to forage at a minimum height of 1m. A Soprano Pipistrelle was also observed commuting across the hedgerow, west to east.

- 5.13.8. Overall, a peak of three bats were observed commuting along the hedgerow. The hedgerow provided good foraging habitat for common bat species. Brown Long-eared bat (an at-risk species) were regularly observed commuting along this hedgerow, however no rare species were recorded at this crossing point.

5.14 Crossing Point 15

- 5.14.1. There were six surveys undertaken for this crossing point location; 20/07/2022, 01/08/2022, 17/08/2022, 26/08/2022, 07/09/2022 and 20/09/2022.
- 5.14.2. A total of seven bats passes were registered on 20/07/2022. All bats, including five Common Pipistrelle, a Soprano Pipistrelle and a Noctule were recorded foraging. Three of which (two Common Pipistrelle and the Soprano Pipistrelle) were observed foraging over the hedgerow at a height of 2m.
- 5.14.3. A total of eight bat passes were recorded on 01/08/2022, all Common or Soprano Pipistrelle. Of these, three Common Pipistrelle were observed foraging next to the hedgerow at a height of 1m and one Soprano Pipistrelle was observed commuting south to north at a height of 5m along the hedgerow.
- 5.14.4. A peak of 11 bat passes were registered on 17/08/2022, also all Common or Soprano Pipistrelle. Of these, only two were observed utilising the hedgerow; a commuting Soprano Pipistrelle, flying north to south at a height of 3m and a foraging Common Pipistrelle at a height on 4m.
- 5.14.5. A Common and Soprano Pipistrelle were recorded during the survey conducted on 26/08/2022. The Soprano Pipistrelle was observed foraging along the hedgerow at a minimum height of 1m. The Common Pipistrelle was heard and not seen.
- 5.14.6. The survey conducted on 07/09/2022 registered seven bat passes, all Common Pipistrelle. Six of which were utilising and foraging above the hedgerow. An additional bat was heard and not seen.
- 5.14.7. Two Soprano Pipistrelle bats were observed on 20/09/2022, foraging but not utilising the hedgerow.
- 5.14.8. Overall, a peak of one bat was observed commuting along the hedgerow. The hedgerow was used as foraging habitat for Common and Soprano Pipistrelle. No at-risk or rare species were recorded at this crossing point.

5.15 Crossing Point 16

- 5.15.1. There were six surveys undertaken for this crossing point location; 14/07/2022, 25/07/2022, 17/08/2022, 07/09/2022, 21/09/2022 and 27/09/2022.
- 5.15.2. A total of nine bat passes, all Common or Soprano Pipistrelle were observed on 14/07/2022. Three Soprano Pipistrelle bats were observed commuting along the hedgerow at a height of 1m. Two of these were commuting north to south and one south to north.

Three registers were recorded foraging, two of which were observed foraging utilising the hedgerow. The remaining three bat passes were heard and not seen.

- 5.15.3. Six bat passes were registered on 25/07/2022. This included three Soprano Pipistrelle bats foraging above the hedgerow. An unidentified bat species was also recorded foraging but not utilising the feature. A Noctule and a Soprano Pipistrelle were heard and not seen.
- 5.15.4. Two Soprano Pipistrelle and one Common Pipistrelle were observed commuting north to south at a minimum height of 1m along the hedgerow on 17/08/2022. Two further Common Pipistrelle were observed foraging along the hedgerow.
- 5.15.5. A total of 12 bat passes were recorded on 07/09/2022. A Brown Long-eared bat was observed commuting south to north at a height of 1m along the hedgerow. A Barbastelle was observed foraging over the hedgerow at a height of 2m, before commuting north along the hedgerow. A further five Soprano Pipistrelle, three Common Pipistrelle, a Barbastelle and a *Myotis* sp. were also observed foraging during this survey, but not utilising the hedgerow.
- 5.15.6. Peak of activity was recorded on 21/09/2022 with a total of 16 bat passes recorded on 21/09/2022. This included three Soprano Pipistrelle, a Brown Long-eared bat and a Barbastelle commuting at a minimum height of 2m, in both directions along the hedgerow. Five Soprano Pipistrelle and two Common Pipistrelle were also observed utilising the hedgerow, by foraging along or above it during the survey. An additional Common Pipistrelle was observed foraging but not utilising the hedgerow. The other three registers were heard and not seen.
- 5.15.7. A total of five bat passes were recorded during the survey on 27/09/2022. This included one Barbastelle, commuting north to south at a height of 2m along the hedgerow. Two Barbastelle were observed foraging but not utilising the hedgerow. An additional Barbastelle and a Soprano Pipistrelle were heard and not seen.
- 5.15.8. Overall, a peak of five bats, including Barbastelle were observed commuting along the hedgerow. This feature provides foraging habitat for a number of bat species.

5.16 Crossing Point 17

- 5.16.1. There were five surveys undertaken for this crossing point location; 15/07/2022, 21/07/2022, 17/08/2022, 05/09/2022, and 21/09/2022.
- 5.16.2. The survey undertaken on the 15/07/2022 registered ten bat records from two species; Common Pipistrelle and Soprano Pipistrelle. Of these, five were from Common Pipistrelle, all of which were foraging passes. Three of these registrations were for bats using the feature, foraging up and down the hedgerow on the eastern side, at heights of 1.5-2m above the ground. Two of the Common Pipistrelle records were heard and not seen. The other five call registrations from this survey were for Soprano Pipistrelle bats, four of which were foraging along the feature at heights of 1.5-4m, and one record for a commuting bat utilising the feature and travelling north to south at a height of 2m.

- 5.16.3. The survey on the 21/07/2022 registered five bat records from two species: Common Pipistrelle and Soprano Pipistrelle. Only one of three Common Pipistrelle records was seen to be utilising the feature, recorded as commuting along it from north to south. Only one of the two Soprano Pipistrelle records was noted as utilising the feature, commuting along it from north to south.
- 5.16.4. The survey on the 17/08/2022 recorded only two bat records, one Common Pipistrelle and one Soprano Pipistrelle. Both bats were foraging in nearby fields either side of the feature, and therefore were not utilising the feature. Both bats were foraging in circular patterns and at a height of 5-7m above the ground.
- 5.16.5. A total of nine bat records were registered during the survey on the 05/09/2022, from three species; Common Pipistrelle, Soprano Pipistrelle and *Myotis* sp. Of the five Common Pipistrelle records, three were seen to be utilising the feature for foraging at a height of 2-7m above the ground. Two further records were for *Myotis* sp., one of which was seen to be utilising the feature for foraging at a height of 7m above the ground. Two further records were for Soprano Pipistrelle, however these were only heard and not seen.
- 5.16.6. The majority of call registrations were made on the survey undertaken on the 21/09/2022. There were 13 call records on this survey from three species; Common Pipistrelle, Soprano Pipistrelle and Noctule. Of these, five records were for Common Pipistrelle, one for Noctule and seven for Soprano Pipistrelle. Of the seven Soprano Pipistrelle records, three were determined to be utilising the feature for commuting. The bats were seen to be travelling from south to north and vice-versa, at a height of 1.5m above the ground.
- 5.16.7. Overall, a peak of three commuting bats was recorded for this feature, with no at-risk or rare species.

5.17 Crossing Point 18

- 5.17.1. There were six surveys undertaken for this crossing point location; 23/06/2022, 11/07/2022, 25/07/2022, 10/08/2022, 14/09/2022 and 26/09/2022.
- 5.17.2. The survey on the 23/06/2022 registered nine bat records, eight Common Pipistrelle and one Soprano Pipistrelle. Of the eight Common Pipistrelle, two were heard and not seen, but the remaining six were recorded as using the feature, all moving north to south and vice-versa, at a height of 2-4m above the ground. Of these six records, four were for commuting and two for foraging using the feature. The single Soprano Pipistrelle record was for foraging in circular patterns north to south and vice-versa using the feature and an Oak *Quercus* sp. tree just to its east, and at a height of 3m above the ground.
- 5.17.3. The majority of bat records were made on the survey that was undertaken on the 11/07/2022. Four species were recorded on this survey; Common Pipistrelle, Soprano Pipistrelle, Noctule and *Nyctalus* sp. There were 16 call records during this survey, and all were heard and not seen.

- 5.17.4. The survey on the 25/07/2022 registered 14 bat records, from three species; Common Pipistrelle, Soprano Pipistrelle and *Myotis* sp. All but two of these records were heard and not seen. One Common Pipistrelle was recorded commuting using the feature, flying from north to south and at a height of 2.5m above the ground. One *Myotis* sp. was also recorded commuting north to south using the feature at a height of 1.5m above the ground.
- 5.17.5. The survey on the 10/08/2022 registered 11 bat records from three species; Common Pipistrelle, Soprano Pipistrelle and Noctule. Of these 11 records, five were recorded as foraging bats, four of which were using the feature. These four records were for Common and Soprano Pipistrelle, all flying in a south to north direction and between 1.5-2m above the ground.
- 5.17.6. Six records of Soprano Pipistrelle were recorded during the survey. Of these, two were heard and not seen, and four were records for commuting bats. All commuting passes were for bats flying south-east to north and between 2.5-5m above the ground.
- 5.17.7. The survey on the 26/09/2022 registered nine bat records from two species; Soprano Pipistrelle and Barbastelle. There were six Soprano Pipistrelle records, three of which were heard and not seen, two were for foraging passes and one for commuting. Both foraging passes were bats using the feature and flying south-east to north-west and at a height of 1-2m above the ground. The commuting Soprano Pipistrelle was also using the feature and travelling south-east to north and at a height of 2.5m above the ground. The three remaining records on this survey were for Barbastelle, one of which was a foraging pass over the feature from east to west at a height of 3m above the ground, and the other two records were for commuting. These two passes were bats flying south to north over the feature at 4m above the ground.
- 5.17.8. Overall, a peak of four commuting bats was recorded for this feature and multiple at-risk or rare species, including Barbastelle.

5.18 Crossing Point 19

- 5.18.1. There were six surveys undertaken for this crossing point location; 30/05/2022, 06/07/2022, 20/07/2022, 02/08/2022, 30/08/2022 and 26/09/2022.
- 5.18.2. The survey on the 30/05/2022 recorded three species; Common Pipistrelle, Soprano Pipistrelle and *Myotis* sp. Of the five call registrations, three of these were heard not seen and two were for commuting bats, one Common Pipistrelle and one *Myotis* sp., using the feature. The *Myotis* sp. record revealed the bat flying east to west and at a height of 2.5m above the ground.
- 5.18.3. The majority of bat records were made on the survey that was undertaken on the 06/07/2022. Three species were recorded on this survey including three Barbastelle records, ten Common Pipistrelle records and two Soprano Pipistrelle records. There were 15 call records during this survey, and all but one of these registrations were heard not seen. The one record which was seen was for a Common Pipistrelle commuting and using the feature. The bat was flying from west to east and at a height of 1.5m above the ground.

- 5.18.4. The survey on the 20/07/2022 recorded three bat species; Common Pipistrelle, Soprano Pipistrelle and *Nyctalus* sp. There were ten call records during this survey, six of which were seen and noted as commuting. Two of these were for Common Pipistrelle, flying west to east and vice-versa, at 2-3m above the ground, although only one of these registrations was noted to be utilising the feature. One registration was for two *Nyctalus* sp. bats commuting east to west along the hedgerow together, 4m above the ground. The other three registrations were for Soprano Pipistrelle, commuting west to east and south to north using the feature, between 1.5-2m above the ground.
- 5.18.5. The survey conducted on the 02/08/2022 recorded seven registrations, from four species; three Common Pipistrelle, two Soprano Pipistrelle, one Barbastelle and one Noctule. Five of these registrations were heard not seen. However, of the two that were seen for Barbastelle and Soprano Pipistrelle, both were utilising the feature. The Barbastelle was recorded commuting along the feature west to east and at a height of 0.5m above the ground. The Soprano Pipistrelle was recorded foraging along the feature at a height of 2m above the ground in an east to west direction.
- 5.18.6. The survey on the 30/08/2022 recorded 13 registrations from four species; Common Pipistrelle, *Myotis* sp., Noctule and Soprano Pipistrelle. The majority of these records were heard not seen; however, one Common Pipistrelle was seen commuting but not using the feature, and two Soprano Pipistrelle were seen commuting and foraging but not using the feature. All of these records were bats flying at 3m above the ground. There was also one unidentified species of bat which was recorded using the feature for commuting south to north, at 2m above the ground.
- 5.18.7. No bats were recorded on the final survey at this crossing point location on 26/09/2022.
- 5.18.8. Overall, there was a peak of six commuting bats for this feature including at-risk and rare species, Barbastelle. However, the majority of this activity was bats commuting in an east/west direction, rather than north/south direction.

5.19 Crossing Point 20

- 5.19.1. Two surveys were undertaken at this crossing point location, the first on the 31/05/2022 recorded no bat passes, whilst the survey on the 30/06/2022 registered a total of seven bat records, two of which were from Noctule and five from Common Pipistrelle. Of the Common Pipistrelle records, two were seen to be commuting bats utilising the feature, both flying from south-west to north-east, and at a height of 1.5-2m.
- 5.19.2. Overall, there was a peak of two commuting bats for this feature, and no at-risk or rare species.

5.20 Crossing Point 21

- 5.20.1. There were two surveys undertaken for this crossing point location; 07/06/2022 and 22/06/2022.

- 5.20.2. Peak activity recorded at this crossing point was on the 07/06/2022, dominated by Common Pipistrelle with 18 records for this survey. Seven of the Common Pipistrelle records were recorded utilisations of the feature, with five of these records as commuting and two as foraging. The commuting records for Common Pipistrelle showed the bats flying between 1.5-2.5m above the ground and using the track as a flight corridor to fly south to north and vice-versa. The two foraging records showed bats flying at 1.5m above the ground, and with multiple foraging passes noted for each recording. The other species recorded on this survey were Soprano Pipistrelle with two records, and one record for *Nyctalus* sp. One of the Soprano Pipistrelle records was for a foraging bat making 14 passes and flying at 1.5m above the ground whilst using the feature. The remaining bat records on this survey (11) were heard not seen.
- 5.20.3. The survey completed on the 22/06/2022 recorded six bat records, with two records of Common Pipistrelle and four records for Soprano Pipistrelle. All but one of these records was for foraging, with multiple foraging passes made for each record (between four and 35 passes). On all foraging records, the bats were seen foraging 1.5m above the ground using the feature, under the woodland canopy along the footpath clearing that runs north to south. Only one of the records was for commuting; a Soprano Pipistrelle registered as commuting >8m above the ground.
- 5.20.4. Overall, there was a peak of five commuting bats for this feature and no at-risk or rare species. This feature demonstrated good foraging habitat for both Common and Soprano Pipistrelle.

5.21 Crossing Point 22

- 5.21.1. There were two surveys undertaken for this crossing point location; 16/06/2022 and 29/06/2022.
- 5.21.2. Both crossing point surveys at this location documented the same number of bat records, at five each.
- 5.21.3. The survey on 16/06/2022 recorded three bat species; Common Pipistrelle, Soprano Pipistrelle and Noctule, but none were using the feature. One of the Noctule records was for a foraging bat, with 29 foraging passes away from the feature. These 29 passes were observed at a height of 30-60m above the ground (it should be noted that predicting flight height at this height is inherently difficult. Of the remaining bat records, one was observed as a Common Pipistrelle commuting, however this pass was out of the view of the camera and so not observed during analysis. The remaining three bat records, two Noctule and one Soprano Pipistrelle, were recorded as heard not seen.
- 5.21.4. Of the five bat records recorded during the survey completed on the 29/06/2022, two were Common Pipistrelle and three were Noctule. As above, none of these records were considered to be utilising the feature. Two of the Noctule records were commuting bats, flying at >60m above the ground from south to north. The remaining Noctule record was for a foraging bat away from the feature. One Common Pipistrelle record was for a commuting

bat flying at 2m above the ground, but not using the feature. The other Common Pipistrelle record was heard not seen.

- 5.21.5. Overall, there was a peak of three commuting bats at this location, however none using the feature and no at-risk or rare species.

5.22 Crossing Point 23

- 5.22.1. There were two surveys undertaken for this crossing point location; 07/06/2022 and 21/06/2022.
- 5.22.2. Peak activity recorded at this crossing point was on the 07/06/2022, dominated by Common Pipistrelle. The majority (10 of 15) of the bat records noted during this survey were observed by the surveyors, and identified as either foraging or commuting bats, however only eight of these records were considered to be utilising the feature during this survey. All eight utilisations of the feature (hedgerow) were for foraging, and all foraging was south of the feature, with bats flying between 2-4m above the ground. Two of the bat passes observed during this survey were identified as commuting, with bats crossing the feature from the south and heading north-east over the hedgerow and towards the green space adjacent to the feature. Five of the bat passes on this survey were heard not seen.
- 5.22.3. The survey completed on the 21/06/2022 recorded only two bat records, both being Common Pipistrelle. Both records were heard not seen, so comment cannot be made on their use of the feature for this survey, however it is considered unlikely that they were utilising the habitat features for commuting.
- 5.22.4. Overall, there was a peak of two commuting bats for this feature and no at-risk or rare species.

