

# **A1 in Northumberland: Morpeth to Ellingham**

**Scheme Number: TR010041**

## **6.8 Environmental Statement – Appendix 9.5 Bat Report**

**Part B**

APFP Regulation 5(2)(a)

Planning Act 2008

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

June 2020

Infrastructure Planning

Planning Act 2008

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

**The A1 in Northumberland: Morpeth to Ellingham  
Development Consent Order 20[xx]**

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**Environmental Statement - Appendix**

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APPENDIX A

SURVEY INFORMATION

APPENDIX B

SURVEY RESULTS

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## 1. INTRODUCTION

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- 1.1.1. The A1 in Northumberland: Alnwick to Ellingham (Part B) aims to increase capacity along an approximately 8 km section of the existing A1 between Alnwick and Ellingham in Northumberland. Part B includes widening the existing A1 from single carriageway to a dual carriageway. Part B also includes improving the existing junction at Charlton Mires with a new grade-separated junction and a new Heckley Fence Accommodation Overbridge. Part B aims to increase capacity, enhance resilience, improve safety and improve journey times along the route. Details of Part B location are provided on the **Location Plan** of this Environmental Statement (ES) (**Application Document Reference: TR010041/APP/2.1**).
- 1.1.2. Part B comprises dualling of the existing A1 single carriageway; a new southbound carriageway would be constructed to the east of the existing A1, and the existing A1 would become a new northbound carriageway. A number of Private Means of Access would need to be closed and replaced with new access routes including new roads for East and West Linkhall, and from the B6347 and Rock South Farm. To facilitate the construction of Part B, sections of an Extra High Voltage cable, utility pipes and telecommunication cables would need to be diverted. Part B also includes new drainage features, new and extended culverts, and temporary and permanent Public Right of Way diversions.
- Three compounds would be temporarily required to facilitate the construction of Part B: Main Compound; Lionheart Enterprise Park Compound (eastern and western sites); and Charlton Mires Site Compound (refer to **Figure 2.4: Temporary Construction Works, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**)). Within this document, Part B comprises three elements. The Part B Main Scheme Area refers to the Order Limits north of Alnwick and south of Ellingham only. The Order Limits also includes the Lionheart Enterprise Park Compound (eastern and western sites), located to the south of Alnwick, and the Main Compound, which is located within the A1 in Northumberland Morpeth to Felton (Part A).
- 1.1.3. This appendix assesses potential effects on bats within the study area resulting from Part B. This appendix (and its associated figures) is not intended to be read as a standalone assessment and reference should be made to **Chapter 2: The Scheme** of this ES (**Application Document Reference: TR010041/APP/6.1**) which provides the full details of Part B.
- 1.1.4. For the purposes of this appendix, the Survey Area encompasses the Order Limits including a 50 m buffer.

### 1.1. ECOLOGICAL BACKGROUND

- 1.1.1. Habitat Suitability Assessments (HSA) of buildings and trees were completed in 2016 (**Ref. 1**) encompassing a 100 m buffer around a selection of proposed Part B options at that time. HSA assessment was accompanied by a desk study to identify publicly held records of bat

species and roosts, as well as an assessment of habitats within 500 m beyond proposed Part B options to identify potential bat supporting habitat.

- 1.1.2. Surveys completed during 2018 and 2019 have been completed for land within the Order Limits and a 50 m buffer. This variation in survey extent has been influenced by the selection of a preferred Scheme after the 2016 surveys (see **Chapter 3: Assessment of Alternatives** of this ES (**Application Document Reference: TR010041/APP/6.1**)), allowing refinement of the survey area and a targeted survey approach to be completed. Whilst these historic surveys and assessments have been referenced within this appendix, surveys and assessments undertaken during 2018 and 2019 have been the primary source of information for which to inform this assessment and its conclusions.

## 2. BASELINE IDENTIFICATION METHODOLOGY

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### 2.1. DESK STUDY

- 2.1.1. A desk study was undertaken in 2019, the results of which are summarised within this appendix. For the production of this updated study, the following websites and organisations were consulted for all available bat records within 5 km of the Order Limits (inclusive of the Main Compound and Lionheart Enterprise Park Compound both eastern and western sites):
- a. MAGIC (to Identify European Protected Species (EPS) licences granted within 5 km of the Order Limits; and
  - b. Environmental Records Information Centre North East (ERIC North East).
- 2.1.2. Records were filtered to the most recent ten-year period between 2009 and 2019. Records prior to this ten-year period were not considered ecological relevant to inform this assessment and were excluded.
- 2.1.3. The Phase 1 Habitat Assessment (**Appendix 9.1: Habitats and Designated Sites** of this ES) was reviewed to identify the presence of habitats suitable for use by bats and the presence of statutory and non-statutory sites designated for bats within 5 km of the Order Limits, or within 30 km for Special Areas of Conservation (SAC) with bats as a qualifying feature.

### 2.2. FIELD SURVEY

- 2.2.1. To fully assess the potential of habitats within the Order Limits and wider area to support foraging, commuting, and roosting bats, a suite of surveys utilising several survey types were completed, including roost assessments and transects. Each of the below survey types was conducted to understand the context of use of the Order Limits and wider landscape by bats, in order to fully assess the potential impacts of Part B and understand any requirements for mitigation to ameliorate any impacts.

#### HABITAT SUITABILITY ASSESSMENT

##### Trees

- 2.2.2. In March 2019 trees were examined to identify Potential Roosting Features (PRFs) for bats. Examinations were conducted from the ground, using binoculars, endoscope, a high-powered torch and an at-height camera (PoleKam). Trees were mapped using a handheld mapping device with GPS functionality and photographs taken of each tree. All features identified and considered suitable for use by roosting bats were recorded and included a search for: decay (woodpecker holes; knot holes; flush cuts; tear-outs; double-leaders; wounds and cankers; and butt rot); damage (hazard-beams; frost cracks; subsidence, shearing and helical splits; lightning strikes; impact shatters; desiccation fissures; transverse snaps; and lifting bark); and associations (unions; ivy; and bird and bat boxes) in line with standard guidelines (**Ref. 2** and **Ref. 3**).



- 2.2.3. Any features suitable for roosting bats, were also examined for signs of roosting bats. These included a search for the presence of bat droppings, scratches, smoothing, staining, and flies in / around or below possible points of access / egress; presence of dead bats; distinctive odour of bats; and sightings of bats utilising binoculars and high-powered torches where required.
- 2.2.4. If the PRFs recorded were unable to be inspected from ground level, an aerial inspection was completed (where possible), led by experienced Natural England (NE) bat licensed ecologists and qualified tree climbers. Aerial inspections were completed using an endoscope and high-powered torch. The character, profile and suitability of PRFs to support a bat roost were recorded for all aerially inspected features, alongside the presence (or otherwise) of bats or evidence of bat use/occupancy.
- 2.2.5. Trees were assessed for their roost potential and categorised in line **Table 2-1** below, adapted from Collins (2016) (**Ref. 4**).
- 2.2.6. Where woodland blocks were present, the block as a whole was also assessed for its suitability to support roosting bats. Trees that were identified as having a higher suitability to support bat roosts than that of the surrounding woodland were recorded individually.
- 2.2.7. Trees identified as of moderate or high suitability to support roosting bats were subject to dusk emergence or pre-dawn return surveys to ascertain bat presence or use of identified features. Methods employed are detailed from **paragraph 2.2.12** below.

**Table 2-1 – Assessment of Tree Suitability for Roosting Bats**

Suitability	Description of Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by foraging bats.
Low	A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roost potential.	Habitat that could be used by small numbers of commuting bats such as a 'gappy' hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat.  Suitable, but not isolated habitat that could be used by small numbers of foraging bats such as alone tree (not in a parkland situation) or a patch of scrub.
Moderate	A tree with one or more potential roost sites that could be used by bats	Continuous habitat connected to the wider landscape that could be used

Suitability	Description of Roosting Habitats	Commuting and Foraging Habitats
	due to their size, shelter protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessment in this table are made irrespective of species conservation status, which is established after presence is confirmed).	by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitats.	<p>Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge.</p> <p>High quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree lined watercourses and grazed parkland. Site is close to and connected to known roosts.</p>
Confirmed roost	<p>Observation of bats (including emergence / re-entry).</p> <p>Fresh or old bat droppings; scratches, smoothing and staining around entrances; flies around entrances; dead juvenile bats; and sighting of bats.</p>	

### Buildings and Structures

- 2.2.8. Building assessments were conducted from ground-level during 2018 and 2019. The assessment included recording the height, width, use and constituent construction materials for each building and structure. In line with relevant guidance (**Ref. 3**), PRFs such as gaps in mortar or brickwork, lifted lead flashing, gaps behind cladding (including fascia and barge boards) were searched for and recorded where encountered with photographs and detailed descriptions of location. Evidence of the presence or use by bats, such as droppings, feeding signs, or sightings of bats was also recorded where present.
- 2.2.9. Habitat adjacent to buildings and structures was also assessed for its suitability for commuting and foraging by bats.

- 2.2.10. Buildings and structures suitable to support roosting bats were assessed and categorised as described in **Table 2-2** below, adapted from Collins (2016) (**Ref. 4**).
- 2.2.11. Buildings and structures containing features with low, moderate or high suitability to support roosting bats were subject to bat activity survey (dusk emergence or pre-dawn return) in 2018 / 2019. The results of these surveys are detailed below in **Section 4.2**.

**Table 2-2 – Assessment of Building Suitability for Roosting Bats**

<b>Suitability</b>	<b>Description of Roosting Habitats</b>	<b>Commuting and Foraging Habitats</b>
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).	Habitat that could be used by small numbers of commuting bats such as a ‘gappy’ hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat.  Suitable, but not isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessment in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitats.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge.

Suitability	Description of Roosting Habitats	Commuting and Foraging Habitats
		High quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree lined watercourses and grazed parkland. Site is close to and connected to known roosts.
Confirmed roost	Bats discovered roosting within the building or recorded emerging from / entering the building at dusk and / or dawn. Buildings found to contain conclusive evidence of occupation by bats, such as bat droppings. A confirmed record (as supplied by an established source such as the local bat group) would also apply to this category.	

### BAT DUSK EMERGENCE / PRE-DAWN RETURN SURVEY

- 2.2.12. Dusk emergence and dawn re-entry surveys of trees, buildings and structures with roost potential were carried out in 2018 and 2019 as described beginning paragraph 2.2.14. Dusk emergence surveys began 15 minutes before sunset and continued until 90 minutes after sunset. The dawn re-entry surveys began 90 minutes before sunrise and finished at 15 minutes after sunrise.
- 2.2.13. The surveyors used a bat detector (Batbox Duet, Echo Meter Touch, Batlogger, Anabat Scout) to listen to echolocation calls of bats observed and MP3 recorders (Roland and Song Meter 2, used with detectors without in-built recording capability) to record bat activity. During the survey, surveyors mapped the flight-lines used by bats observed and noted any features used by the bats to exit or enter buildings / trees / structures. Incidental records of bat activity in the vicinity of the surveyor locations were also collected.

#### Trees

- 2.2.14. Trees identified in March 2019 of moderate or high suitability to support roosting bats were subject to activity surveys during the 2019 active bat season (May to September inclusive). Those trees subject to activity survey are illustrated in **Figure 9.8: Trees Subject to Survey, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).
- 2.2.15. Bat activity surveys were conducted of trees with PRFs unsafe to access through aerial or tree-climbed inspection, those unable to be fully assessed from ground level or those with identified evidence of bat use/presence. In accordance with best practice guidelines (**Ref. 4**), the level of survey effort employed was proportional to the category of roost suitability apportioned to any individual tree following preliminary ground and aerial assessment. The

number and timing of survey visits is provided in **Appendix A, Table A-1** of this report. Surveyor locations were chosen to maximise viewshed of PRFs on trees.

### Buildings and Structures

- 2.2.16. Buildings and structures containing PRFs were subject to activity surveys during July and September 2018, and May and August 2019 in line with best practice guidelines (**Ref. 3**). This involved surveyors watching and listening for bats emerging from or returning to roost within the buildings (**Figure 9.9: Buildings Subject to Survey, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**)).
- 2.2.17. Survey effort was proportional to the suitability category afforded an individual building / structure in line with standard guidance (**Ref. 3**). **Table 2-3** details the level of survey effort required against each suitability category (adapted from Collins (2016) (**Ref. 4**)).

**Table 2-3 – Survey Effort Required**

Suitability	Number of Surveys	Timing of Survey
Negligible	No further surveys required	-
Low	One activity survey	May to August
Moderate	Two activity surveys	May to September with at least one of the surveys between May and August
High	Three activity surveys	May to September with at least two of the surveys between May and August

- 2.2.18. Roost suitability and buildings subject to surveys are detailed in **Table 4-4**. The number and timing of survey visits is provided within **Appendix A** of this report.
- 2.2.19. Akin to activity surveys of trees, surveyor locations were selected where viewshed of PRFs was maximised. These surveyor locations are shown in **Figure 9.10: Surveyor Locations, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).

### BAT BOX SURVEYS

- 2.2.20. Sixteen bat boxes were recorded within the Order Limits within woodland to the northern extent of Part B (central OS grid reference: NU 17110 21927). The location of the bat boxes is presented in **Figure 9.13: Bat Box Locations, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).
- 2.2.21. Boxes were initially subject to aerial inspection in May 2019 to ascertain the presence of bats or evidence of use by bats. Subsequently, owing to the confirmed presence of bats within a number of boxes during the initial survey, additional monthly inspections were completed to determine the full extent of use of boxes by bats.

2.2.22. All boxes were accessible by aerial inspection and were inspected monthly between May and September 2019 (inclusive) for the presence of roosting bats. Where bats were present outside the maternity season, they were identified in the hand to species level by an experienced licensed bat ecologist (licence no: 2019-38801-CLS-CLS). Any bats handled were identified to species level (where possible), weighed, forearm length measured, and sex determined, with this information all recorded for each individual bat. If bat droppings were present, samples were taken and sent away for DNA analysis by NatureMetrics.

### **MANUAL TRANSECT SURVEY**

- 2.2.23. Transect surveys were conducted to ascertain how bats moved through the Order Limits and Survey Area and determine any key commuting or foraging habitats. Three transect routes were devised following examination of aerial photography and Phase 1 habitat survey information provided by the baseline surveys completed (**Ref. 2**). Transect routes were distributed across the Bat Survey Area so as to sample the diversity of habitat types and quality present.
- 2.2.24. Transects were labelled: Transect 1 to Transect 3. Each transect incorporated up to 11, five-minute Point Count (PC) locations distributed in representative habitat and spread across each transect route.
- 2.2.25. A single transect survey was completed at dusk between June to October 2018, and April and May 2019, with a pre-dawn survey also completed in June 2018 within the same 24-hour period as a dusk survey. The transect surveys were carried out in accordance with current good practice guidance (**Ref. 4**). The direction and starting point was varied between months to avoid temporal bias in the results.
- 2.2.26. Each dusk transect began at sunset and continued for approximately 120 minutes afterwards. Pre-dawn surveys commenced 120 minutes before sunrise and terminated at sunrise.
- 2.2.27. During each transect the surveyors noted the bat species heard and seen, including the time, location, and where possible behaviour type and direction of flight. Surveyors were equipped with bat detectors (Batbox Duet, Batlogger M, Echo Meter Touch) to listen to echolocation calls of bats observed and MP3 recorders (Roland and SM2, used with those detectors without in-built recording capability) to listen to and record bat activity. Calls registered by the bat detectors were recorded for later analysis using specialist computer software details of which are provided below.
- 2.2.28. A plan showing the transect routes walked during the survey is provided in **Figure 9.11: Bat Transect Routes, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). Dates, times and weather conditions of each of the transect survey visits are provided in **Appendix A** of this report together with details of personnel who undertook the surveys.