6 Winter Automated Survey Results

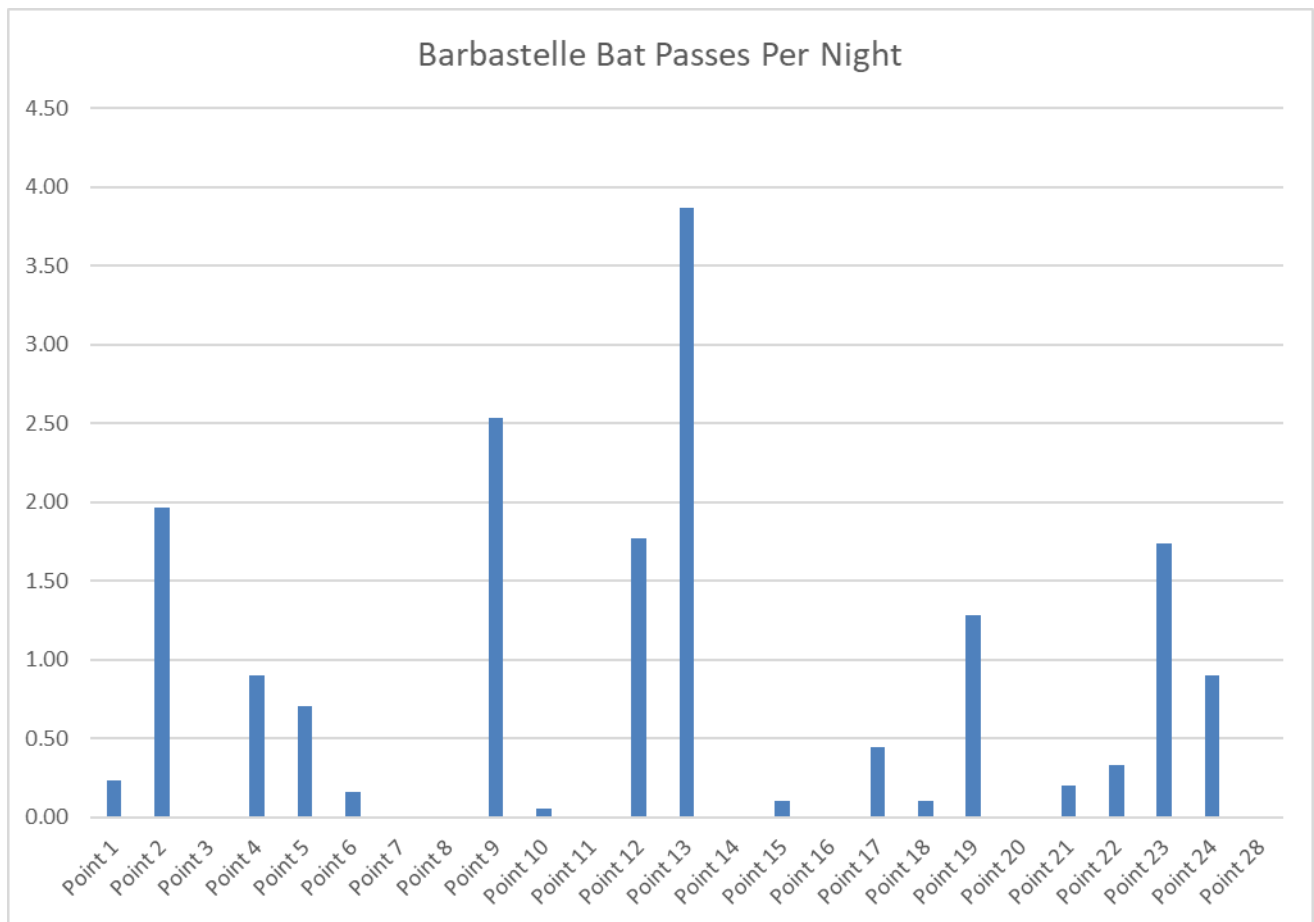
6.1 Survey results - overall

- 6.1.1. At least ten bat species were recorded using habitats within the Survey Area during the winter (November to April) automated bat detector surveys. The following species and species groups were confirmed and will be discussed as follows:
- Barbastelle;
 - Common Pipistrelle;
 - Soprano Pipistrelle;
 - Nathusius' Pipistrelle;
 - *Myotis* species;
 - Noctule;
 - Leisler's Bat
 - *Nyctalus* Bat species (Noctule or Leisler's Bat);
 - Brown Long-eared Bat; and
 - Serotine.
- 6.1.2. The passes per night recorded during the automated detector surveys for each location in each month are shown in **Table TR5-5-2-2, Annex B**.
- 6.1.3. A total of 10,589 call registrations were recorded across the route for the winter deployment period. Of these calls, the most commonly registered species were Common Pipistrelle and Soprano Pipistrelle accounting for 81.51% and 10.63% of total bat passes, respectively. The least registered species was Serotine, accounting for 0.04% of total bat passes.

6.2 Barbastelle

- 6.2.1. Barbastelle activity was recorded across the deployment period at all locations during each month of the survey period within the Survey Area, averaging 0.75ppn, with a peak of activity at Point 13 recording an average of 3.87ppn. Point 9 also had notable Barbastelle activity, with an average of 2.53ppn. Barbastelle activity was noticeably lower at the remaining locations, with no records at Points 3, 7, 8, 11, 14, 16, 20 and 28 and up to 1.97ppn at Point 2.
- 6.2.2. The graph showing average Barbastelle ppn by location is shown on **Figure TR5-5-6-1**.

Figure TR5-5-6-1 - Barbastelle Passes Per Night by Location

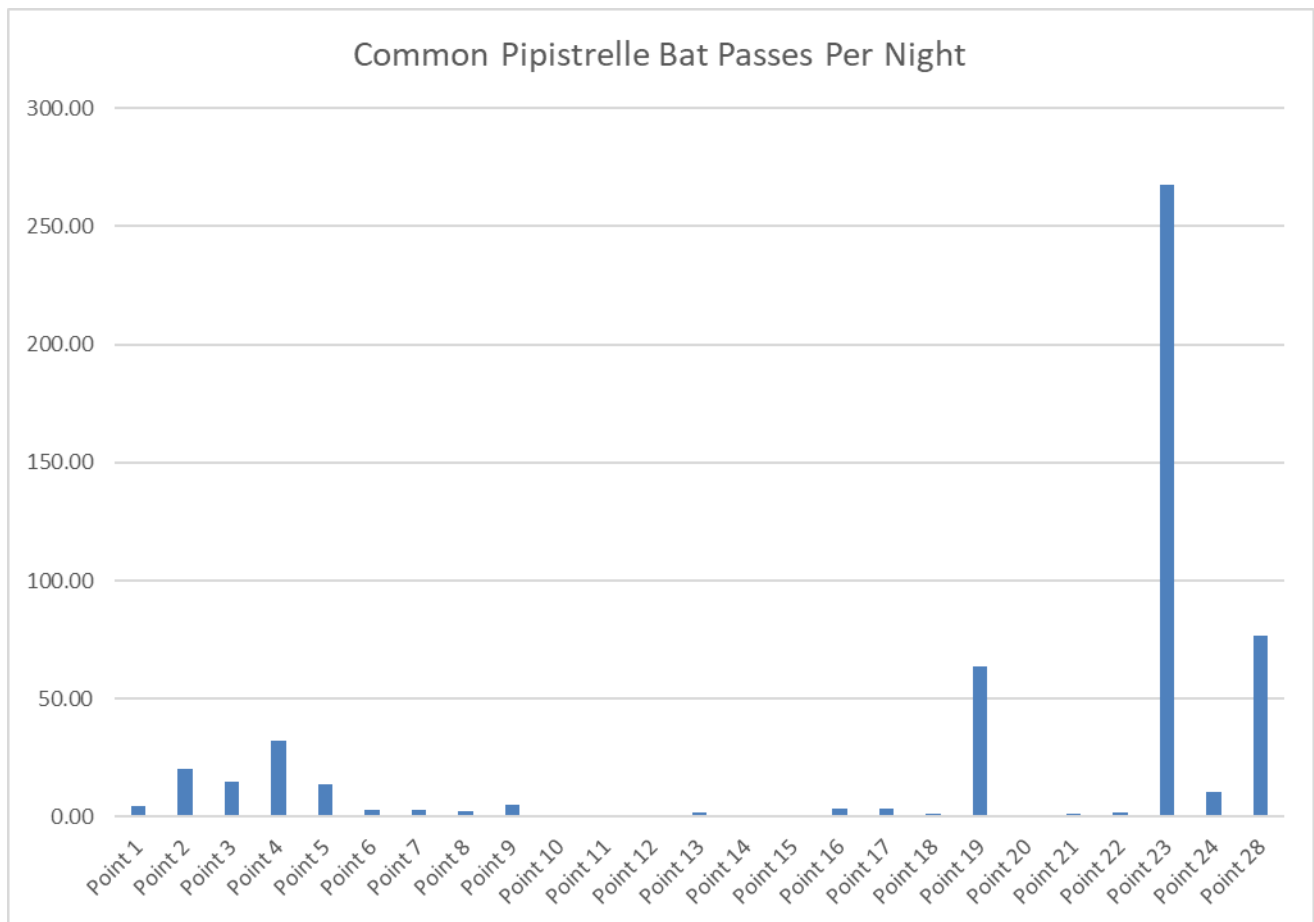


- 6.2.3. Point 13 recorded the highest peak of Barbastelle activity of all the detectors, recording a peak of 11.60ppn in April. There was no activity at this location in the remaining months, with 0.00ppn for December and February.
- 6.2.4. The next highest peak in Barbastelle activity across all detectors was at Point 9, with a peak in activity during March at 7.4ppn. For the remaining Winter months, activity at this point remained relatively low, ranging from 0.00ppn in November, to 0.20ppn in January.

6.3 Common Pipistrelle

- 6.3.1. Common Pipistrelle activity across the deployment period at all locations across all Winter months within the Survey Area averaged 18.76ppn, with a peak of activity at Point 23 recording an average of 267.33ppn. Points 28 and 19 also had notable Common Pipistrelle activity, with an average of 76.40ppn and 63.72ppn, respectively. Common Pipistrelle activity was noticeably lower at the majority of remaining locations, ranging from an average of 0.00ppn at Points 10, 11, 12, 14, 15, 16, 17, 18, 20, and 21, up to 32.40ppn at Point 4.
- 6.3.2. The graph showing average Common Pipistrelle ppn by location per month is shown on **Figure TR5-5-6-2**.

Figure TR5-5-6-2 - Common Pipistrelle Passes Per Night by Location

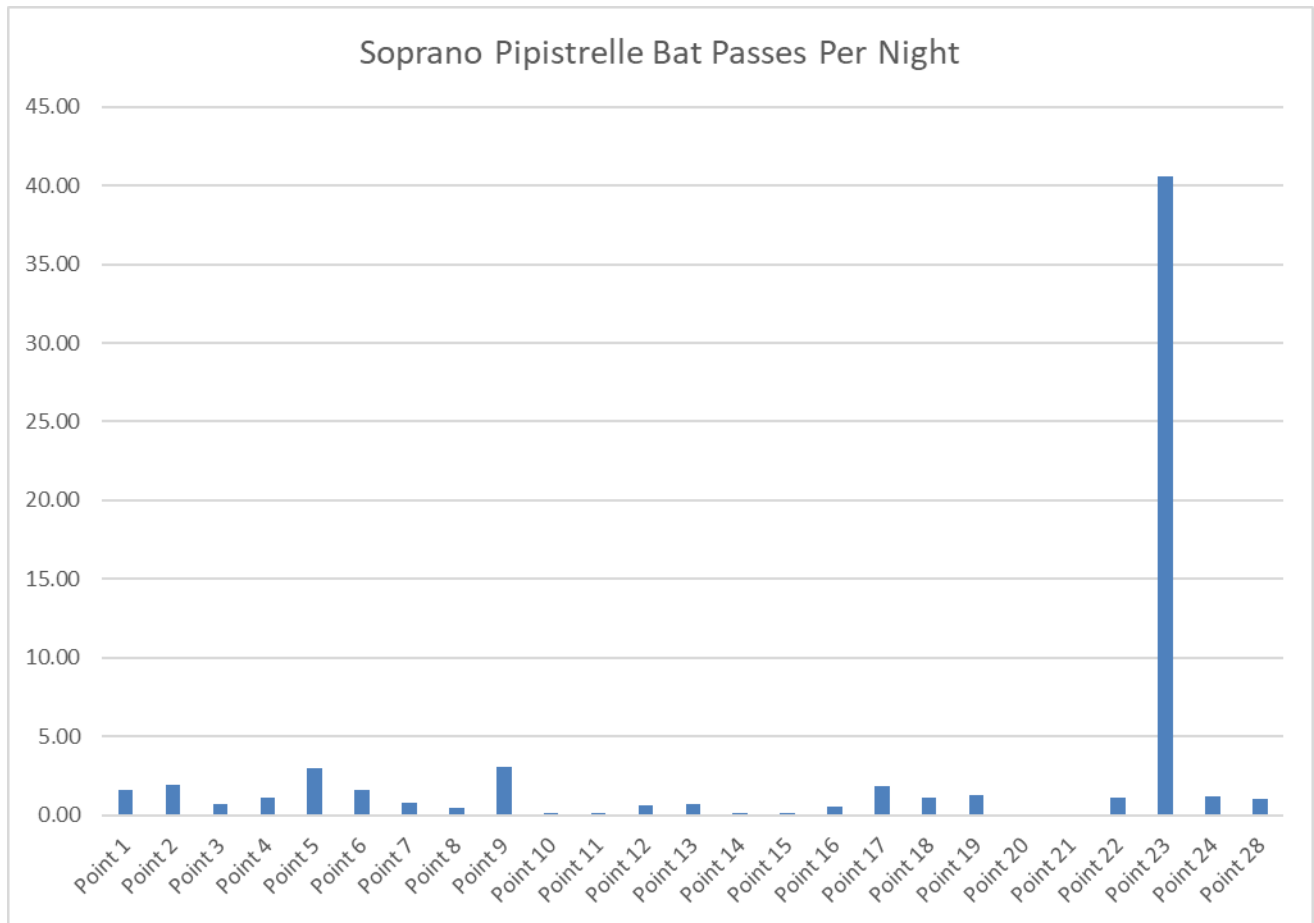


- 6.3.3. Point 23 recorded the highest peak of Common Pipistrelle activity of all the detectors, recording a peak of 802.00ppn in April. There was no Common Pipistrelle activity at this point for the remaining months detectors were deployed at this location, with 0.00ppn for February and March.
- 6.3.4. The next highest peak in Common Pipistrelle activity across all detectors was at Point 28, with a peak in activity during April at 76.40ppn. Detectors were not put out at this location in any of the other Winter months, as Point 28 was a late addition to the survey effort.

6.4 Soprano Pipistrelle

- 6.4.1. Soprano Pipistrelle activity across the deployment period at all locations within the Survey Area was an average of 2.45ppn, with a peak of activity at Point 23 recording an average of 40.53ppn. Points 9 and 5 also registered notable Soprano Pipistrelle activity, with an average of 3.07ppn and 3.00ppn, respectively. Soprano Pipistrelle activity remained low at the remaining locations, ranging from 0.00ppn for Points 10, 11, 14, 15, 20 and 21, up to 1.93ppn at Point 2.
- 6.4.2. The graph showing average Soprano Pipistrelle ppn per location is shown on **Figure TR5-5-6-3**.

Figure TR5-5-6-3 – Soprano Pipistrelle Passes Per Night by Location



6.4.3. Point 23 recorded the highest peak of activity of all the detectors, recording a peak of 120.80ppn in April. Activity at this point was notably lower for the other months detectors were deployed at this location with 0.00ppn in February to 0.40ppn in March.