## DEFRA LOCAL SCALE CROSSING POINT SURVEYS

- 2.2.29. Defra local scale surveys were undertaken during May and September 2018 at locations where bats could potentially cross the current A1 carriageway. Surveys were conducted to determine the extent of use of these locations by bats, latterly determining the importance of these locations for bats crossing the A1 carriageway and any requirements for mitigation. Surveys were conducted in accordance with Defra Local Scale Survey Guidelines (**Ref. 6**) and were designed to be repeatable during and following construction to provide comparable results to facilitate the monitoring of the effectiveness of any mitigation strategies employed.
- 2.2.30. Locations for potential bat Crossing Points (CP) were identified using aerial photography and Phase 1 habitat survey information (**Ref. 2**). Six CP locations were identified along the existing A1 carriageway (CP1-CP6) as illustrated on **Figure 9.14: Defra Local Scale Effect Surveys, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). At these locations' surveyors were positioned on either side of the road to determine "use" by bats, recording bat flight paths either over or under the road.
- 2.2.31. During the 2018 survey period a minimum of two surveys were carried out at each location to assess if bats "used" the feature. At any survey location where more than ten bats were recorded crossing the carriageway, survey effort would be increased to a total of six surveys. Locations where activity exceeded this threshold are considered to be "crossing points".
- 2.2.32. Dusk surveys began at sunset and continued until 60 minutes after sunset. Dawn surveys began 60 minutes before sunrise and finished at sunrise. Surveyors used bat detectors (Echo Meter Touch and iPads, Batbox Duets and Roland, Batlogger M) to listen to and record echolocation calls of bats observed. During the survey, surveyors mapped the flight-lines used by any bats observed, including the height at which bats crossed the road to determine whether it was in a potential collision zone (i.e. potential for collision with traffic moving along the carriageway). Incidental records of bat activity in the vicinity of surveyor locations was also collected.

## DEFRA LANDSCAPE SCALE TRANSECTS

- 2.2.33. In 2018 Defra landscape scale transect surveys were undertaken in order to comply with current best practice and provide a pre-construction baseline of bat activity and diversity at a landscape scale.
- 2.2.34. The survey methodology is designed at pre-construction so that survey efforts can be replicated during construction and post-construction. This allows for comparable analysis of all survey results. Whilst each survey effort is useful in its own right, the comparison of all results from each stage of construction helps determine the impact of Part B and mitigation employed, in relation to bats, at a landscape scale. All surveys were undertaken in accordance with current best practice methodologies (Berthinussen & Altringham, 2015) (**Ref. 5**).

- 2.2.35. Transect routes were identified following examination of aerial photography and Phase 1 habitat survey information (**Ref. 2**). Transects 1 km in length and perpendicular to Part B were identified, with 10-minute stationary spot checks located at 100 m intervals along the linear transect route from Part B. Transects were designed to avoid known maternity roosts or habitat considered to be optimal or of very low value to bats. This approach seeks to avoid habitat extremes that might hide or over-emphasise potential impacts of Part B. To avoid possible replication of results, transects were located over 500 m apart as illustrated in **Figure 9.11: Bat Transect Routes, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). A total of five transects were each surveyed twice, once walking away from the road and once walking towards the road, during 2018.
- 2.2.36. Weather conditions were recorded at each 10-minute spot check locations, along with the number of bat passes, start time, stop time, habitat grade (detailed in **Table 2-4**), path type and additional notes regarding activity (e.g. foraging or commuting).

**Table 2-4 – Habitat Grade Descriptions**

<b>Habitat Grade</b>	<b>Description</b>
1	Fence or wall lining road/path & open fields beyond
2	Hedges/shrubby verges lining road/path & open fields beyond
3	Intermittent medium trees/bushes lining road/path & open fields beyond
4	Intermittent tall trees lining road/path & open fields beyond
5	Continuous tall tree cover lining road/path with woodland &/ open fields beyond

### **AUTOMATED DETECTOR SURVEY**

- 2.2.37. In combination with the walked transect surveys, during 2018 and 2019, additional bat activity data was gathered using automated bat detectors. Static bat detectors (Wildlife Acoustic, Song Meter 4), were installed within the Bat Survey Area in pre-determined locations during each of the survey months June to October 2018 and April and May 2019. The locations of the automated detectors are shown on **Figure 9.12: Static Detector Locations, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).
- 2.2.38. Two detectors associated with habitats representative of each transect route were deployed each month in accordance with current good practice guidance i.e. for a minimum of five nights in each month (**Ref. 3**). Automated detectors were set to commence recording at least 30 minutes before sunset and cease recording 30 minutes after sunrise. Bat calls registered by static bat detectors were subsequently analysed using specialist computer software (Kaleidoscope Pro 5.1.3).



## 2.3. DATA ANALYSIS

### ECHOLOCATION ANALYSIS

- 2.3.1. Where possible, bat calls were identified to species level. However, species of the genus *Myotis* are grouped together in most cases as their calls are similar in structure and have overlapping call parameters, making species identification problematic (**Ref. 7**). For pipistrelle species the following criteria-based on measurements of peak frequency were used to classify calls:
- a. Common pipistrelle  $\geq 42$  and  $< 49$  KHz;
  - b. Soprano pipistrelle  $\geq 51$  KHz;
  - c. Nathusius' pipistrelle *Pipistrellus nathusii*  $< 39$  KHz;
  - d. Common / soprano pipistrelle  $\geq 49$  and  $< 51$  KHz; and
  - e. Common / Nathusius' pipistrelle  $\geq 39$  and  $< 42$  KHz.
- 2.3.2. In addition, the following categories were used for calls which could not be identified with confidence due to the overlap in call characteristics between species or species groups:
- a. Pipistrelle sp. (either Nathusius', common or soprano pipistrelle)
  - b. *Myotis* / *Plecotus* sp.; and
  - c. *Nyctalus* sp. (either Leisler's bat or noctule).
- 2.3.3. The recordings of bat echolocation calls collected during surveys were analysed using specialist computer software (Kaleidoscope 5.1.3, BatSound 4.2 or Anabat Insight). This analysis enabled confirmation of species or species group based on the acoustic bat call parameters above.
- 2.3.4. The relative activity of different species of bats is interpreted by counting the minimum number of bats recorded within discrete sound files in conjunction with surveyor notes made during any survey.

### DEFRA LOCAL SCALE SURVEYS

- 2.3.5. In accordance with the guidelines (**Ref. 3**), bat recordings were auto analysed using BatClassify (GPL, Version 3). This software identifies all bat calls to species level, where possible. The threshold for correct identification within BatClassify was a confidence score of  $>0.9$ . Anything below this threshold was manually checked.
- 2.3.6. Survey proformas were reviewed for each surveyor and each survey, to remove duplicate crossing events e.g. bats recorded crossing at the same time, height, distance and direction by more than one surveyor. These events were then assigned a species by comparing times between the data sheets and sound recordings. Data was then assessed to deduce whether bats were recorded crossing within 5 m of the existing, and if so whether this was at a "safe" or "unsafe" height from potential collision with traffic. The definition of safe and unsafe is adapted from the Defra guidance, where:
- a. A "safe" pass is at a height of over 5 m above ground level or at any height underneath a feature using an underpass; and

**b.** An “unsafe” pass is at a height of 5 m or lower above ground level.

- 2.3.7. The data was then assessed to obtain the total number of different species of bats using the feature and whether safe or unsafe passage height.
- 2.3.8. In line with Defra guidance, surveys utilising the same CP locations should be undertaken during construction and post-construction, with assessment through statistical analysis utilising all three sets of results (across the construction stages) completed.