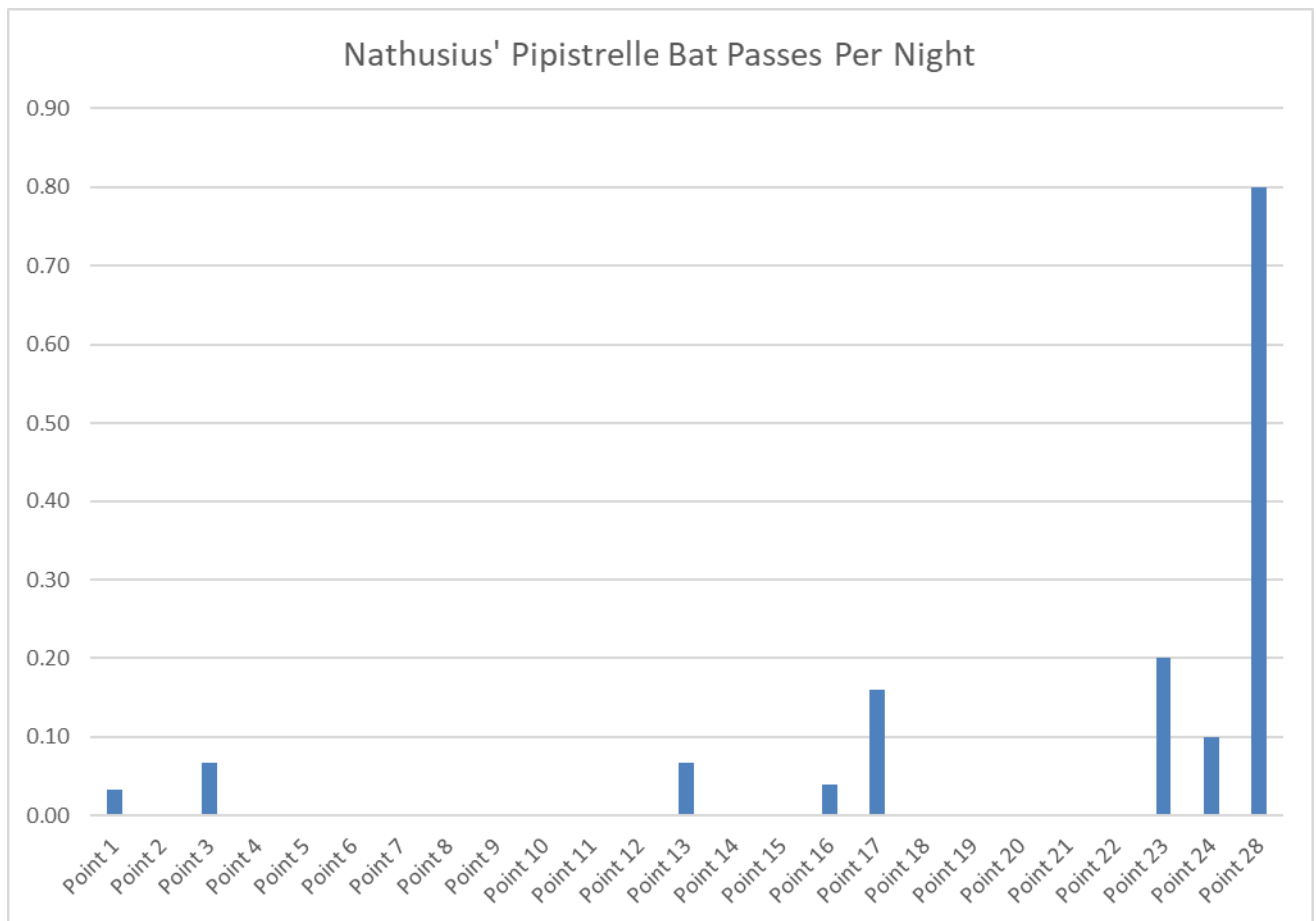
6.4.4. Point 9 recorded the second highest level of Soprano Pipistrelle activity, with a peak of 9.00ppn in March. Activity was much lower for the remaining Winter months, from 0.00ppn in January, up to 0.20ppn in November.

6.5 Nathusius’ Pipistrelle

6.5.1. Nathusius’ Pipistrelle activity across the deployment period at all locations across all Winter months within the Survey Area averaged 0.03ppn, with a peak of activity at Point 28 recording an average of 0.80ppn. Point 23 had the second highest Nathusius’ Pipistrelle activity level at 0.20ppn. Nathusius’ Pipistrelle activity was noticeably lower at the remaining locations, ranging from an average of 0.00ppn at Points 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 18, 19, 20, 21 and 22, to 0.16ppn at Point 17.

6.5.2. The graph showing average Nathusius’ Pipistrelle ppn by location per month is shown on **Figure TR5-5-6-4.**

Figure TR5-5-6-4 - Nathusius' Pipistrelle Passes Per Night by Location

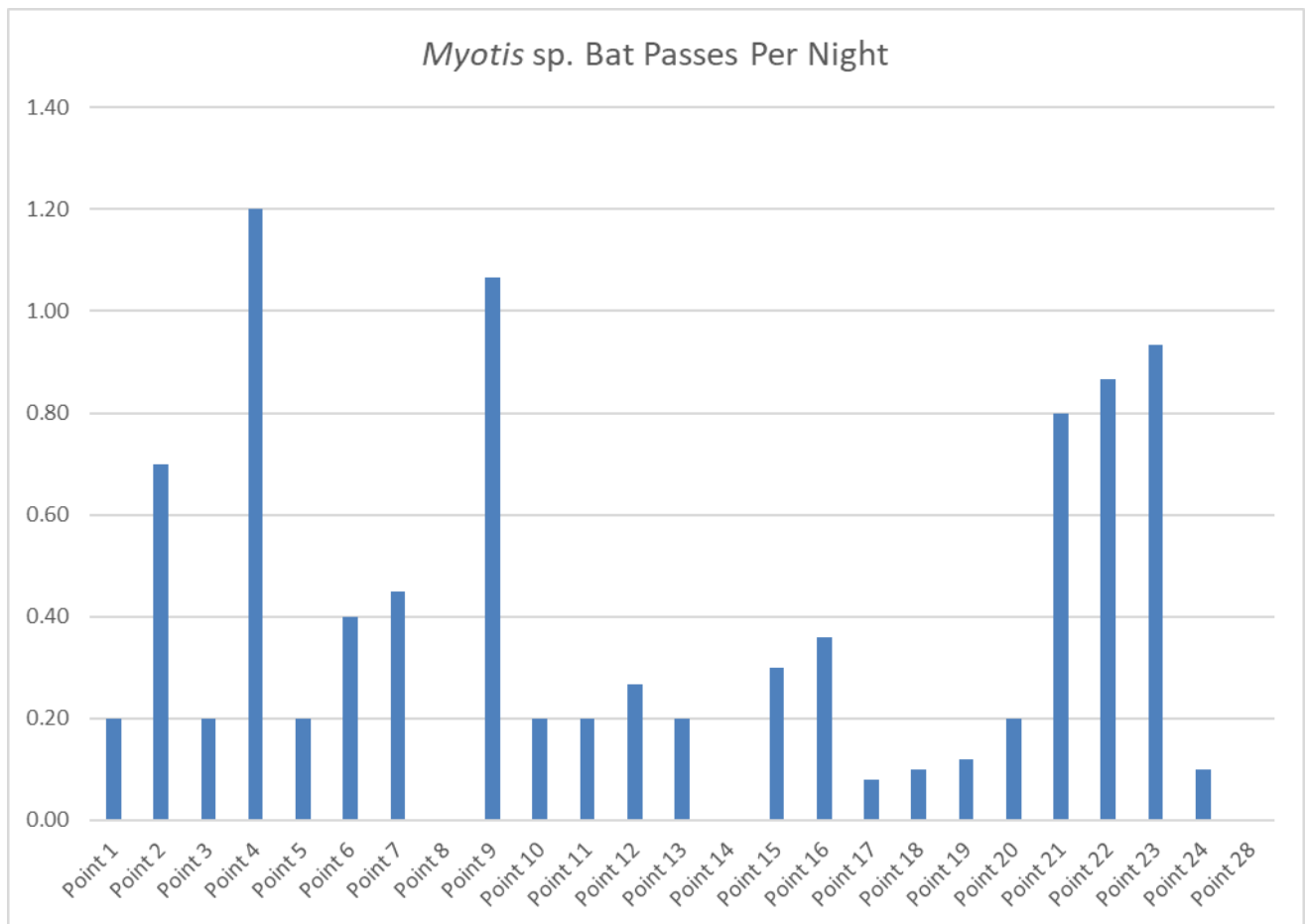


- 6.5.3. Point 28 recorded the highest levels of Nathusius' Pipistrelle activity, with a peak of 0.80ppn in April. Detectors were not put out at this location in any of the other winter months, as Point 28 was a late addition to the survey effort.
- 6.5.4. Point 23 recorded the second highest peak of activity of all the detectors, recording a peak of 0.60ppn in April. Activity at this point was notably lower for the other months a detector was deployed at this location, at 0.00ppn in February and March.

6.6 *Myotis* species

- 6.6.1. *Myotis* sp. activity across the deployment period at all locations across all Winter months within the Survey Area averaged 0.37ppn, with a peak of activity at Point 4 recording an average of 1.20ppn. Point 9 also had notable *Myotis* sp. activity, with an average of 1.07ppn. *Myotis* sp. activity was lower at the remaining locations, ranging from an average of 0.00ppn at Points 8, 14 and 28, to and to 0.93ppn at Point 23.
- 6.6.2. The graph showing average *Myotis* sp. ppn by location per month is shown on **Figure TR5-5-6-5**.

Figure TR5-5-6-5 - *Myotis* sp. Passes Per Night by Location

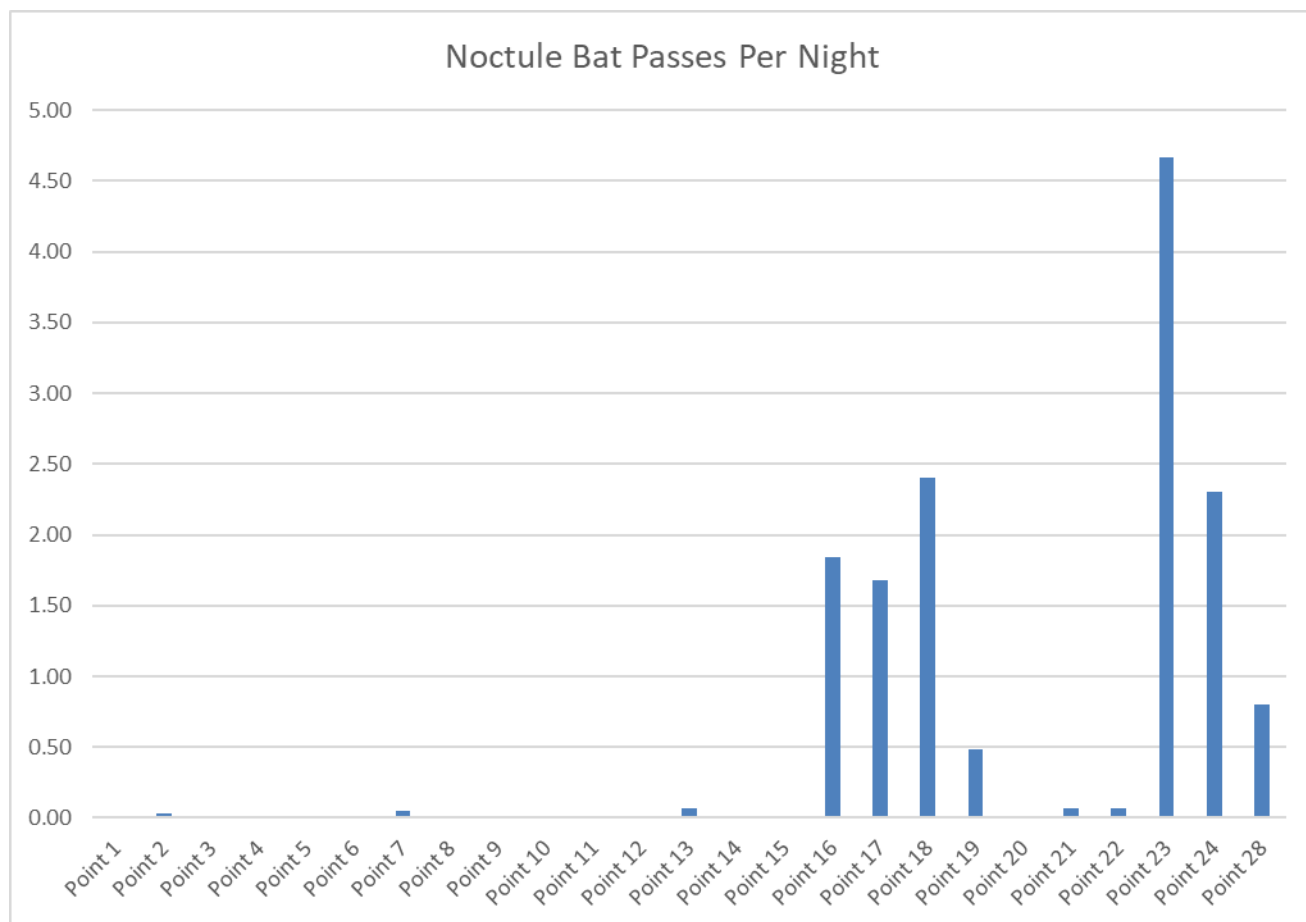


- 6.6.3. Point 4 recorded the highest peak of activity of all the detectors, recording a peak of 3.40ppn in March. Activity at this point for the remaining months was low, with the lowest average passes per night in January, at 0.20ppn, up to 0.80ppn in April. A detector was not placed here during any other months of the survey period.
- 6.6.4. The next highest peak in *Myotis* sp. activity across all detectors was at Point 9, with a peak in activity during March at 2.60ppn. For the remaining winter months when a detector was deployed at this location (November and January), activity at this point remained much lower, ranging from 0.00ppn in November, up to 0.60ppn in January.

6.7 Noctule

- 6.7.1. Noctule activity across the deployment period at all locations across all Winter months within the Survey Area averaged 0.49ppn, with a peak of activity at Point 23 recording an average of 4.67ppn. Point 18 also had notable Noctule activity, with an average of 2.40ppn. Noctule activity was lower at the remaining locations, ranging from an average of 0.00ppn at Points 1, 3, 4, 5, 6, 8, 9, 10, 11, 12, 14, 15, and 20, to 2.30ppn at Point 24.
- 6.7.2. The graph showing average Noctule ppn by location per month is shown on **Figure TR5-5-6-6**.

Figure TR5-5-6-6 - Noctule Passes Per Night by Location

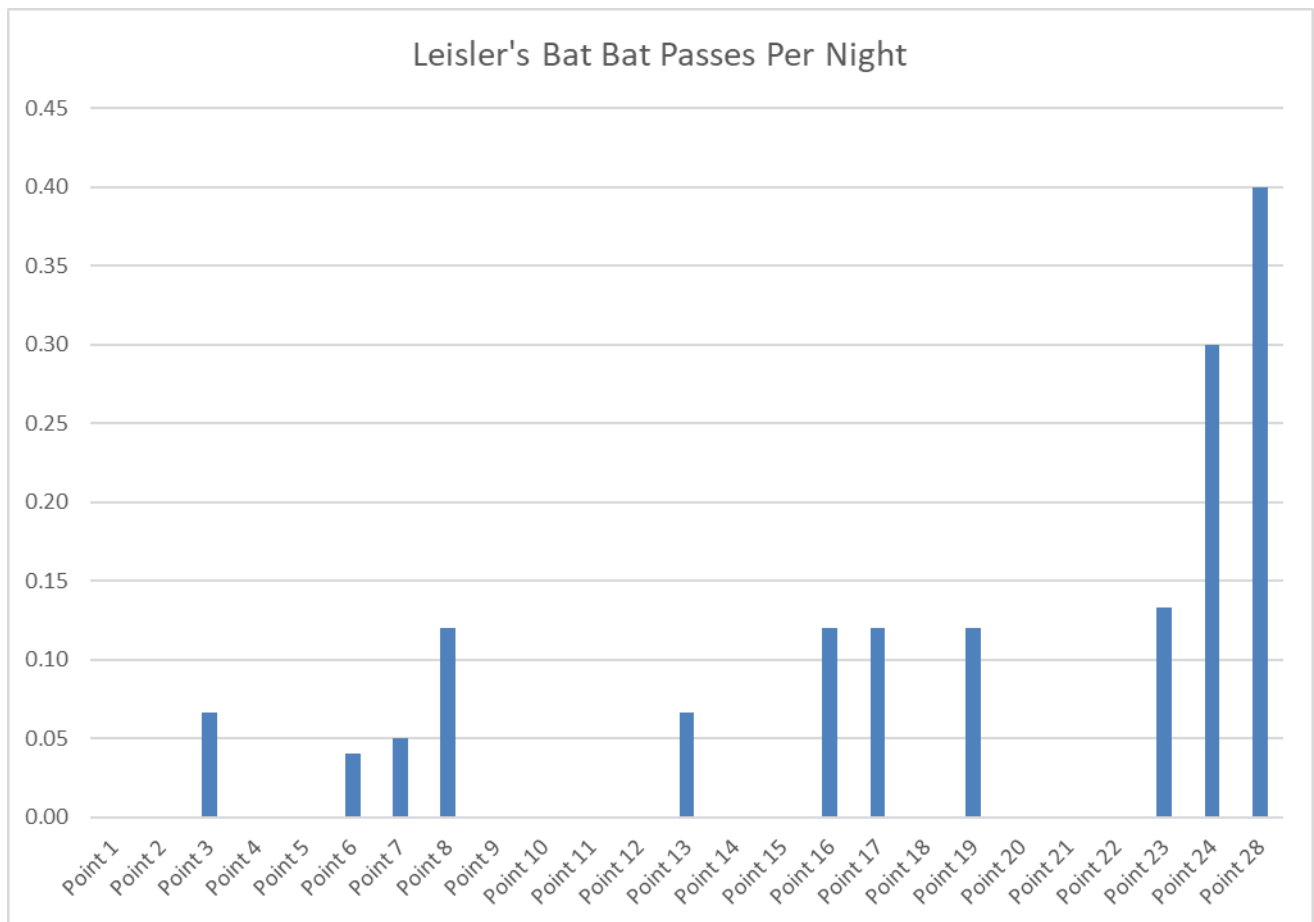


- 6.7.3. Point 23 recorded the highest peak of activity of all the detectors, recording a peak of 14.00ppn in April. There was no Noctule activity at this point for the remaining months, at 0.00ppn in February and March, which were the only other months detectors were deployed at this location.
- 6.7.4. The next highest peak in Noctule activity across all detectors was at Point 18, with a peak in activity during April at 4.80ppn. A detector was only placed at this location in one other month, March, for which there was no Noctule activity recorded at 0.00ppn.

6.8 Leisler's Bat

- 6.8.1. Leisler's Bat activity across the deployment period at all locations across all Winter months within the Survey Area averaged 0.05ppn, with a peak of activity at Point 28 recording an average of 0.40ppn. Point 24 followed with the next highest activity levels for Leisler's Bat activity, with an average of 0.30ppn. Leisler's Bat activity was lower at the remaining locations, ranging from an average of 0.00ppn at Points 1, 2, 4, 5, 9, 10, 11, 12, 14, 15, 18, 20, 21 and 22, up to 0.13ppn at Point 23.
- 6.8.2. The graph showing average Leisler's Bat ppn by location per month is shown on **Figure TR5-5-6-7**.

Figure TR5-5-6-7 - Leisler's Bat Passes Per Night by Location



6.8.3. Point 28 recorded the highest peak of Leisler's Bat activity of all the detectors, recording a peak of 0.40ppn in April. Detectors were not put out at this location in any of the other Winter months, as Point 28 was a late addition to the survey effort.

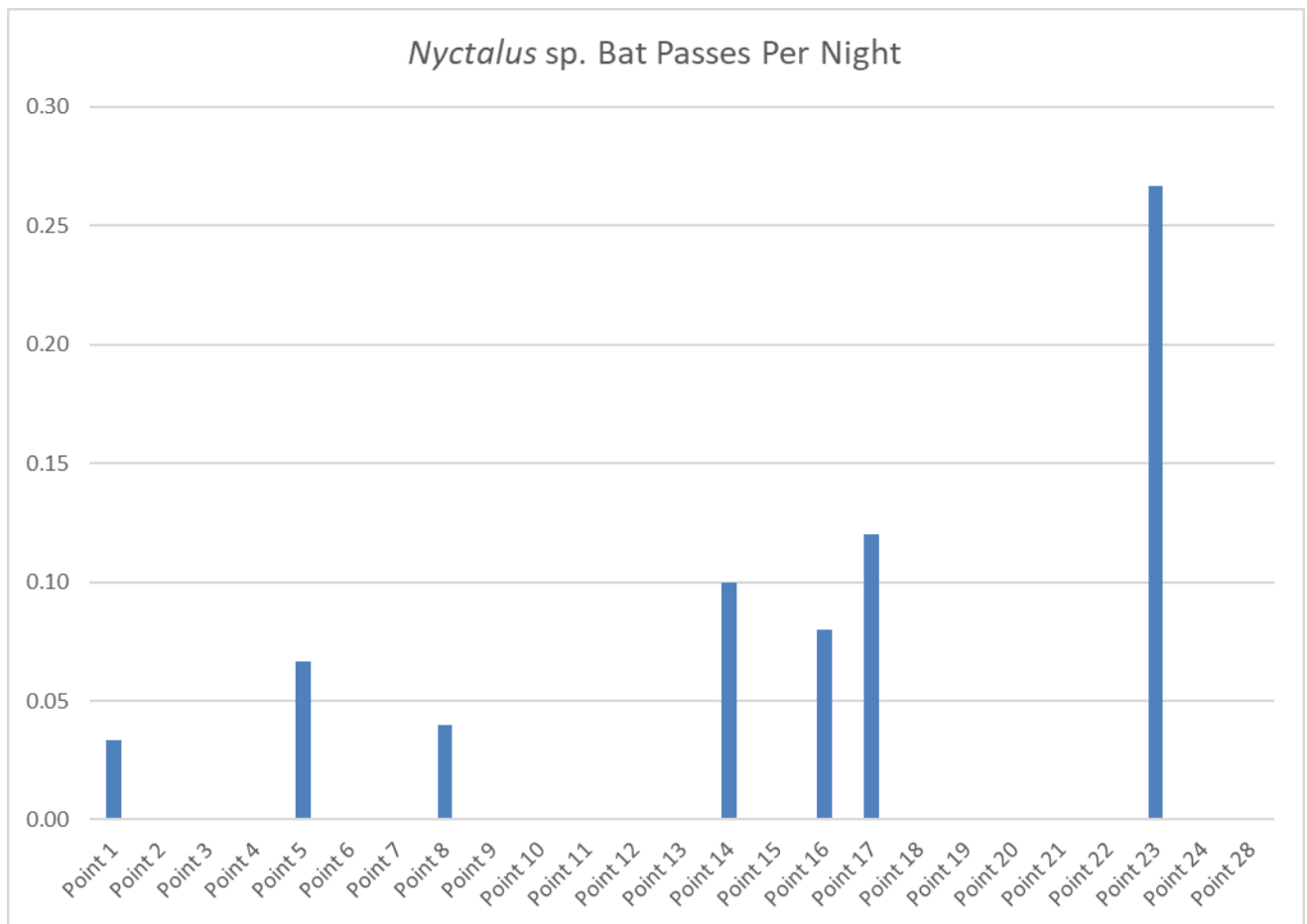
6.8.4. The next highest peak in Leisler's Bat activity across all detectors was at Point 24, with a peak in activity during April at 0.60ppn. A detector was only placed at this location in one other month, March, for which there was no Leisler's bat activity recorded at 0.00ppn.

6.9 *Nyctalus* species

6.9.1. *Nyctalus* sp. activity across the deployment period at all locations across all Winter months within the Survey Area averaged 0.03ppn, with a peak of activity at Point 23 recording an average of 0.27ppn. Point 17 followed with the next highest activity levels for *Nyctalus* sp. activity, with an average of 0.12ppn. *Nyctalus* sp. activity was lower at the remaining locations, ranging from an average of 0.00ppn at Points 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 15, 18, 19, 20, 21, 22, 24 and 28, up to 0.10ppn at Point 14.

6.9.2. The graph showing average *Nyctalus* sp. ppn by location per month is shown on **Figure TR5-5-6-8**.

Figure TR5-5-6-8 – *Nyctalus* sp. Bat Passes Per Night by Location



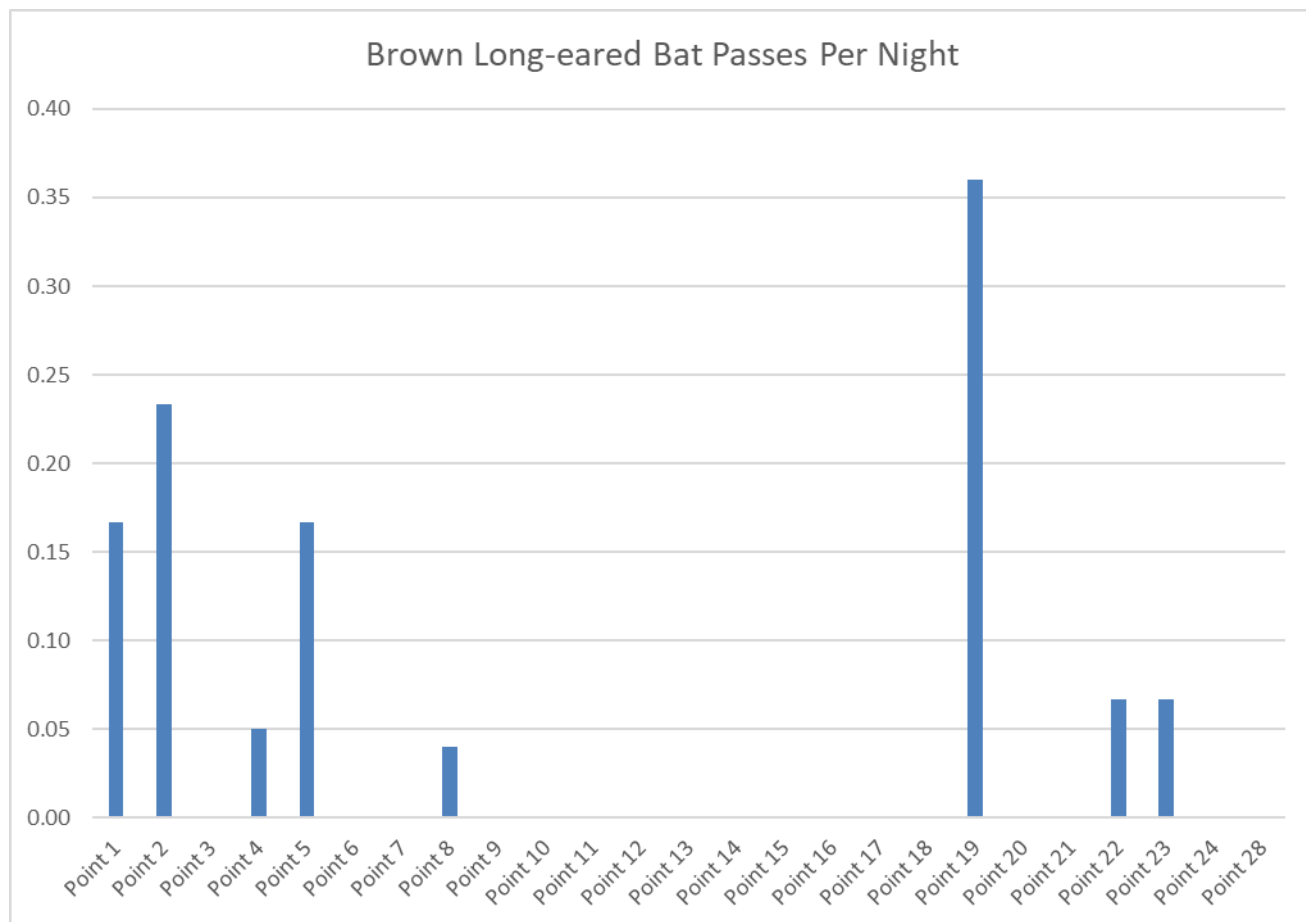
- 6.9.3. Point 23 recorded the highest peak of *Nyctalus* sp. Activity of all the detectors, recording a peak of 0.80ppn in April. It should be noted that detectors were not deployed in November, December or January at this location. There was no *Nyctalus* sp. Activity at this point for the remaining months, at 0.00ppn in February and March.
- 6.9.4. The next highest peak in *Nyctalus* sp. Activity across all detectors was at Point 17 (where detectors were deployed five of the six-month survey period), with a peak in activity during November, February and April, all at 0.20ppn. Activity was lower for the remaining months, at 0.00ppn for December and March.

6.10 Brown Long-eared Bat

- 6.10.1. Brown Long-eared Bat activity across the deployment period at all locations across all winter months within the Survey Area averaged 0.07ppn, with a peak of activity at Point 19 recording an average of 0.36ppn. Point 2 followed with the next highest activity levels for Brown Long-eared Bat activity, with an average of 0.23ppn. Brown Long-eared Bat activity was lower at the remaining locations, ranging from an average of 0.00ppn at Points 3, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 24 and 28, up to 0.17ppn at Point 5.

6.10.2. The graph showing average Brown Long-eared ppn by location per month is shown on **Figure TR5-5-6-9**.

Figure TR5-5-6-9 - Brown Long-eared Bat Passes Per Night by Location



6.10.3. Point 19 recorded the highest peak of Brown Long-eared Bat activity of all the detectors (where detectors were deployed for five of the six-month survey period), recording a peak of 1.2ppn in April. Brown Long-eared Bat activity was lower at this point for the remaining months, at 0.00ppn in November, January and March, up to 0.20ppn in March.

6.10.4. The next highest peak in Brown Long-eared Bat activity across all detectors was at Point 2 (where detectors were deployed for all six months of the survey period) with a peak in activity during April at 0.80ppn. Activity was lower for the remaining months, at 0.00ppn in November, December, January and February, up to 0.60ppn in March.

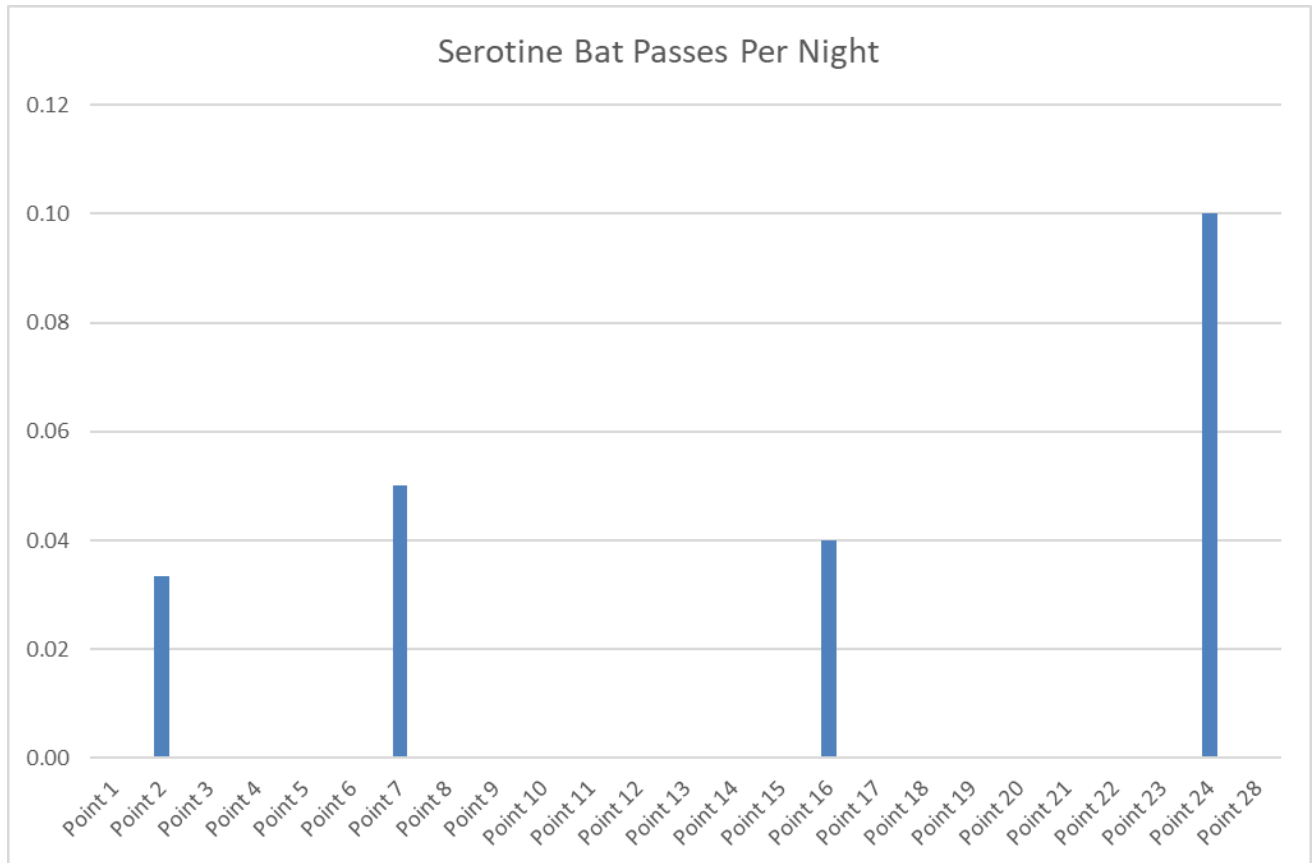
6.11 Serotine

6.11.1. Serotine activity across the deployment period at all locations across all winter months within the Survey Area averaged 0.01ppn, with a peak of activity at Point 24 recording an

average of 0.01ppn. Points 2, 7 and 16 were the only other locations where Serotine were recorded across the Survey Area.