### DEFRA LANDSCAPE SCALE TRANSECTS

- 2.3.9. Following recommendations within the guidelines (**Ref. 3**) acoustic data was analysed using BatClassify (GPL, Version 3) with a confidence value of >0.8 used to confirm that the auto analysis had correctly identified the bat pass. All passes with a confidence score <0.8 were analysed manually. All bat passes were checked visually using specialist analysis software (Bat Explorer) as a general quality assurance process (all files were checked against the corresponding sonogram, although not labelled if meeting the 0.8 threshold).
- 2.3.10. Following the surveys, the landscape scale transect data was analysed using Generalised Estimating Equations (GEE) in the R program<sup>1</sup> to determine whether there is an existing effect on bats associated with increasing distance from Part B.
- 2.3.11. The results of the analysis detail the standard error and significance of the distance from the Part B variable, and any other variables (e.g. time, distance, habitat grade) that have been found significant in the final model. The results are shown as a table along with the scale and correlation parameters. In line with Defra guidance (**Ref. 5**) the Wald statistic<sup>2</sup> and significance level are reported individually for the distance variable within the text.
- 2.3.12. The scale and correlations figure details the predicted difference of bat activity over the range of variables (time, distance, habitat grade) with distance from Part B for total bat activity. This shows the predicted percentage change in bat activity between 0 and 1,000 m from Part B using the following formula (included within the R package<sup>1</sup>).

$$\begin{aligned} & (\text{Predicted number of bat passes at } 100\text{m} \\ & \quad - \text{predicted number of bat passes at } 0\text{m}) \\ & \quad \times 100 \text{ predicted number of bat passes at } 0\text{m} \end{aligned}$$

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<sup>1</sup> R Version 3.3.2 (2016-10-31)

<sup>2</sup> The **Wald test** (also called the Wald Chi-Squared Test) is a way to find out if [explanatory variables](#) in a model are [significant](#). “Significant” means that they add something to the model; variables that add nothing can be deleted without affecting the model in any meaningful way; the output referred to as the ‘Wald statistic’.

## AUTOMATED DETECTOR SURVEY

- 2.3.13. Recordings (.wav format) of bat echolocation calls collected during the automated detector surveys were first converted and cut in to 10 second files before being analysed using automatic identification software provided within Kaleidoscope Pro 5.1.3. The analysis of each of these files enables identification and 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.
- 2.3.14. During the auto-identification process an analysis parameter was applied to filter out noise files. The settings used during the filter process are detailed in **Table 2-4**.

**Table 2-5 – Kaleidoscope Pro 5.1.3 Auto Identification Parameters**

Signal of Interest	
<b>Kilohertz</b>	5 – 150
<b>Milliseconds</b>	2 – 500
<b>Minimum number of calls</b>	2

- 2.3.15. Files that were filtered out using the parameters in **Table 2-4** were saved as ‘noise’ files and allocated to a separate storage folder. All files labelled as noise during the auto-identification process were saved and not included within the subsequent data counts.
- 2.3.16. All remaining sound files were either attributed to a particular bat species or classified as ‘NoID’ where the call parameters could not be identified by the Kaleidoscope Pro software. All calls that were not common pipistrelle *Pipistrellus* or soprano pipistrelle *Pipistrellus pygmaeus* were manually checked to verify the auto-species identification. Calls labelled as ‘NoID’ were manually checked to identify bat species where possible.
- 2.3.17. The sound analysis of common pipistrelle and soprano pipistrelle calls was streamlined to enable efficient processing. The match ratio (ranging between 0.01-1) for individual sound files provides an assessment of the number of calls ascribed to the primary auto-identified species. All recordings with a score of 0.89 or less were manually checked to identify all bat species present. Ten percent of calls above a 0.9 ratio indicated a high level of probability that a single bat species was present within the recording.
- 2.3.18. Confidence intervals (indicative values ranging from >0.01-1 with the higher number representing a more confident identification of the primary auto-identified species) were ranked for common pipistrelle and soprano pipistrelle. The 50 calls with the lowest confidence intervals were assessed. Where identification was incorrect these were then labelled correctly. The process of checking the least confident auto-identified calls was continued until at least 50 calls were auto-identified correctly.

2.3.19. Analysed bat calls were subject to Quality Assurance review under the following protocols:

- a. Second review of 10% of common and soprano pipistrelle calls; and
- b. Second review of 10% of all other species calls.

**Automated Detector, Bat Passes per Hour Methodology**

2.3.20. To allow standardisation and comparison of static detector survey results the number of bat passes recorded per hour (pph) was used as per current best practice, as detailed below:

$$\text{Bat pph} = \frac{\text{Total bat passes recorded at a Static detector location}}{\text{Number of hours static detector surveyed}}$$

2.3.21. This standardisation of pph compensated for the changes in seasonal night length and as such available bat foraging time and varying survey length due to battery life, occasional equipment malfunction and external factors (such as vandalism and theft). The pph measurement allows an unbiased comparison of static detector data.

2.3.22. This standardisation enabled comparison between the different bat species recorded, the level of activity at each static location and the level of activity recorded across the year. It should be noted that this survey type represents an index of bat activity at the static locations. It is not a measure of bat abundance.

### 3. ECOLOGICAL IMPACT ASSESSMENT METHODOLOGY

3.1.1. Ecological receptors were subject to nature conservation evaluation. Impact significance was then assessed taking into account the type and magnitude of potential impacts (including duration, extent and reversibility) and their consequent effects on important ecological receptors.

#### 3.2. NATURE CONSERVATION EVALUATION

3.2.1. Ecosystems, habitats and species are assigned levels of importance for nature conservation based on the criteria detailed within CIEEM guidance (Ref.7), IAN 130/10 (Ref. 8) and summarised in **Table 3-1** of this chapter. The rarity, ability to resist or recover from environmental change and uniqueness of an ecological receptor, function/role within an ecosystem and level of legal protection or designation afforded to a given ecological receptor are all factors considered in determining its importance. Consideration has also been given to the importance of the species or habitat and its conservation status at a geographic level taking population size, life cycle, rarity and/or distribution into account.

3.2.2. In addition, the importance of an ecological receptor takes into account any statutory or non-statutory designations, the intrinsic importance of the ecological receptor and whether it supports legally protected or notable species.

**Table 3-1 – Importance Criteria**

Importance	Criteria
International or European	<p>Ecosystems and Habitats - Ecosystems or habitats essential for the maintenance of:</p> <ul style="list-style-type: none"> <li>– Internationally designated areas or undesignated areas that meet the criteria for designation; and/or</li> <li>– Viable populations of species of international conservation concern.</li> </ul> <p>Species:</p> <ul style="list-style-type: none"> <li>– Species whose presence contributes to the maintenance of qualifying habitats, communities and assemblages that occur within internationally designated sites or within undesignated areas that meet the criteria for such designation.</li> <li>– Resident, or regularly occurring, populations of species that may be considered at an International or European level including those listed on Annexes II, IV and V of the Habitats Directive and Annex I of the Birds Directive, where:</li> <li>– The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or</li> </ul>

Importance	Criteria
	<ul style="list-style-type: none"> <li>– The population forms a critical part of a wider population at this scale; or</li> </ul> <p>The species is at a critical phase of its life cycle at this scale</p>
UK or National	<p>Ecosystems and Habitats - Ecosystems or habitats essential for the maintenance of:</p> <ul style="list-style-type: none"> <li>– Qualifying communities and assemblages that occur within nationally designated sites or within undesignated areas that meet the criteria for such designation; and/or</li> <li>– Viable populations of species of national conservation concern.</li> <li>– Areas of ancient woodland.</li> <li>– Habitats listed for their principal importance for biodiversity (Section 41 of the NERC Act 2006).</li> </ul> <p>Species:</p> <ul style="list-style-type: none"> <li>– Species whose presence contributes to:</li> <li>– The maintenance of qualifying habitats, communities and assemblages that occur within nationally designated sites or within undesignated areas that meet the criteria for such designation; or</li> <li>– The maintenance and restoration of biodiversity and ecosystems at a national level, as defined in the Natural Environment and Rural Communities (NERC) Act 2006 Section 41 requirements.</li> <li>– Resident, or regularly occurring, populations of species that may be considered at an International/European (as detailed above), National or UK level including those receiving legal protection (listed within Schedules 1, 5 and 8 of the WCA) or listed for their principal importance for biodiversity or conservation status, where:                         <ul style="list-style-type: none"> <li>– The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or</li> <li>– The population forms a critical part of a wider population at this scale; or</li> </ul> </li> </ul> <p>The species is at a critical phase of its life cycle at this scale</p>
Regional	<p>Ecosystems and Habitats - Ecosystems or habitats essential for the maintenance of:</p> <ul style="list-style-type: none"> <li>– Populations of species of conservation concern within the region.</li> </ul> <p>Species:</p> <ul style="list-style-type: none"> <li>– Species whose presence contributes to the maintenance and restoration of biodiversity and ecosystems within the region.</li> </ul>

Importance	Criteria
	<ul style="list-style-type: none"> <li>– Resident, or regularly occurring, populations of species that may be considered at an International, European, UK or National level (as detailed above), where:</li> <li>– The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or</li> <li>– The population forms a critical part of a wider population at this scale; or</li> </ul> <p>The species is at a critical phase of its life cycle at this scale.</p>
County	<p>Ecosystems and Habitats - Ecosystems or habitats essential for the maintenance of:</p> <ul style="list-style-type: none"> <li>– Populations of species of conservation concern within the authority area.</li> </ul> <p>Species:</p> <ul style="list-style-type: none"> <li>– Species whose presence contributes to the maintenance and restoration of biodiversity and ecosystems within a relevant area such as Northumberland.</li> <li>– Resident, or regularly occurring, populations of species that may be considered at an International, European, UK or National level (as detailed above), where:</li> <li>– The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or</li> <li>– The population forms a critical part of a wider population at this scale; or</li> </ul> <p>The species is at a critical phase of its life cycle at this scale.</p>
Local	<p>Ecosystems and Habitats - Ecosystems or habitats essential for the maintenance of:</p> <ul style="list-style-type: none"> <li>– Populations of species of conservation concern within the local area (for example a Local Nature Reserve).</li> </ul> <p>Species:</p> <ul style="list-style-type: none"> <li>– Species whose presence contributes to the maintenance and restoration of biodiversity and ecosystems at a local level.</li> <li>– Resident, or regularly occurring, populations of species that may be considered at an International, European, UK or National level (as detailed above), where:</li> <li>– The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or</li> </ul>

Importance	Criteria
	<ul style="list-style-type: none"> <li>– The population forms a critical part of a wider population at this scale; or</li> </ul> The species is at a critical phase of its life cycle at this scale.
Less than Local	Ecosystems or habitats that do not meet the above criteria, i.e., supporting at least populations of species of conservation concern within the local area

### 3.3. IMPACT ASSESSMENT

#### CHARACTERISATION OF POTENTIAL IMPACTS

- 3.3.1. CIEEM (Ref. 7) notes that impacts that are likely to be relevant in an assessment are those that are predicted to lead to significant effects (adverse or beneficial) on important ecological receptors. Significant effects are those that undermine the conservation status<sup>3</sup> of important ecological receptors. Knowledge and assessment of construction methods and operational activities, together with the ecological knowledge of ecologists with experience of similar large-scale infrastructure projects, has been used to identify the potential impacts of the project on ecological receptors.
- 3.3.2. Habitats and species that are considered to have a nature conservation importance of less than local are not considered important ecological receptors<sup>4</sup> in the context of this assessment. Any impact on such a feature as a result of Part B is considered unlikely to have a significant effect on the conservation status of such habitats or species on a local, regional, national or international scale. Therefore, features assessed to be of less than local nature conservation importance have been scoped out of the EclA.
- 3.3.3. Characterisation of potential impacts has considered the processes that could lead to effects on ecological receptors, using the range of standard parameters from IAN 130/10, as well as others deemed appropriate (informed by CIEEM's Guidelines). These included whether the impact was positive (beneficial) or negative (adverse), the probability of the

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<sup>3</sup> Conservation status for habitats is determined by the sum of the influences acting on the habitat and its typical species that may affect its long-term distribution, structure and function as well as the long-term distribution and abundance of its population within a given geographical area. Conservation status for species is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its population within a given geographical area.

<sup>4</sup> An ecological receptor is considered important based on many factors including its rarity, diversity, naturalness, context in the wider landscape, size and distribution as set out in A Nature Conservation Review (Ratcliffe, 1977).



impact occurring (certain, probable, unlikely), its complexity (direct, indirect, cumulative), extent, size, duration, reversibility and timing / duration.

### Significance of Effects

- 3.3.4. Having characterised importance and potential impacts, proposals for mitigation and compensation have been considered, with the aim of avoiding, preventing, reducing or, if possible, offsetting any identified significant adverse effects. After the application of mitigation proposals, where significant effects are likely to occur, the overall significance of the effect has been assessed.
- 3.3.5. IAN 130/10 does not prescribe a method for determining the significance of ecological effects but does propose significant effect categories which are aligned with other topic areas in the DMRB. These are Neutral, Slight, Moderate, Large or Very Large (Table 3 of IAN 130/10) and are reproduced in **Table 3-2** below.
- 3.3.6. In all instances, when determining the level of significance of the ecological effect, **Table 3-2** has been used as a guide in association with professional judgement (this is consistent with guidance in IAN 130/10). For example, an effect on a receptor of county level importance could be considered Large if a particularly high proportion of the county resource were to be affected. To determine whether an effect is significant or not, CIEEM's Guidelines was also considered (in lieu of comparable guidance in the DMRB).

**Table 3-2 – Significance Categories of Effects on Ecological Receptors**

Significance Category	Typical Descriptors of Effect (Nature Conservation)
Very Large	An impact on one or more receptor(s) of International, European, UK or National importance.
Large	An impact on one or more receptor(s) of Regional importance.
Moderate	An impact on one or more receptor(s) of County or Unitary Authority Area importance.
Slight	An impact on one or more receptor(s) of Local importance.
Neutral	No significant impacts on key nature conservation receptors.

### 3.4. MITIGATION

- 3.4.1. The principles of the mitigation hierarchy have been applied when considering potential impacts and subsequent effects on ecological receptors through the following sequential actions:
- a. Avoidance;
  - a. Mitigation;
  - b. Compensation; and
  - c. Enhancement.
- 3.4.2. For the purpose of this assessment, mitigation refers to measures that are considered essential to avoid and / or reduce negative impacts of Part B. Compensation refers to measures taken to make up for the loss of, or permanent damage to, biological resources through the provision of replacement areas. Unless otherwise stated, all compensatory measures are considered to be part of the essential mitigation package.
- 3.4.3. The mitigation measures described within this EclA have been incorporated into the design and construction programme and taken into account in the assessment of residual effects. The mitigation aims to avoid or negate impacts on ecological receptors in accordance with good practice guidance and UK, English and local government environmental impact, planning and sustainability policies. These mitigation measures include those required to achieve the minimum standard of established good practice together with additional measures to further reduce any negative impacts of Part B. The mitigation measures include those required to reduce or avoid the risk of committing legal offences.
- 3.4.4. Mitigation measures set out in the ES are specified as environmental commitments and secured via the **Outline Construction Environmental Management Plan (CEMP) (Application Document Reference: TR010041/APP/7.3)** in the contract documents to ensure implementation by the appointed the main Contractor.
- 3.4.5. Impacts that are not significant (including those where compliance with regulation is required) would be expected to be avoided or reduced through the application of the Outline CEMP and best working practice (e.g. mitigation of potential pollution impacts through adherence to standard best practice and guidelines). Significant ecological impacts are expected to be mitigated through a combination of best practice and typical, proven mitigation methods along with mitigation targeted to specific locations as described in the assessment.