6.11.2. The graph showing average Serotine ppn by location per month is presented in **Figure TR5-5-6-10 - Serotine Bat Passes Per Night by Location**.

Figure TR5-5-6-10 - Serotine Bat Passes Per Night by Location



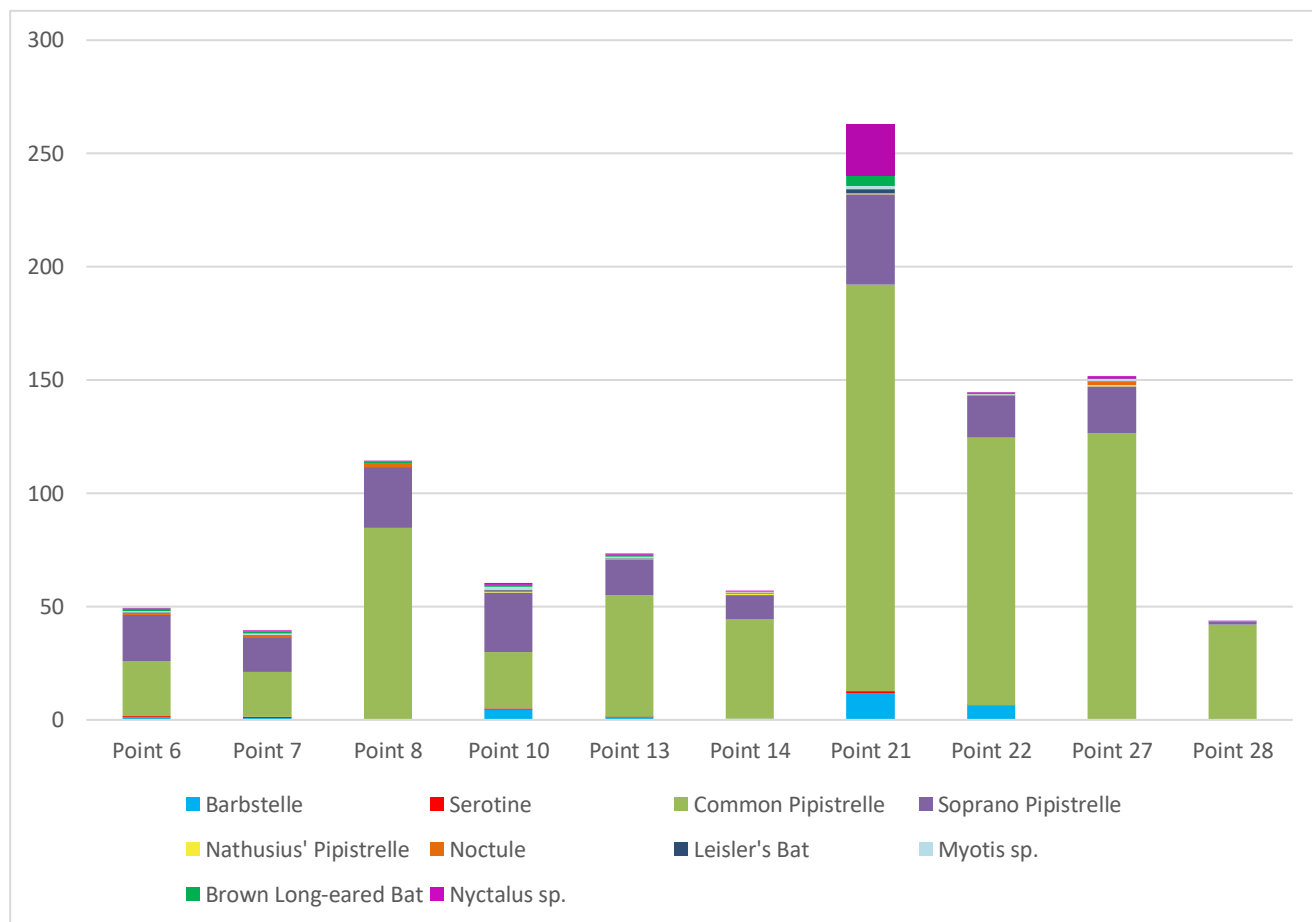
6.11.3. Point 24 had detectors deployed in March and April and only recorded one Serotine pass was recorded at Point 24, in April. Only one Serotine pass was recorded at Point 2 (where detectors were deployed every month of the survey period, in November), Point 7 (where detectors were deployed for four of the six-month survey period) and Point 16 (where detectors were deployed for five of the six-month survey period).

7 Summer Automated Survey Results

7.1 Survey Results Overview

- 7.1.1. At least ten bat species were recorded using habitats within the Survey Area during the summer automated bat detector surveys. The following species and species groups were confirmed and will be discussed as follows:
- Barbastelle;
 - Common Pipistrelle;
 - Soprano Pipistrelle;
 - Nathusius' Pipistrelle;
 - *Myotis* species;
 - Noctule;
 - Leisler's Bat;
 - *Nyctalus* species (Noctule or Leisler's bat);
 - Brown Long-eared Bat; and
 - Serotine.
- 7.1.2. The passes per night recorded during the automated detector surveys for each location in each month are shown in **Table TR5-5-2-3, Annex B**.
- 7.1.3. A total of 32,446 call registrations were recorded across the route for the summer deployment period. Of these calls, the most commonly registered species were Common Pipistrelle and Soprano Pipistrelle accounting for 71.89% and 19.22% of all total bat passes respectively. Barbastelle accounted for 2.91%, with most of those recorded at Point 21.
- 7.1.4. **Figure TR5-5-7-1** summarises the levels of activity for each species of bat per location across the summer deployment period.

Figure TR5-5-7-1 - Summary of Bat Passes Per Night for All Species Per Location



- 7.1.5. Point 21 recorded the highest bat activity levels at 263.11ppn, accounting for 26.37% of bat passes in the summer. The majority of activity at Point 21 was from Common Pipistrelle (accounting for 68.19% of passes at this location), followed by Soprano Pipistrelle (15.10% of passes at this location) and *Nyctalus* sp. (8.69% of passes at this location).
- 7.1.6. Points 27 and 22 followed with the next highest bat activity levels, with 151.64ppn (15.20% of total bat passes) and 144.78ppn (14.51% of total bat passes of total bat passes), respectively.
- 7.1.7. Point 7 demonstrated the lowest bat activity level, recording 39.42ppn (3.95% of total bat passes).

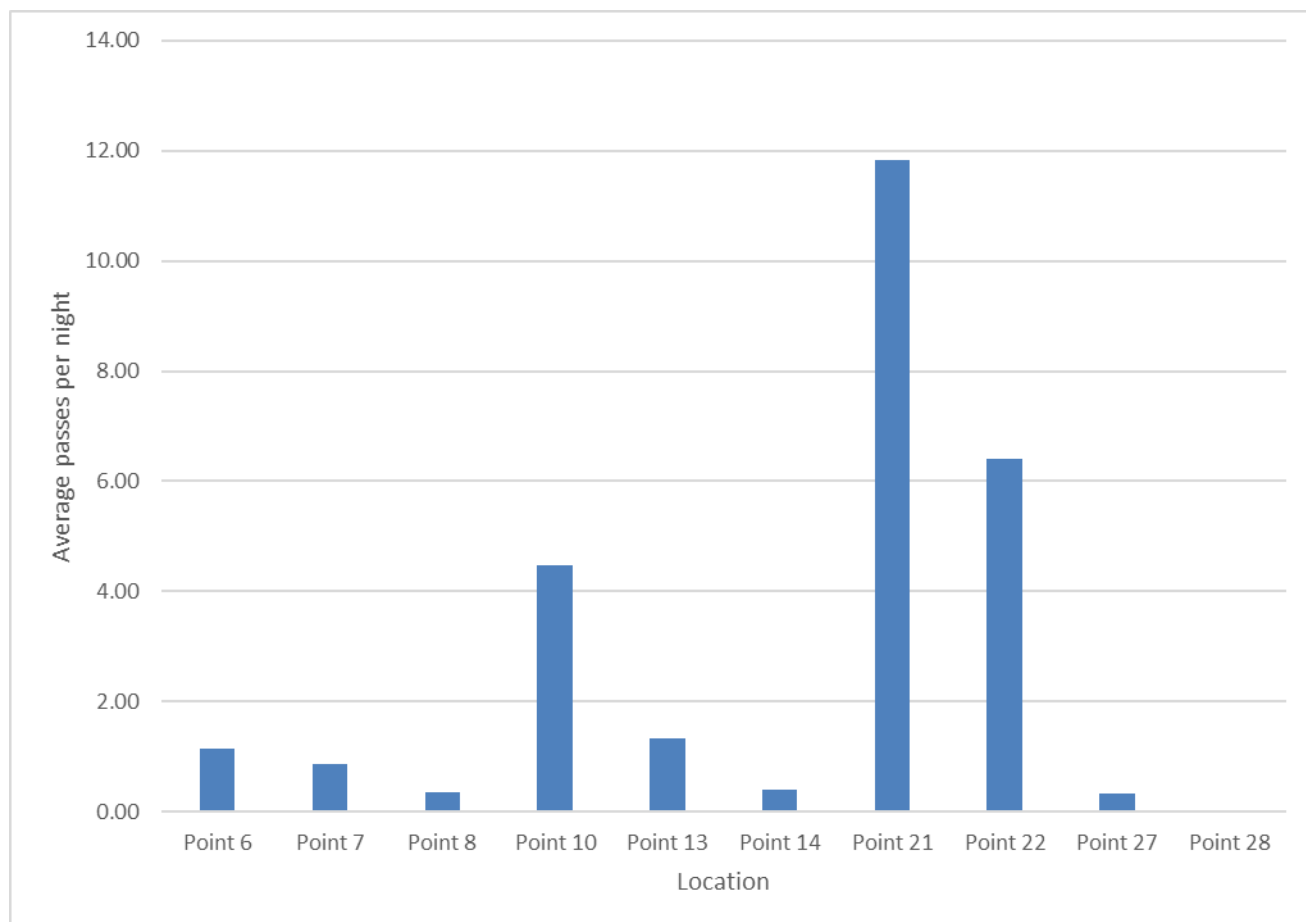
7.2 Barbastelle

- 7.2.1. Barbastelle activity across the deployment period at all locations within the Survey Area was an average of 2.99ppn, with a peak of activity at Point 21 recording an average of 11.83ppn and 1.33 passes per hour. Point 10 and 22 also had notable Barbastelle activity with an average of 4.47ppn and 6.42ppn respectively. Barbastelle activity was noticeably lower at

the remaining locations, ranging from an average of 0ppn at Point 28 and to 1.33ppn at Point 13.

7.2.2. The graph showing average Barbastelle ppn per location is shown on **Figure TR5-5-7-2**.

Figure TR5-5-7-2 – Passes per night for Barbastelle per location.



7.2.3. Point 21 recorded the highest peak of activity of all the detectors, recording a peak of 30.13ppn in May. Activity at this point fluctuates, with the lowest average passes per night in July at 2.8ppn. Of note, there is another peak of Barbastelle activity at Point 21 in August with 10.71ppn.

7.2.4. The next highest peak was at Point 22 with 16.14ppn in August. Activity at this point was fairly constant between the months of June to August with an average of 15.05ppn during these months. Activity was lower in the months of May and September at 3ppn and 1.2ppn, respectively.

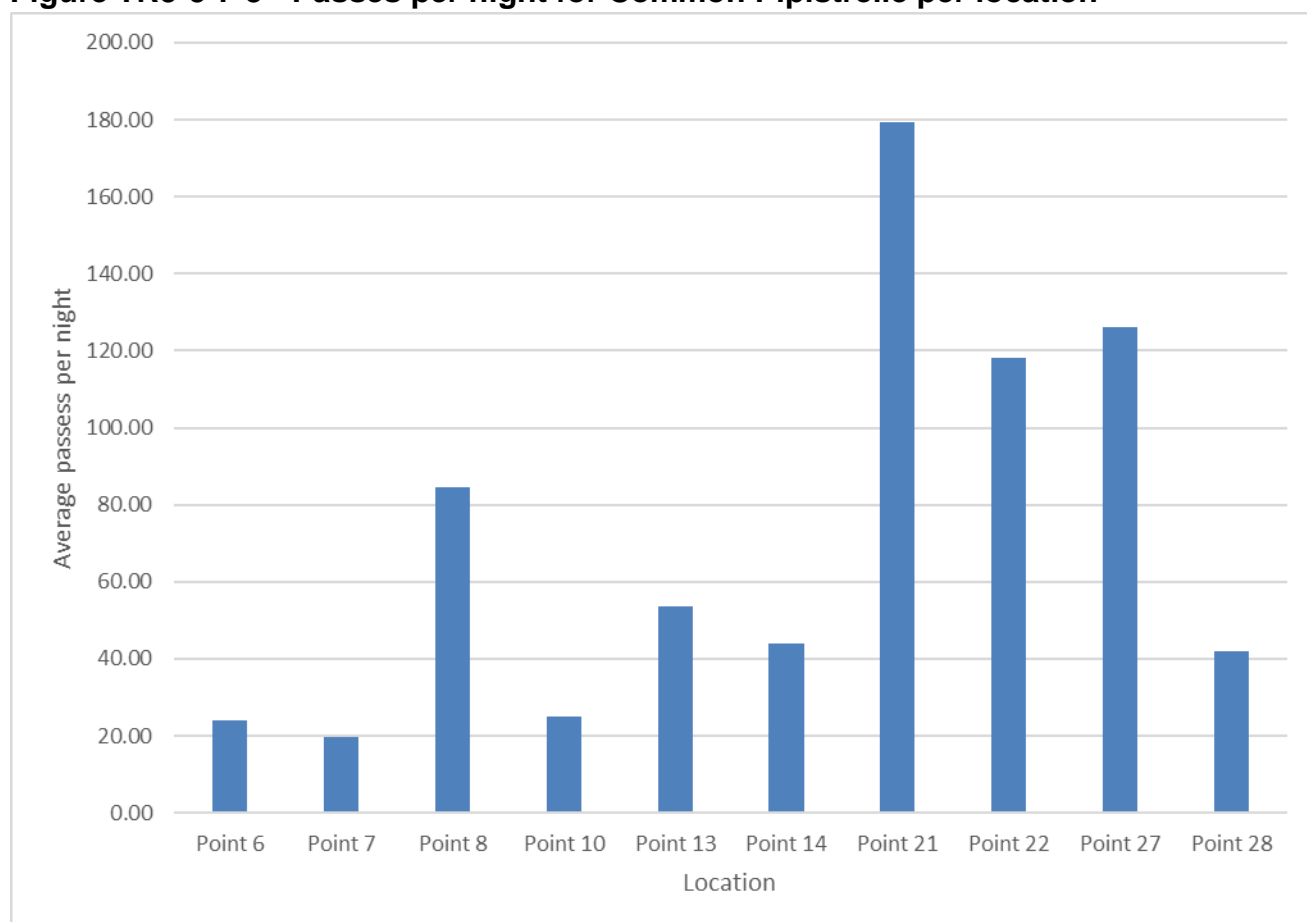
7.3 Common Pipistrelle

7.3.1. Common pipistrelle activity across the deployment period at all locations within the Survey Area was an average of 73.82ppn, with a peak of activity at Point 21 recording an average of 179.42ppn and 20.14pph. Points 8, 22 and 27 also had relatively high average of 84.42,

118.03, 126.18ppn respectively. All other points ranged between 19.83 and 53.62ppn, with Common Pipistrelle recorded at all locations.

- 7.3.2. The graph showing average Common Pipistrelle ppn per location is shown on **Figure TR5-5-7-3**.

Figure TR5-5-7-3 - Passes per night for Common Pipistrelle per location



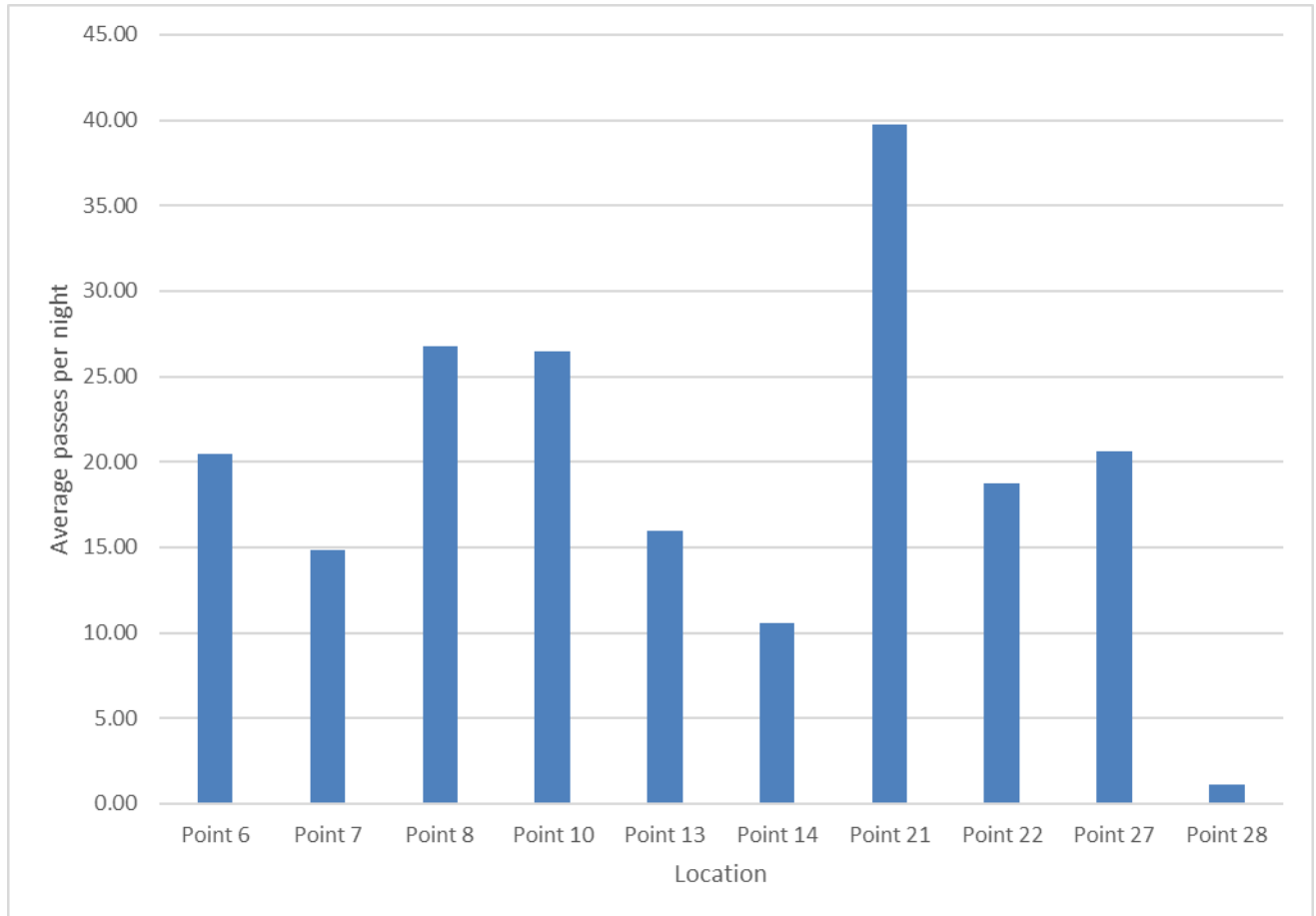
- 7.3.3. Point 21 recorded the highest peak of activity of all the detectors, recording a peak of 509.38 ppn in May. Activity at this point fluctuates vastly, with the lowest average passes per night in July at 28.43ppn.
- 7.3.4. The next highest peaks were at Point 27 with 246ppn in August and Point 22 with 221ppn in July.

7.4 Soprano Pipistrelle

- 7.4.1. Soprano Pipistrelle activity across the deployment period at all locations within the Survey Area was an average of 19.74ppn, with a peak of activity at Point 21 recording an average of 39.72ppn. All other points, except for Point 28 ranged between 10.58 and 26.81 ppn. Point 28 recorded less Soprano Pipistrelle activity at an average of 1.12ppn.

7.4.2. The graph showing average Soprano Pipistrelle ppn per location is shown on **Figure TR5-5-7-4**.

Figure TR5-5-7-4 – Passes per night for Soprano Pipistrelle per location.



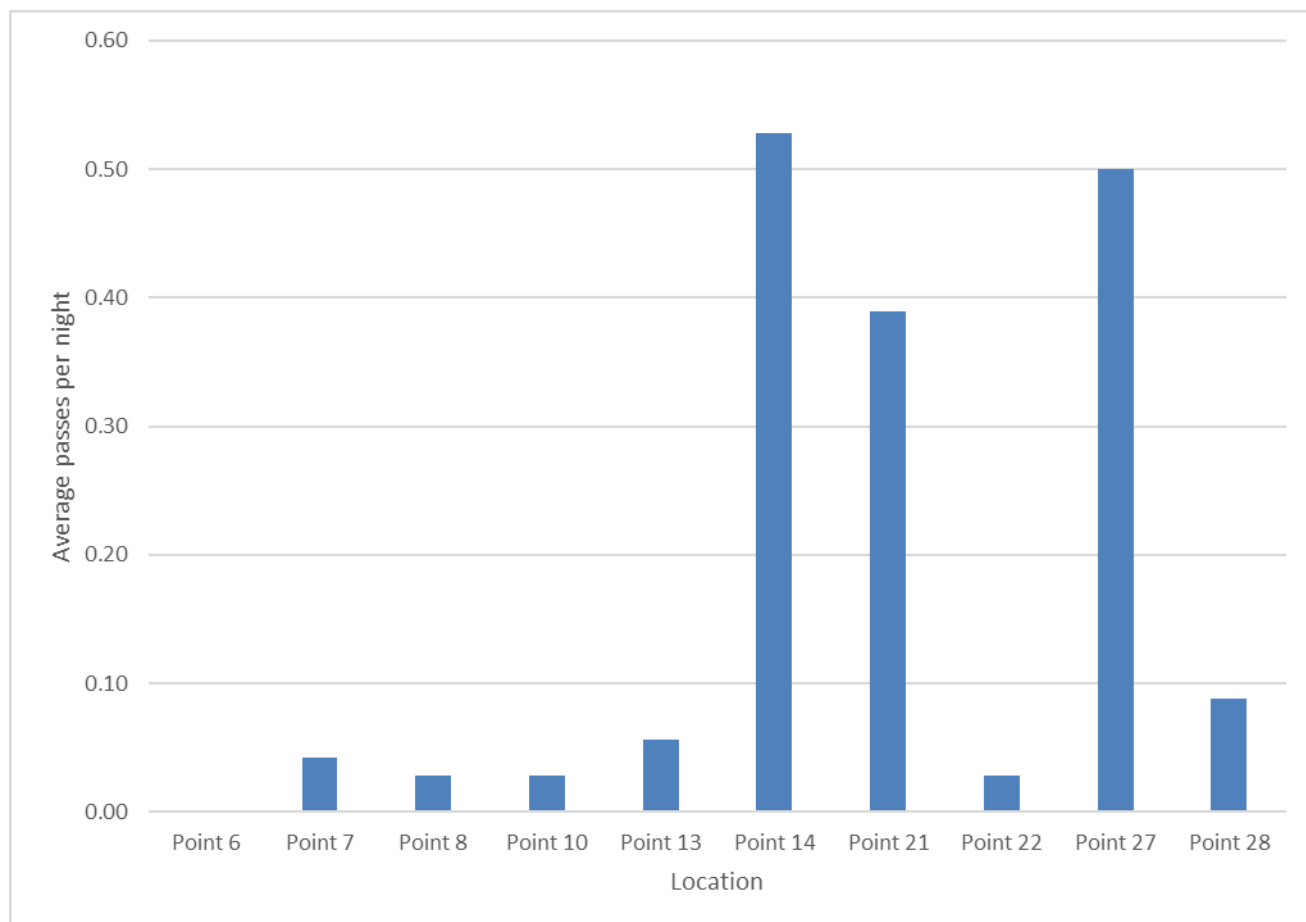
7.4.3. Point 21 recorded the highest peak of activity of all the detectors, recording a peak of 184.6ppn in October. Activity at this point averaged 17.8 during the months of May, July, August and September and June had a lower average number of 3.5ppn.

7.5 Nathusius' Pipistrelle

7.5.1. Nathusius' Pipistrelle activity was low across the Survey Area, with an average of 0.17ppn across the deployment period at all locations within the Survey Area. A peak of an average of 0.53ppn was recorded at Point 14. Average activity was also higher at Points 21 and 27, with an average of 0.39ppn and 0.5ppn, respectively. All other points had considerably lower activity, all below 0.1ppn. No Nathusius' Pipistrelle activity was recorded at Point 6.

7.5.2. The graph showing average Nathusius' Pipistrelle ppn per location is shown on **Figure TR5-5-7-5**.

Figure TR5-5-7-5 - Passes per night for Nathusius' Pipistrelle per location.

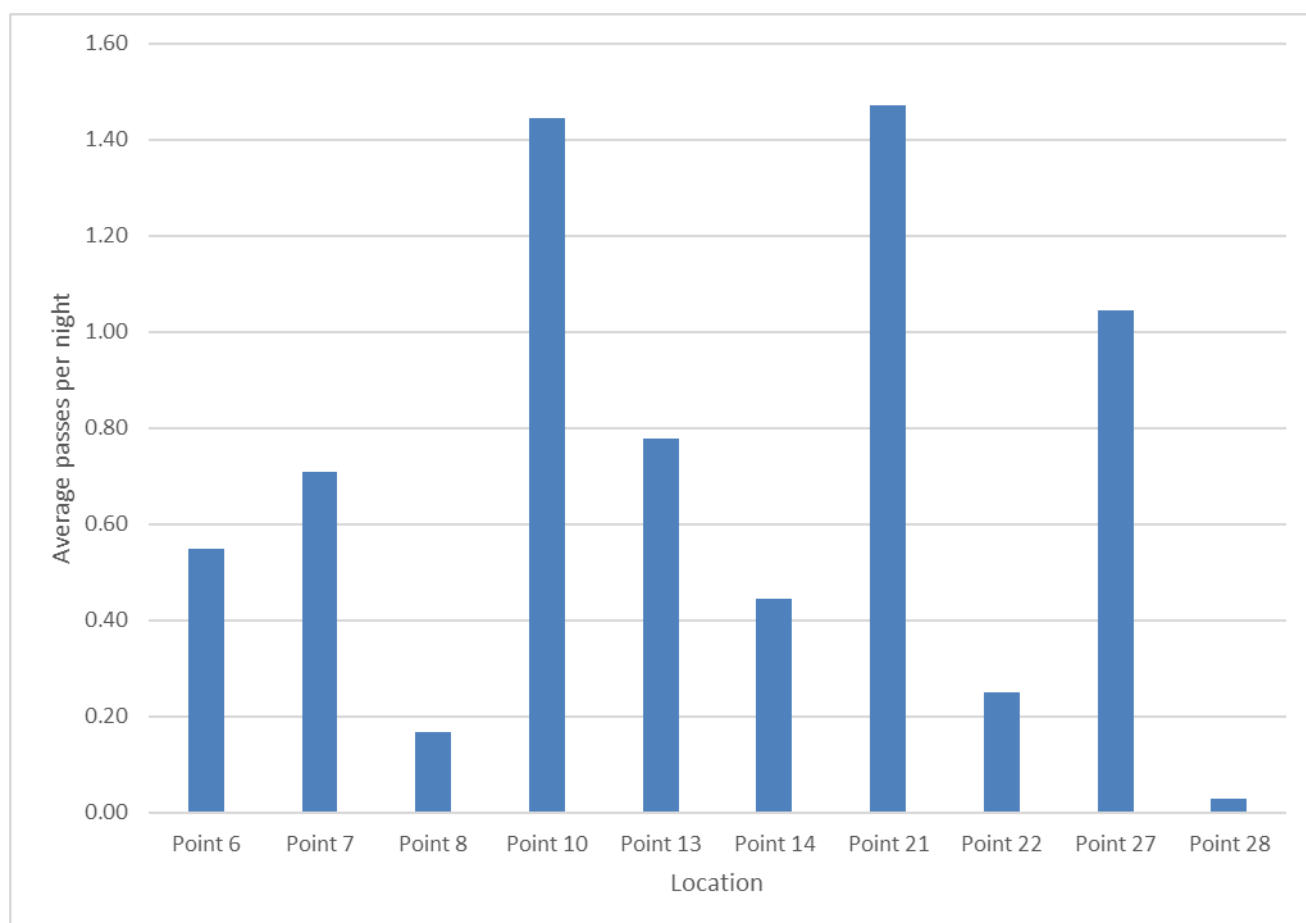


- 7.5.3. Point 14 recorded the highest peak of activity of all the detectors, recording a peak of 0.29ppn in September. Activity was only recorded at this point during two other months, June and August, at low levels (0.02ppn and 0.03ppn, respectively).
- 7.5.4. A peak of 1.25ppn was recorded at Point 21 during May, the only point Nathusius' Pipistrelle was recorded during this month. Nathusius' Pipistrelle was also recorded at this point in September at low levels of 0.8ppn.

7.6 *Myotis* species

- 7.6.1. *Myotis* sp. activity across the deployment period at all locations within the Survey Area was an average of 0.68ppn. *Myotis* sp. activity was highest at Points 10, 21 and 27, with 1.44, 1.47 and 1.05 ppn on average. All other locations experienced under 1 ppn on average throughout the summer months. Activity was low and consistent at all points throughout the summer months.
- 7.6.2. The graph showing average *Myotis* sp. ppn per location is shown on **Figure TR5-5-7-6**.

Figure TR5-5-7-6 - Passes per night for *Myotis* species per location.



7.6.3. *Myotis* sp. was only recorded passing point 28 once throughout the summer, in May.

7.7 Noctule

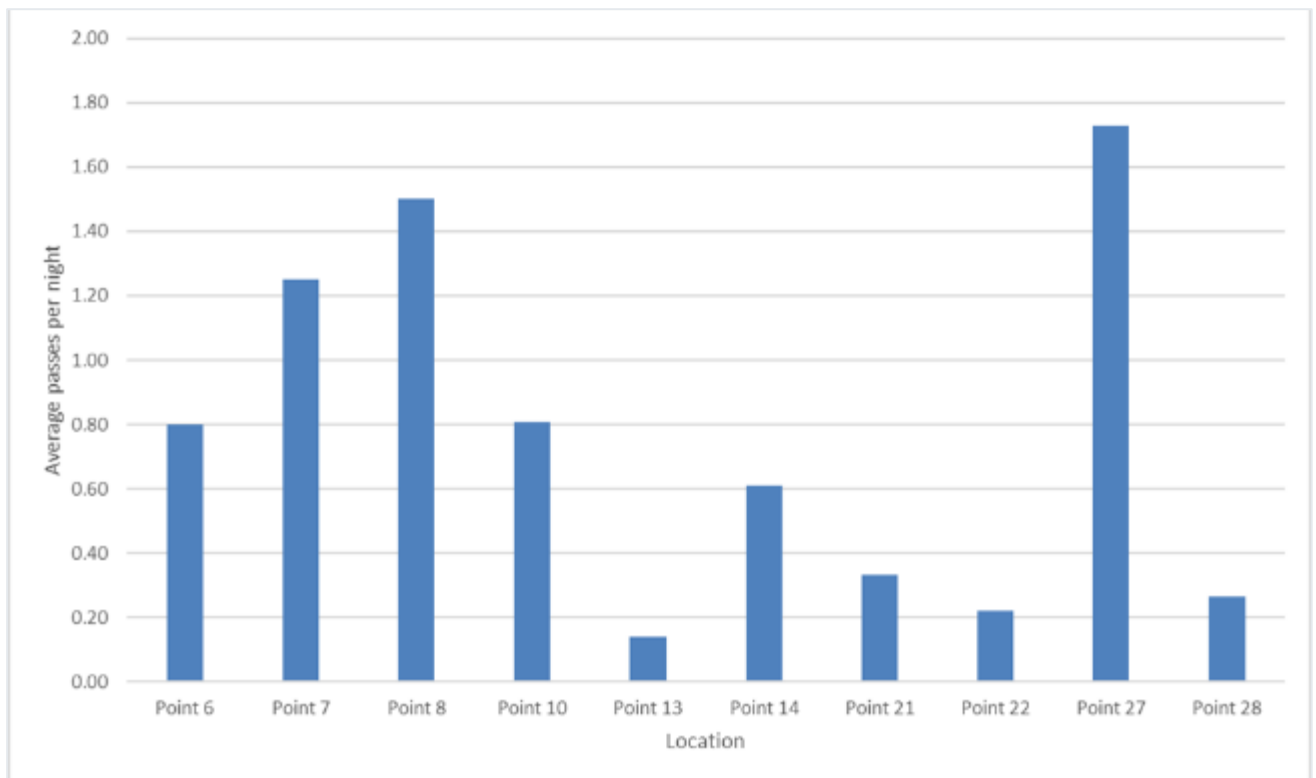
7.7.1. Noctule activity across the deployment period at all locations within the Survey Area was an average of 0.71ppn. A peak of 1.73 ppn on average were detected at Point 27 during the summer months, despite no data being collected in May or June due to access constraints. A majority of those calls recorded in August with an average of 3.14ppn.