### 3.5. ASSUMPTIONS AND LIMITATIONS

- 3.5.1. Ecological surveys are limited by factors which affect the presence of bats, such as the time of year, and behaviour of bats. Absence of evidence of any bat species should not be taken as conclusive proof that a species is absent or that it would not be present in the future. Limitations below are not considered to have negatively impacted the conclusions and/or mitigation prescribed within this appendix in respect of Part B.

- 3.5.2. Survey efforts reported herein which fall outside of the Bat Survey Area are a result of variances and refinements to Part B but are included for context. These differences do not impact the results of surveys and any recommendations are made in light of the current Bat Survey Area and Part B.
- 3.5.3. Where a precautionary approach has been employed, this is not considered to have been a constraint to the assessment of features within this appendix. Further surveys, including pre-construction surveys, would be undertaken with a view to updating baseline results (those informing this assessment), and informing requirements for any additional mitigation / licensing where required, to ensure construction of Part B remains compliant with legislation.

### **BROWN LONG-EARED BAT**

- 3.5.4. Due to the nature of their echolocation, brown long-eared bat *Plecotus auritus* may have been under recorded during surveys across Part B. The echolocation calls of brown long-eared bats are extremely quiet, with calls only registering when a bat is in close proximity to a recorder (**Ref. 6**) (typical characteristic frequency of 33 kHz). Brown long-eared bats glean prey from the surface of leaves and other surfaces, also catching prey mid-flight and do not regularly produce a 'feeding buzz' akin to other bat species. The species is common across the UK and therefore potential exists for the species to occur within the Bat Survey Area. Mitigation prescribed herein would benefit all bat species and any potential under-recording is not considered to have negatively impacted this assessment or its conclusions.

### **HIBERNATION SURVEYS**

- 3.5.5. Hibernation surveys have not been undertaken. A precautionary approach to evaluation has been adopted where suitable hibernation habitat has been identified. Precautionary values have been assigned to both known receptors and potential receptors based on the best available information. This is in order to ensure that all potentially significant effects of Part B have been identified.
- 3.5.6. The use of a precautionary approach is not considered to have negatively impacted the results or conclusions of this assessment.

### **TREES**

- 3.5.7. Due to grazing cattle being present during surveys in 2019, access to trees 3b, 4b, 5b, 6b, 12b was not possible and further surveys of these trees was not undertaken. A precautionary approach has been used in the assessment of those trees listed above, and this is not considered to have negatively impacted the conclusions or mitigation prescribed within this assessment.

### **BUILDINGS AND STRUCTURES**

- 3.5.8. During dusk emergence and pre-dawn return surveys of buildings B10B, B4B and B102B in 2018 and 2019, surveyors made observations of 'possible emergences'. Where this term has been used, a precautionary approach had been applied and a roost assumed. Any such

observations have been categorised as an emergence/re-entry and the required additional surveys undertaken in line with best practice guidelines (**Ref. 4**).

- 3.5.9. During a dawn survey on the 30 August 2018 at building B6B and dusk survey on the 5 September 2018 at building B6C, identification of emerging species could not be confirmed during subsequent data analysis due to corruption of sound files. In these circumstances the field surveyor's identification has been used. The assessment of the building and presence of roosting bats is still valid and subsequent surveys identified bats using these features as *Pipistrelle* sp.
- 3.5.10. An echolocation call for a 'possible emerging' bat recorded at building B4B during a dusk survey on the 14 August 2018 was not captured. During previous and subsequent further surveys, no roosting bats were seen so it is unlikely that this building is being used by roosting bats. The assessment of this building has not been affected by this limitation and conclusions in this assessment remain valid.
- 3.5.11. The presence of cattle within a field adjacent to a large barn building to the east of a holiday cottage at Heckley House (building HH6), prevented access and dusk emergence/pre-dawn return surveys of the building. This building would not be directly impacted by Part B, with any bats/roost present only subject to temporary and irregular disturbance associated with the construction and use of a new access to the north.
- 3.5.12. Given an absence of survey data, a precautionary approach has been used for the building and a roost assumed. This is not considered to have negatively impacted the results, conclusions or mitigation prescribed within this assessment.
- 3.5.13. No surveys were undertaken at a small barn south of Charlton Mires Farm (OS Grid Ref: 17824 20608), due to access restrictions and livestock being present. Following an external assessment from public rights of way and review of aerial/streetview imagery, the building does not appear to have suitability for roosting bats due to it being an open barn being used for sheltering livestock. In line with mitigation within this assessment, a pre-construction surveys would be undertaken to update the potential of buildings to support roosting bats. The use of an external assessment and aerial imagery to assess the barn is not considered to have negatively impacts the results, conclusions or mitigation prescribed in this assessment.

### **MANUAL TRANSECT SURVEYS**

- 3.5.14. Dusk transect surveys for Transect 3 in October 2018 and Transect 2 in June 2018 were not completed due to adverse weather conditions. These surveys could not be rescheduled. The absence of this data has been taken into account during analysis of the data to ensure comparability of the results and is not considered to have negatively impacted the conclusions of this assessment.
- 3.5.15. Transect 3 was rerouted from July 2018 onwards as cattle were present within the fields through which the transect route passed. Due to the relocation of cattle, Transect 3 was rerouted for surveys undertaken in April and May 2019. Transect 1 in September 2018 had a

minor adjustment to the route due to an unstable tree along the field margin, however, there was no change to stopping point locations or habitats included within the transect. Alteration to transect stopping points occurred in July 2018 for Transect 2, with stopping points 1 and 11 being moved due to the presence of horses. When required, alteration to transect routes was considered during analysis of data to ensure comparability of the results. This is not considered to have negatively impacted the conclusions of this assessment.

- 3.5.16. Stopping point counts of 10 minutes were conducted for all non-Defra transects during the August 2018 survey period. The data recorded during these surveys was appropriately adjusted to ensure comparability. Due to the extended point count timings, the August transect surveys took longer than the surveys undertaken during other months. The lengths of these surveys were still within the timing outlined within survey guidance, however, due to the difference in survey length full comparisons between survey months has been subject to limitation. Due to extensive survey efforts to assess bat activity for Part B, it is not considered that this limitation affects the validity of the data collected or the conclusions made within this report.

#### **DEFRA LOCAL SCALE TRANSECTS**

- 3.5.17. Health and safety considerations prevented surveyors accessing both sides of the A1 at the location of CP6 on 5 July 2018 and the survey was undertaken from the east side of the A1 only. Revised working methods resolved this limitation in the subsequent survey. Due to the low numbers of bats recorded at the crossing point in further surveys, the absence of data from one side is not considered to have negatively affected the conclusions of this assessment.
- 3.5.18. Recorder malfunctions resulted in no sound recordings being generated during surveys at CP1 on the 12 June 2018, CP2, on the 11 June 2018, and CP3 and CP4 on the 5 July 2018. Survey results have been informed from data collected through written survey proformas. As these surveys represent the initial surveys to verify the use of a potential crossing point, this approach was considered appropriate. If usage of the crossing point had reached the threshold, then additional surveys would have been required to overcome this limitation and provide necessary data required by the outline methodology. The use of survey proforma records is not considered to have negatively impacted the results or conclusions of this assessment.

#### **AUTOMATED DETECTOR SURVEYS**

- 3.5.19. Automatic detector data from location 4 for October 2018 was lost due to the SM4 unit being stolen. This survey data could not be repeated, and the data remains absent from the survey effort. Due to extensive survey efforts to assess bat activity for Part B, it is not considered that this limitation affects the conclusions made within this report.
- 3.5.20. During June 2018, there were minor differences to automatic detector deployment, with automatic detectors at location 1 and 2 being deployed on 18 June and location 3-6 deployed on 19 June. This minor variation is not considered to affect the validity or use of

the results. Furthermore, collection dates for the static were constrained by land access issues resulting in some detectors remaining at locations for excessive periods of time. This limitation has been addressed by restricting analysed data to the first five nights after deployment and is not considered to have negatively impacted the results or conclusions of this assessment.