7.7.2. Points 7 and 8 were the only other areas to record an average of over 1 ppn with an average of 1.25 and 1.5ppn, respectively.

7.7.3. Point 13 only record Noctule in August, with an average of 0.08ppn, the lowest average of Noctule ppn.

7.7.4. The graph showing average Noctule ppn per location is shown on **Figure TR5-5-7-7**.

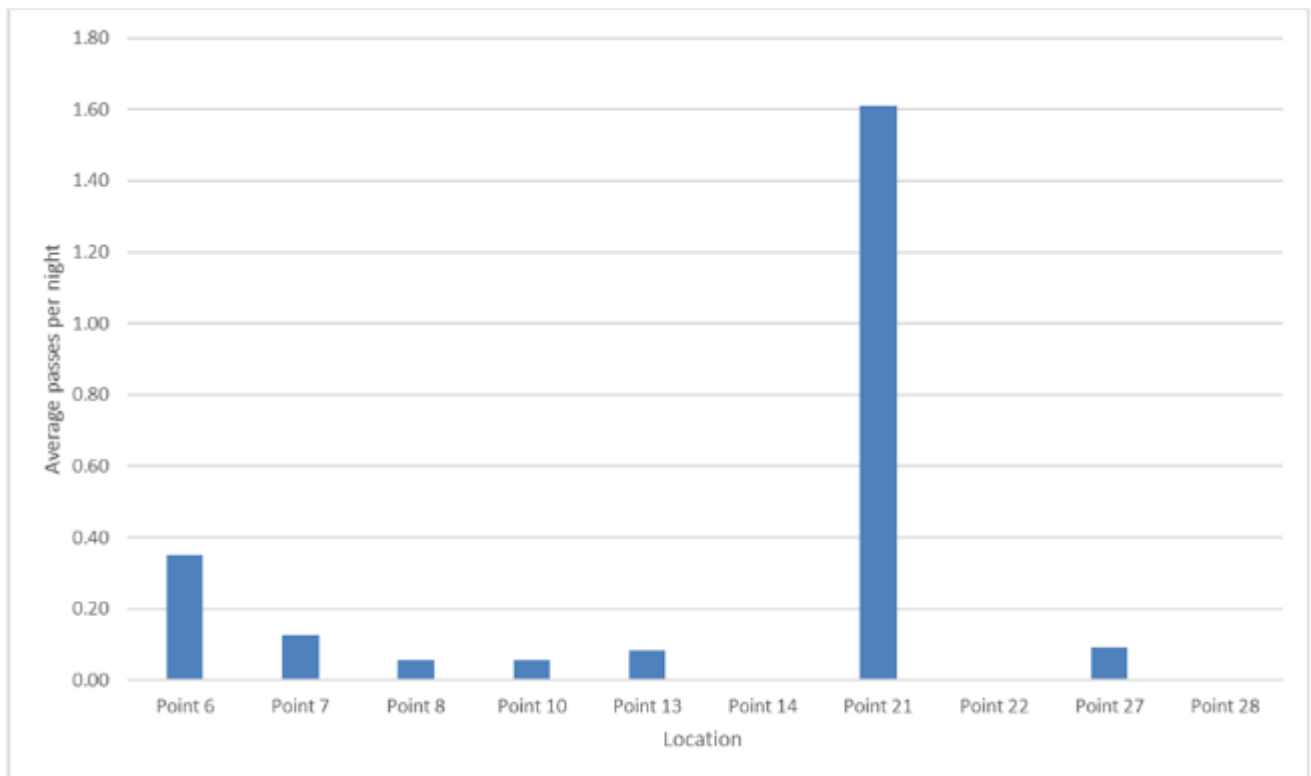
Figure TR5-5-7-7 - Passes per night for Noctule per location.



7.8 Leisler's Bat

- 7.8.1. Leisler's activity across the deployment period at all locations within the Survey Area was an average of 0.24ppn, with a peak of activity at Point 21 recording an average of 1.61ppn. All other locations recorded considerably less Leisler's activity all below 0.4ppn. No Leisler's were detected at Points 14, 22 or 28.
- 7.8.2. Point 21 only recorded Leisler's during October, despite being deployed during all summer months at this location, with an average of 11.6ppn.
- 7.8.3. The graph showing average Leisler's ppn per location is shown on **Figure TR5-5-7-8**.

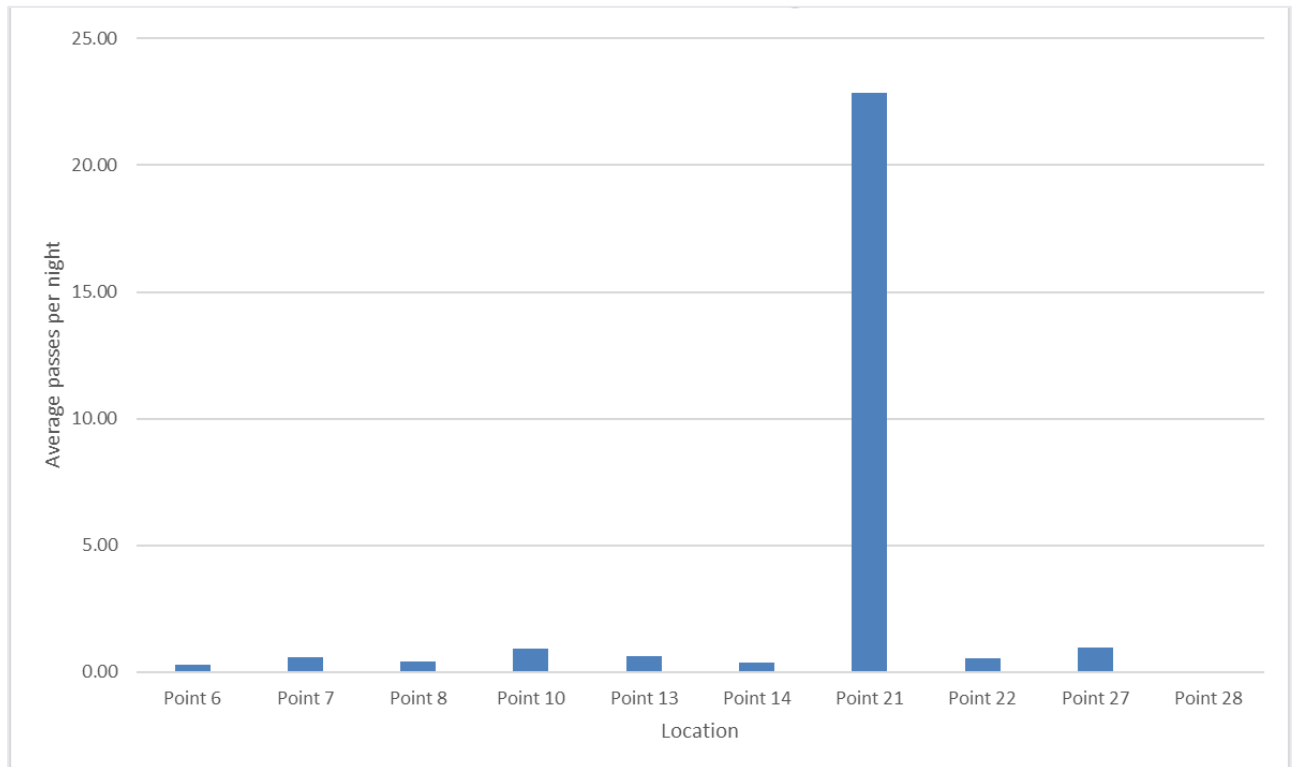
Figure TR5-5-7-8 - Passes per night for Leisler's per location.



7.9 *Nyctalus* species

- 7.9.1. *Nyctalus* sp. activity across the deployment period at all locations within the Survey Area was an average of 3.06ppn, with a peak of activity at Point 21 recording an average of 22.86ppn. All other points recorded considerably less *Nyctalus* sp. activity all below 1ppn. No *Nyctalus* sp. activity was detected at Point 28.
- 7.9.2. A peak of an average of 94.5ppn was recorded at Point 21 in May with the next average peak of 9.2ppn in October. All other months recorded an average of below 2.5ppn.
- 7.9.3. The graph showing average Leisler's ppn per location is shown on **Figure TR5-5-7-9**.

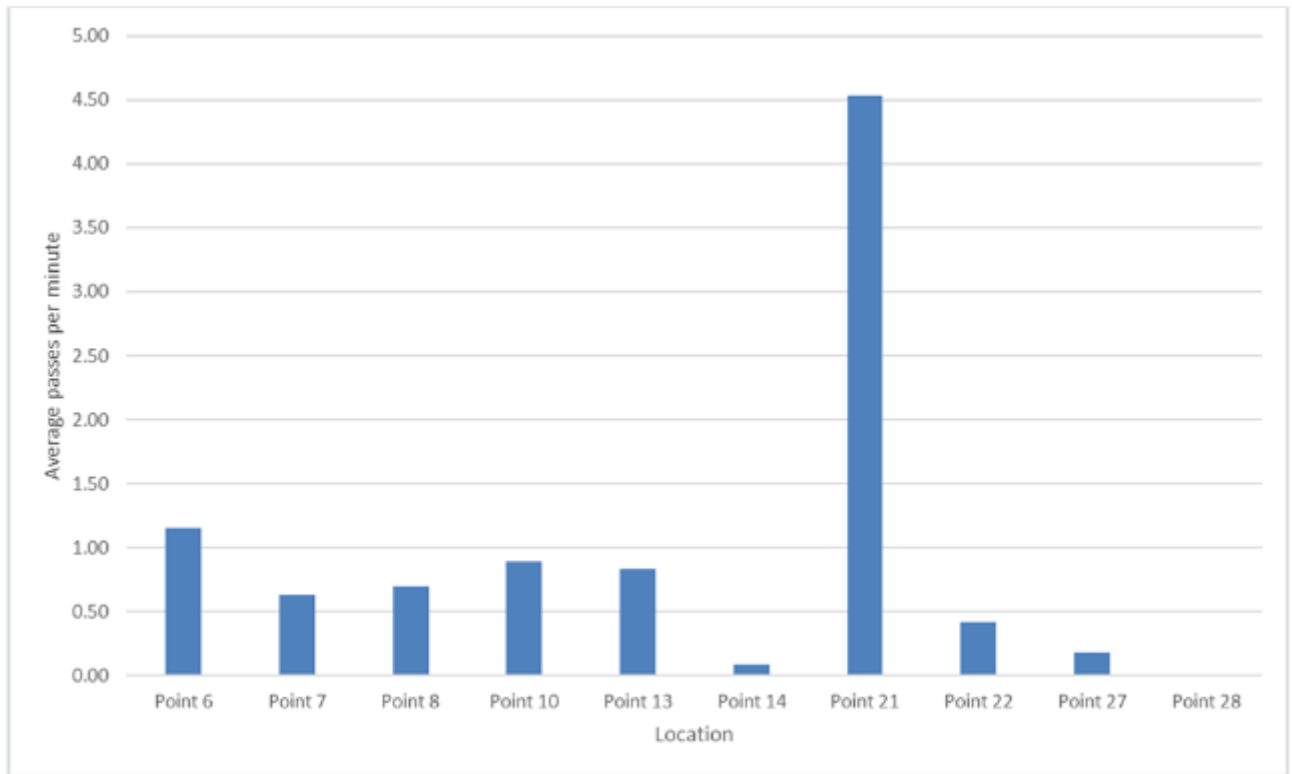
Figure TR5-5-7-9 - Passes per night for Nyctalus species per location



7.10 Brown Long-eared Bat

- 7.10.1. Brown long-eared bat activity across the deployment period at all locations within the Survey Area was an average of 0.98ppn, with a peak of activity at Point 21 recording an average of 4.53ppn. All other points recorded considerably less Brown Long-eared activity all below 1/5ppn. No Brown Long-eared activity was detected at Point 28.
- 7.10.2. A peak of an average of 12.88ppn was recorded at Point 21 in May with the next average peak of 7ppn in June. All other months recorded an average of 1.6ppn or below.
- 7.10.3. The graph showing average Brown Long-eared ppn per location is shown on **Figure TR5-5-7-10**.

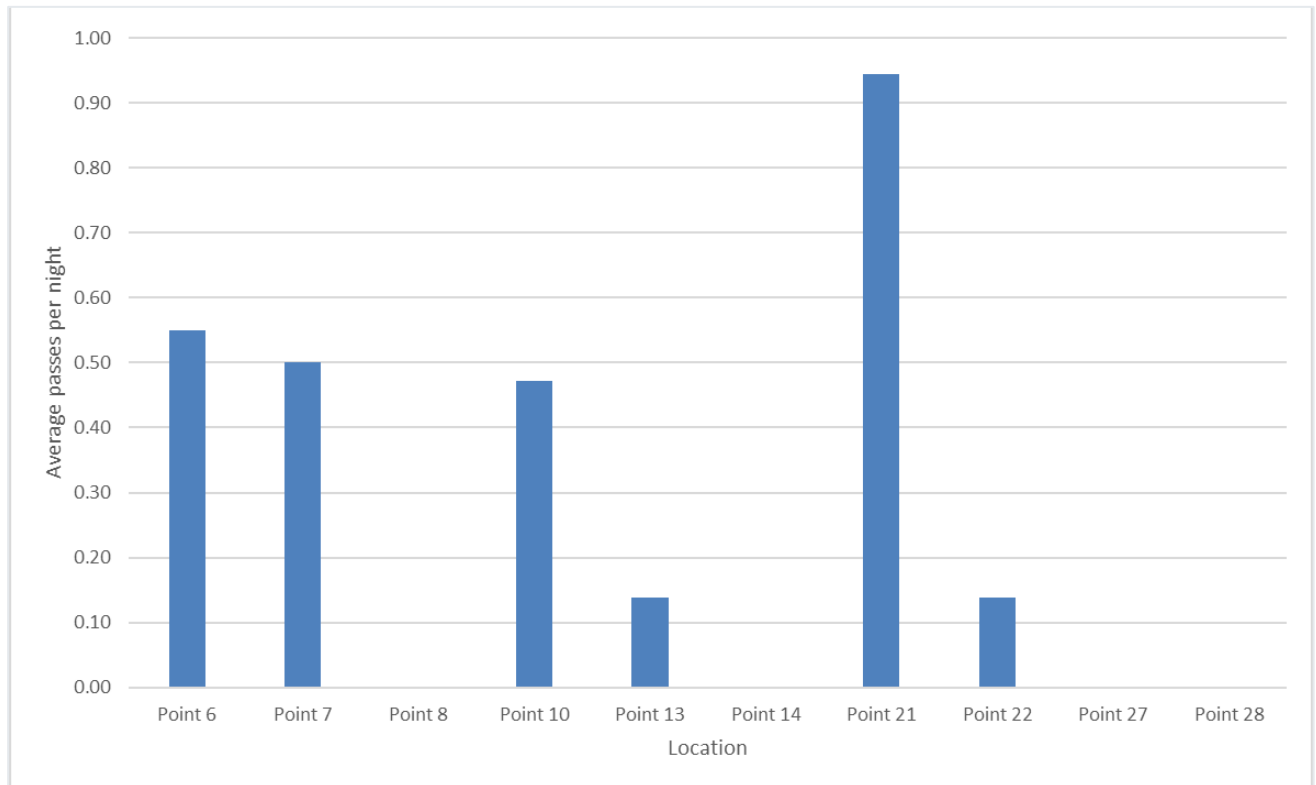
Figure TR5-5-7-10 - Passes per night for Brown Long-eared Bat per location.



7.11 Serotine

- 7.11.1. Serotine activity was low across the Survey Area, with an average of 0.27ppn across the deployment period at all locations within the Survey Area. A peak of an average of 0.94ppn was recorded at Point 21, with the most average ppn of 2.38 recorded in May. No Serotine activity was recorded at Points 8, 14, 27 or 28.
- 7.11.2. The graph showing average Serotine ppn per location is shown on **Figure TR5-5-7-11**.

Figure TR5-5-7-11 - Passes per night for Serotine per location



8 Summary

- 8.1.1. The crossing point surveys concluded that four features; CP5, CP16, CP18, CP19, provided commuting habitat for Barbastelle. These crossing points where Barbastelle were identified using the feature to commute recorded a maximum of one commuting Barbastelle on any survey. Crossing point locations CP6, CP10 and CP11 recorded no commuting bats during the crossing point surveys, whilst all remaining crossing point locations provided intermittent commuting habitat for species such as Common and Soprano Pipistrelle, with the peak commuting passes observed at CP9, recording a peak of six bats commuting. All features recorded low levels of foraging by bats, usually associated with the feature itself which provided foraging habitat within the landscape or associated with adjacent habitats such as grassland and woodland.
- 8.1.2. At least ten bat species were recorded using habitats within the Survey Area during the summer and winter automated bat detector surveys, including Barbastelle. It should be noted that 42% of the winter survey effort was not completed due to access restrictions. Points 1, 2 and 12 had a full winter survey effort. No access was permitted for Point 27 throughout the winter survey period, intermittent access was given the other points.
- 8.1.3. A total of 32,446 call registrations were recorded across the route for the summer deployment period. Of these calls, the most commonly registered species were Common Pipistrelle and Soprano Pipistrelle, accounting for 71.89% and 19.22% of all total bat passes, respectively. Barbastelle accounted for 2.91%, with most of those recorded at Point 21. Point 21 recorded the most bat passes, accounting for 26.37% of bat passes in the summer, followed by Point 27, accounting for 15.20% of bat passes in the summer.
- 8.1.4. A total of 10,589 call registrations were recorded across the route for the winter deployment period. Of these calls, the most commonly registered species were Common Pipistrelle and Soprano Pipistrelle accounting for 81.51% and 10.63% of total bat passes, respectively. The least registered species was Serotine, accounting for 0.04% of total bat passes. Barbastelle accounted for 3.28%, with a peak of activity at Point 13 recording an average of 3.87ppn. Point 9 also had notable Barbastelle activity, with an average of 2.53ppn.

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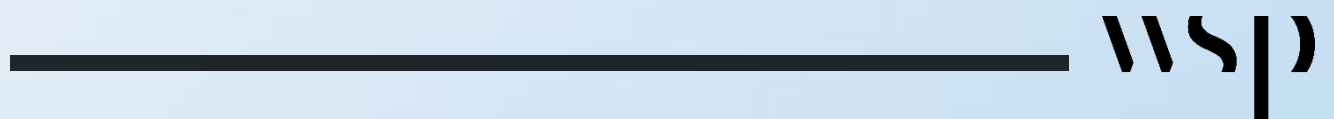
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Annex A

Study & Survey Areas



Path: \\uk.vspgroup.com\central\data\Projects\70086xxx\70086660 - C2C TWA0 Stage\03 WIP\Ecology\07 GIS & Mapping\OGIS Project\Bats\C2C_Bat Surveys Overview_ZP.qgz



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

- Legend
- Scheme Boundary
 - Number of surveys at each crossing point location:
 - 2
 - 3
 - 6



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Revision Details		By Check	Date	Suffix
Drawing Status FINAL				
Job Title Greater Cambridge Partnership Cambridge to Cambourne				
Drawing Title Summer Bat Crossing Point Survey Location Map				
Scale at A1		1:16,000		
Drawn UKHJR003				
Stage 1 Check MP	Stage 2 Check GC	Originated JF	Date 09/03/2023	
0 200 400 600 800 1,000 m 				
				
Drawing Number Figure 5.5.1-1				

Path: \\uk.vspgroup.com\central\data\Projects\70086xxx\70086660 - C2C TWAO Stage\03 WIP\Ecology\07 GIS & Mapping\OGIS Project\Bats\C2C_Bat Surveys Overview_ZP.qgz



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Legend

- Scheme Boundary
- Winter Automated Detector Locations

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Revision Details		By	Date	Suffix
		Check		

Drawing Status

FINAL

Job Title

Greater Cambridge Partners
Cambridge to Cambourne

Drawing Title

Winter Automated Detector
Location Map

Scale at A1

1:16,000

Drawn	UKHJR003		
Stage 1 Check	Stage 2 Check	Originated	Date
MP	GC	JF	09/03/2023

0 200 400 600 800 1,000 m

Drawing Number

Figure 5.5.1-2

Path: \\uk.vspgroup.com\central\data\Projects\70086xxx\70086660 - C2C TWAO Stage\03 WIP\Ecology\07 GIS & Mapping\OGIS Project\Bats\C2C_Bat Surveys Overview_ZP.qgz



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Legend

- Scheme Boundary
- Summer Automated Detector Locations

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Revision Details

By	Date	Suffix
Check		

Drawing Status

FINAL

Job Title

Greater Cambridge Partners
Cambridge to Cambourne

Drawing Title

Summer Automated Detector
Location Map

Scale at A1

1:16,000

Drawn

UKHJR003

Stage 1 Check

MP

Stage 2 Check

GC

Originated

JF

Date

09/03/2023

0 200 400 600 800 1,000 m

wsp

Drawing Number

Figure 5.5.1-3

Annex B

Survey Results

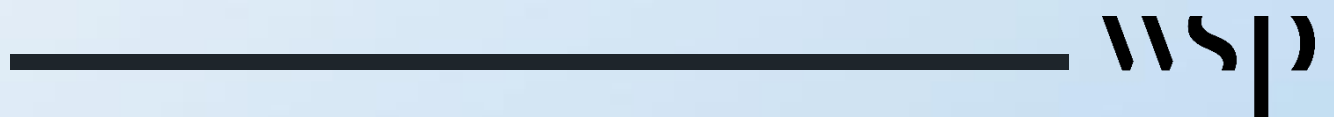




Table TR5-5-B-1 – Crossing Point dates, start and end times and meteorological data

Crossing Point	Date	Start Time	End Time	Weather						
				Start Temp	End Temp	Wind Start	Wind End	Cloud Cover Start	Cloud Cover End	Rain
CP1	12/07/2022	21:17	22:47	23	20	0	0	8	0	N
CP1	18/08/2022	20:19	21:49	23	23	3	1	7	3	N
CP1	13/09/2022	19:19	20:49	17	17	1	1	8	8	N
CP2	21/07/2022	21:07	22:37	19	18	2	2	7	8	N
CP2	04/08/2022	20:47	22:17	19	18	1	2	8	8	N
CP3	26/07/2022	21:00	22:30	17	16	1	1	4	0	N
CP3	04/08/2022	20:45	22:15	20	18	1	2	7	6	N

Crossing Point	Date	Start Time	End Time	Weather						
				Start Temp	End Temp	Wind Start	Wind End	Cloud Cover Start	Cloud Cover End	Rain
CP4	26/07/2022	21:00	22:30	17	16	1	1	4	0	N
CP4	08/08/2022	20:36	22:06	22	19	1	1	0	0	N
CP5	14/07/2022	21:16	22:46	17	17	1	3	2	1	N
CP5	24/08/2022	20:05	21:35	26	24	1	0	5	7	N
CP5	13/09/2022	19:19	20:49	19	17	2	2	6	6	N
CP6	27/07/2022	20:59	22:30	16	17	3	3	8	8	N
CP6	03/08/2022	20:47	22:17	23	21	2	3	1	1	N
CP6	15/08/2022	20:25	21:55	24	22	1	1	6	6	N



Crossing Point	Date	Start Time	End Time	Weather						
				Start Temp	End Temp	Wind Start	Wind End	Cloud Cover Start	Cloud Cover End	Rain
CP9	09/08/2022	20:36	22:06	22	12	2	1	1	1	N
CP9	31/08/2022	19:50	21:20	19	16	2	0	0	0	N
CP10	16/06/2022	21:23	22:53	21	20	2	3	7	7	N
CP10	15/08/2022	20:25	21:55	24	22	1	1	6	4	N
CP11	13/06/2022	21:21	22:51	14	11	0	0	3	2	N
CP11	05/07/2022	03:15	04:45	9	9	0	0	0	8	N
CP12	20/06/2022	21:24	22:54	15	14	1	0	3	2	N
CP12	07/07/2022	03:17	04:47	17	16	2	1	8	8	Drizzle



Crossing Point	Date	Start Time	End Time	Weather						
				Start Temp	End Temp	Wind Start	Wind End	Cloud Cover Start	Cloud Cover End	Rain
CP13	21/07/2022	21:08	22:38	19	18	1	1	7	4	N
CP13	08/08/2022	20:38	22:08	23	22	2	1	0	0	N
CP13	23/08/2022	20:08	21:38	24	24	2	2	7	7	N
CP14	30/05/2022	21:09	22:39	10	12	2	2	4	4	N
CP14	28/06/2022	03:11	04:41	10	8	1	1	0	1	N
CP14	20/07/2022	21:08	22:38	19	19	2	2	8	8	N
CP14	02/08/2022	22:19	02:49	25	23	2	2	5	3	N
CP14	30/08/2022	19:52	21:22	19	17	4	2	5	0	N

Crossing Point	Date	Start Time	End Time	Weather						
				Start Temp	End Temp	Wind Start	Wind End	Cloud Cover Start	Cloud Cover End	Rain
CP14	15/09/2022	19:15	20:45	15	14	2	2	2	2	N
CP15	20/07/2022	21:08	22:38	21	21	2	2	8	8	N
CP15	01/08/2022	20:50	22:20	24	21	1	1	8	8	N
CP15	17/08/2022	20:20	21:50	17	17	3	3	8	8	N
CP15	26/08/2022	04:30	06:00	11	10	1	1	0	0	N
CP15	07/09/2022	19:34	21:04	19	17	1	1	2	3	N
CP15	20/09/2022	19:03	20:33	17	15	1	1	7	8	N
CP16	14/07/2022	21:17	22:47	16	10	1	1	1	1	N

Crossing Point	Date	Start Time	End Time	Weather						
				Start Temp	End Temp	Wind Start	Wind End	Cloud Cover Start	Cloud Cover End	Rain
CP16	17/08/2022	20:10	21:19	17	17	5	5	8	8	N
CP16	25/07/2022	20:45	22:32	16	15	2	4	1	1	N
CP16	07/09/2022	19:35	21:05	18	18	1	1	4	2	N
CP16	21/09/2022	19:01	20:31	18	17	1	1	8	7	N
CP16	27/09/2022	18:48	20:18	12	11	3	3	6	2	N
CP17	15/07/2022	03:26	04:56	13	12	2	1	1	1	N
CP17	21/07/2022	21:03	22:38	19	18	1	1	7	8	N
CP17	03/08/2022	20:47	22:17	23	21	2	3	1	1	N

Crossing Point	Date	Start Time	End Time	Weather						
				Start Temp	End Temp	Wind Start	Wind End	Cloud Cover Start	Cloud Cover End	Rain
CP17	17/08/2022	20:21	21:51	19	17	4	3	7	7	N
CP17	05/09/2022	19:37	21:09	20	19	2	1	7	1	N
CP17	21/09/2022	19:01	20:31	17	16	1	1	8	7	N
CP18	23/06/2022	03:09	04:39	16	11	1	1	0	0	N
CP18	11/07/2022	21:17	22:49	24	22	1	1	6	5	N
CP18	25/07/2022	21:01	22:31	19	16	2	2	0	0	N
CP18	10/08/2022	20:34	22:04	26	22	1	1	0	0	N
CP18	14/09/2022	19:18	20:48	18	16	2	3	6	8	N



Crossing Point	Date	Start Time	End Time	Weather						
				Start Temp	End Temp	Wind Start	Wind End	Cloud Cover Start	Cloud Cover End	Rain
CP18	26/09/2022	18:50	20:10	12	11	4	1	8	4	N
CP19	30/05/2022	21:09	22:39	10	9	2	2	8	8	N
CP19	06/07/2022	03:17	04:47	11	13	1	2	8	7	N
CP19	20/07/2022	21:08	22:38	22	20	2	1	8	7	N
CP19	02/08/2022	20:49	22:19	24	23	2	2	3	0	N
CP19	30/08/2022	19:52	21:22	19	18	1	1	1	0	N
CP19	26/09/2022	18:49	20:19	12	11	1	1	8	4	N
CP20	31/05/2022	03:16	04:46	10	10	1	1	8	6	Drizzle



Crossing Point	Date	Start Time	End Time	Weather						
				Start Temp	End Temp	Wind Start	Wind End	Cloud Cover Start	Cloud Cover End	Rain
CP20	30/06/2022	21:24	22:54	13	11	1	1	0	0	N
CP21	07/06/2022	21:17	22:47	18	16	1	1	7	7	N
CP21	22/06/2022	03:08	04:38	11	13	0	0	0	0	N
CP22	16/06/2022	21:21	22:51	22	21	0	0	8	8	N
CP22	29/06/2022	03:11	04:41	13	14	1	1	8	4	N
CP23	07/06/2022	21:17	22:47	19	16	2	1	3	4	N
CP23	21/06/2022	03:08	04:38	12	14	1	1	0	0	N

Table TR5-5-B-2 – Winter Automated Detectors passes per night for each location for each species.

	Point											
	1	2	3	4	5	6	7	8	9	10	11	12
Barbastelle Bat Passes Per Night	0.23	1.97	0	0.9	0.7	0.16	0	0	2.53	0.05	0	1.77
Serotine Bat Passes Per Night	0	0.03	0	0	0	0	0.05	0	0	0	0	0
Leisler's Bat Passes Per Night	0	0	0.07	0	0	0.04	0.05	0.12	0	0	0	0
Noctule Bat Passes Per Night	0	0.03	0	0	0	0	0.05	0	0	0	0	0
<i>Myotis</i> sp. Bat Passes Per Night	0.2	0.7	0.2	1.2	0.2	0.4	0.45	0	1.07	0.2	0.2	0.27
Common Pipistrelle Bat Passes Per Night	4.4	20.47	14.73	32.4	13.53	2.68	3.05	2.12	5.2	0.1	0	0.23
Soprano Pipistrelle Bat Passes Per Night	1.63	1.93	0.73	1.1	3	1.6	0.8	0.48	3.07	0.1	0.13	0.63
Nathusius' Pipistrelle Bat Passes Per Night	0.03	0	0.07	0	0	0	0	0	0	0	0	0
Brown Long-eared Bat Passes Per Night	0.17	0.23	0	0.05	0.17	0	0	0.04	0	0	0	0
<i>Nyctalus</i> sp. Bat Passes Per Night	0.03	0	0	0	0.07	0	0	0.04	0	0	0	0



	Point												
	13	14	15	16	17	18	19	20	21	22	23	24	28
Barbastelle Bat Passes Per Night	3.87	0	0.1	0	0.44	0.1	1.28	0	0.2	0.33	1.73	0.9	0
Serotine Bat Passes Per Night	0	0	0	0.04	0	0	0	0	0	0	0	0.1	0
Leisler's Bat Passes Per Night	0.07	0	0	0.12	0.12	0	0.12	0	0	0	0.13	0.3	0.4
Noctule Bat Passes Per Night	0.07	0	0	1.84	1.68	2.4	0.48	0	0.07	0.07	4.67	2.3	0.8
<i>Myotis</i> sp. Bat Passes Per Night	0.2	0	0.3	0.36	0.08	0.1	0.12	0.2	0.8	0.87	0.937	0.1	0
Common Pipistrelle Bat Passes Per Night	2.07	0	0.2	3.28	3.28	1	63.72	0	1.137	1.93	267.33	10.4	76.4
Soprano Pipistrelle Bat Passes Per Night	0.67	0.1	0.1	0.56	1.88	1.1	1.28	0	0.067	1.13	40.53	1.2	1
Nathusius' Pipistrelle Bat Passes Per Night	0.07	0	0	0.04	0.16	0	0	0	0	0	0.2	0.1	0.8
Brown Long-eared Bat Passes Per Night	0	0	0	0	0	0	0.36	0	0	0.07	0.07	0	0
<i>Nyctalus</i> sp. Bat Passes Per Night	0	0.1	0	0.08	0.12	0	0	0	0	0	0.27	0	0

Table TR5-5-B-3 – Summer Automated Detectors passes per night for each location for each species.

	Point 6	Point 7	Point 8	Point 10	Point 13	Point 14	Point 21	Point 22	Point 27	Point 28	Total
Barbastelle	2.2	0.6	0.6	1.4	0.4	0.2	8.4	1.8	0	0	1.56
Common Pipistrelle	6.6	8.4	97.4	4.6	11	3.2	173.8	25	4	5	33.9
Soprano Pipistrelle	9.4	8.2	5.8	6.8	1.4	2	184.6	5.2	4.6	0	22.8
Nathusius' Pipistrelle	0	0	0	0	0.2	0	0	0	0	0	0.02
<i>Myotis</i> sp.	0.8	1.4	0.2	0.4	0.4	0.8	2.6	0.4	0.8	0	0.78
Noctule	0.6	0.4	0.2	0.2	0	0	0	0.2	0	0	0.16
Leisler's	0	0	0	0.2	0.2	0	11.6	0	0.4	0	1.24
<i>Nyctalus</i> sp.	0.2	0	0.2	0	0	0	9.2	0.4	0	0	1
Brown Long-eared	0.6	0.8	0.8	0.4	0.4	0	0.8	0.8	0.4	0	0.5
Serotine	0	0	0	0	0	0	1.8	0	0	0	0.18



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