### **DATA ANALYSIS**

- 3.5.21. It is not possible to definitely attribute registrations with calls between  $> 49$  and  $< 51$  kHz to either common pipistrelle (typical characteristic frequency of 45 kHz) or soprano pipistrelle (typical characteristic frequency of 55 kHz) and calls  $\geq 39$  and  $< 42$  kHz to either Nathusius' pipistrelle or common pipistrelle. Call sequences (registrations) within these parameters have thus been labelled as 'Pip sp.' Pipistrellus sp. for unknown pipistrelle where the surveyor completing the analysis could not confidently identify to species level.
- 3.5.22. It is not possible to definitely attribute the majority of *Myotis* calls to species level with absolute certainty. The species potentially present on site - Daubenton's bat *Myotis daubentonii*, Natterer's bat *Myotis nattereri*, Whiskered bat *Myotis mystacinus* and Brandt's bat *Myotis brandti* - have very similar call characteristics. Registrations from these species should only ever be described as possessing characteristics of calls that are most typical of a specific species. For the purposes of clarity, all calls belonging to this genus have been attributed to *Myotis* sp.

## 4. RESULTS

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### 4.1. DESK STUDY

- 4.1.1. A Phase 1 habitat survey was repeated in March 2019, with results compared with those of the 2017 Phase 1 Habitat Survey Report (**Ref. 2**). Habitats recorded during the updated Phase 1 habitat survey were consistent with those recorded and reported previously. Areas of woodland and linear features (including hedgerows and watercourses) suitable to support foraging, commuting, and roosting bats were recorded within and adjacent to the Order Limits.
- 4.1.2. A search of MAGIC returned records of 20 granted EPS licences within 5 km of Part B. These concern the following bat species. Some records concern multiple species:
- a. Common pipistrelle (11)
  - b. Soprano pipistrelle (12)
  - c. Whiskered bat (2)
  - d. Daubenton's bat (1)
  - e. Brandt's bat (3)
  - f. Brown long-eared bat (2)
  - g. Natterer's bat (4)
- 4.1.3. The closest granted licence (2014-1768-EPS-MIT) is located approximately 650 m north west of the Lionheart Enterprise Park Compound (eastern and western sites) in Alnwick and granted for common pipistrelle.
- 4.1.4. Four EPS licences pertaining to Natterer's bat were returned during the record search: EPSM2011-3272, EPSM2011-3289, 2016-21999-EPS-MIT and 2016-21999-EPS-MIT-1). These records were located at NU 2082 2479 (4.15 km east of the Part B Main Scheme Area), NU 2114 1841 (1.4 km east of the Part B Main Scheme Area) and NU 2048 0100 (3.15 km east of the Main Compound) respectively, with two licences granted at NU 2048 0100.
- 4.1.5. Data provided by ERIC North East returned 480 records of bats within 5 km of Part B for the 10-year period 2009-2019, comprising records of the following species and species groups:
- a. Brandt's bat (1)
  - b. Brown long-eared bat (49)
  - c. Common pipistrelle (133)
  - d. Daubenton's bat (3)
  - d. Long-eared bat species (1)
  - e. Nathusius' pipistrelle (1)
  - f. Natterer's bat (20)
  - g. Noctule *Nyctalus noctula* (42)
  - h. *Nyctalus* bat species (3)
  - i. Pipistrelle bat species (8)

- j. Soprano pipistrelle (127)
- k. Whiskered/Brandt's bat (41)
- l. Unspecified bats (51).

4.1.6. Of these records 126 were categorised as roosts, with two records classed as maternity roost. The species composition and number of roosts is provided within **Table 4-1** below

**Table 4-1 – Bat Roosts – Species Composition**

Bat Species/Species Group	Roost Count	Maternity Roost Count
Brandt's bat	1	-
Brown long-eared bat	22	1
Common pipistrelle	37	1
Natterer's bat	12	-
Soprano pipistrelle	37	-
Unspecified bat	8	-
Whiskered/Brandt's bat	9	-

- 4.1.7. The closest record to Part B was of an unspecified bat roosting within a farm dwelling located at NU 167 229 approximately 150 m west of Part B at its northernmost extent. Twenty-two roost records were counts of one individual bat. The largest recorded roost was of 347 soprano pipistrelle located at NU 20 14. Due to the imprecise location of the record, it is estimated to be approximately 150-1,500 m from the southern extent of the Part B Main Scheme Area.
- 4.1.8. Maternity roosts for brown long-eared bat and common pipistrelle were located at NU 17 00 (approximate 500 m north of the Main Compound) and NU 23334 11594 (approximately 3.15 km west of the Lionheart Enterprise Park Compound both eastern and western sites) respectively. No count data of bats at each of these roosts was provided.
- 4.1.9. Records of Natterer's bat were also returned during the desk study with the closest record for the species associated with a roost situated approximately 950 m north east of the Main Compound (grid reference: NU 18 00).
- 4.1.10. Records of two different roosts were returned from the above location, with counts of one and three individuals respectively. The largest Natterer's bat roost record returned within 5 km of Part B had a count of 10 individuals, approximately 5 km to the north east of the Main Compound.




## 4.2. FIELD SURVEYS

### TREE SURVEY RESULTS

- 4.2.1. A total of 70 trees and two woodlands contained PRFs and had suitability for use by roosting bats. These comprised:
- a. 24 assessed as of low suitability;
  - b. 33 with moderate suitability; and
  - c. 15 with high suitability.
- 4.2.2. Results provided in **Table B-1** and **Figure 9.8: Trees Subject to Survey, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). A single roost was confirmed during surveys; with survey information and roost locations provided in **Table 4-2**.
- 4.2.3. A noctule maternity roost was recorded in tree G02 during ground and aerial assessments. During activity surveys of the tree, over 80 bats were recorded emerging from the roost feature. After the last visible bat was seen leaving the roost, chattering was heard from within the feature, suggesting the number of bats roosting is much higher than that counted.

**Table 4-2 – Tree Roost Results**

ID	Description of Tree and Roost Location	Photographs of Tree
G02	Beech <i>Fagus sylvatica</i> tree located at NU 18588 16149. Large cavity on the main stem around 10 m high that leads to a large hollow that extends up within the tree. Noctule maternity roost present with over 80 bats roosting within (highlighted with red in photo).	

## BUILDING SURVEY RESULTS

- 4.2.4. A total of 43 buildings presented with bat roost suitability following external, ground-based assessment, and were subsequently subject to dusk emergence and pre-dawn return surveys in 2018 and 2019 to determine their use by roosting bats. **Table A-2, Appendix A** of this report provides full details of buildings surveyed and their suitability. **Table 4-3** provides a summary of building suitability.
- 4.2.5. Soprano pipistrelle, common pipistrelle and noctule were confirmed roosting within 12 buildings, with all buildings containing non-breeding summer roosts. These roosts were all located within 50 m of the Order Limits. As no hibernation surveys or assessments were able to be undertaken, a precautionary approach has been applied. All buildings with suitability for roosting bats within the Order Limits have been assumed to have suitability to support hibernation roosts.
- 4.2.6. Bat roosts recorded during surveys are summarised in **Table 4-5** below, with full details provided in **Table A-2, Appendix A** of this report. and illustrated on **Figure 9.9: Buildings Subject to Survey, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).

**Table 4-3 – Building Suitability Summary**

Suitability Prior to Surveys	Building
High suitability building	Charlton Mires Farm - Building complex - B6C, B6K, B6C, B6A, B6H
	B10B, B11B, B6B_1, B100B, B102B
	Heckley fence – Building complex - HF1, HF2, HH1, HH2, HH3, HH4, HH5, HH6
	South Farm – Building complex - SF1, SF2, SF3, SF4, SF5, SF6, SF7, SF8
Moderate suitability building	B4B, B8B, B101B
	Charlton Mires Farm - Building complex - B6G, B6J, B6N, C1, C2
Low suitability building	B1B, B5B, B105B
	Charlton Mires Farm - Building complex - B6B_2, B6E, B6F, B6L
Negligible suitability building	Charlton Mires Farm - Building complex - B6D, B6I, B6M, B7
	Heckley fence – Building complex - HF3

**Table 4-4 – Summary of Building Roost Locations**

<b>Building</b>	<b>Type of Roost</b>
B10B	Soprano pipistrelle – Non-breeding, summer roost
B4B	Unspecified bat – Non-breeding, summer roost
B102B	Common pipistrelle x 2 – Non-breeding, summer roost Common/soprano pipistrelle – Non-breeding, summer roost Noctule – Non-breeding, summer roost
B6C	Possible Common pipistrelle – Non-breeding, summer roost
B6K	Common pipistrelle x 2 – Non-breeding, summer roost
B6M	Common pipistrelle – Non-breeding, summer roost
HF1	Common/soprano pipistrelle – Non-breeding, summer roost
HH1	Soprano pipistrelle x 4 – Non-breeding, summer roost Nyctalus species – Non-breeding, summer roost
HH2	Soprano pipistrelle x 4 – Non-breeding, summer roost
HH3	Common pipistrelle – Non-breeding, summer roost Soprano pipistrelle – Non-breeding, summer roost
SF3	Common Pipistrelle – Non-breeding, summer roost Unspecified species, Possible common/soprano pipistrelle– Non-breeding, summer roost
SF5	Common Pipistrelle x 2 – Non-breeding, summer roost Soprano pipistrelle – Non-breeding, summer roost
Wall near SF5	Common pipistrelle – Non-breeding, summer roost Soprano pipistrelle– Non-breeding, summer roost

4.2.7. **Table B-2** and **Table B-3 Appendix A** of this report detail full results of initial building inspections, the results of dusk emergence and pre-dawn return surveys; and results of hibernation suitability assessments, including descriptions and photographs illustrating locations of roost features. **Table B-2, Appendix A** of this report includes the results from individual buildings originally assessed in 2016 and reported in the 2017 baseline report

(Ref. 1). **Figure 9.9: Buildings Subject to Survey, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) illustrates the locations of all buildings subject to survey and assessment.

### BAT BOX SURVEY RESULTS

- 4.2.8. Sixteen bat boxes were located within mixed woodland to the north of Part B (central OS grid reference: NU 17110 21927) (**Figure 9.13: Bat Box Locations, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**)). Droppings were recorded in the majority of the boxes during aerial tree climbed inspection first undertaken in May 2019. Results of inspections are provided **below**.
- 4.2.9. A single maternity colony of Natterer’s bat was recorded in May 2019 spread across two boxes (Green 82 and Red 60), located on the same tree in close proximity to each other. This colony had moved in June 2019 to another bat box (Green 101) located on the next adjacent tree, within 10 m of the former boxes.
- 4.2.10. Two single transitional soprano pipistrelles were recorded during surveys in July 2019 (Green 101) and August 2019 (Red 60). These bats were recorded in the same boxes in which Natterer’s bats were previously recorded in May and June 2019. A single soprano pipistrelle breeding roost was recorded in September 2019, with a total of ten bats roosting within the box (Green 86, one male, nine females).
- 4.2.11. Following collection of faeces samples from bat boxes in May 2019, DNA analysis results additionally indicated use of boxes by noctule, however, no individual bats were encountered during bat box inspections.
- 4.2.12. No evidence of roosting bats was recorded in: Green 50, Green 97, Green 84, Green 87, Green 45 and Green 0901 across all inspections.

**Table 4-5 – Bat Box Survey Results**

Bat Box ID	Evidence	Survey Month (Bats Recorded Only)
Green 108	Droppings	
Red 4	Droppings – DNA results soprano pipistrelle	
Green 104	Natterer’s bat (more than ten, not handled)	June
	One soprano pipistrelle	July
	Droppings	
Green 101	Droppings	

Bat Box ID	Evidence	Survey Month (Bats Recorded Only)
Green 86	Ten soprano pipistrelles (nine females, 1 male)	September
	Droppings – DNA results Natterer’s bat	
Green 0902	Droppings – DNA results Natterer’s bat	
	Droppings – DNA results noctule	
Green 0903	Droppings – DNA results Natterer’s bat	
Green 82	Fifteen Natterer’s bats* (all female)	May
Red 60	Ten Natterer’s bats* (all female)	May
	One soprano pipistrelle	August
	Droppings – DNA results Natterer’s bat	
*boxes immediately adjacent to each other, Natterer’s bats would likely be part of the same maternity colony		

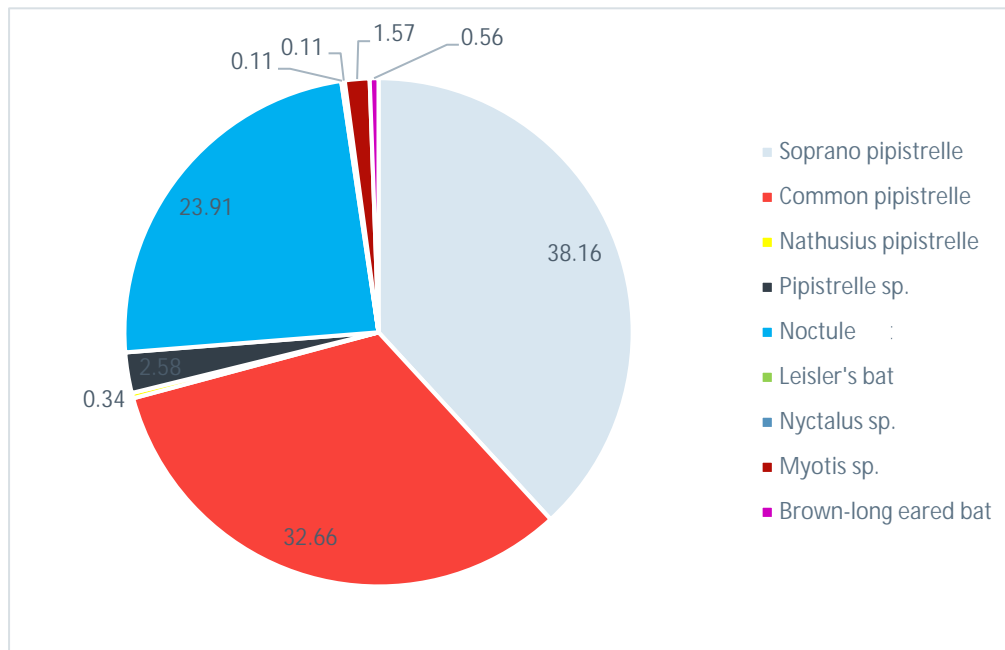
## MANUAL TRANSECT SURVEY RESULTS

- 4.2.13. During the 2018 and 2019 transect surveys a total of 891 bat calls were recorded from the following seven species / species groups: soprano pipistrelle, common pipistrelle, Nathusius’ pipistrelle, noctule, Leisler’s bat, *Myotis* species and brown long-eared bat. All seven species/species groups were additionally recorded at PC locations. Species recorded between PC locations have been omitted from the following graphs and analyses to allow comparable analysis of data between surveys and PC locations.
- 4.2.14. Analysis of transects is provided in the following charts and graphs with raw data provided in **Appendix C** of this report. Transect routes and PC locations are illustrated in **Figure**

**9.11: Transect Routes, Volume 6 of this ES (Application Document Reference: TR010041/APP/6.6).**

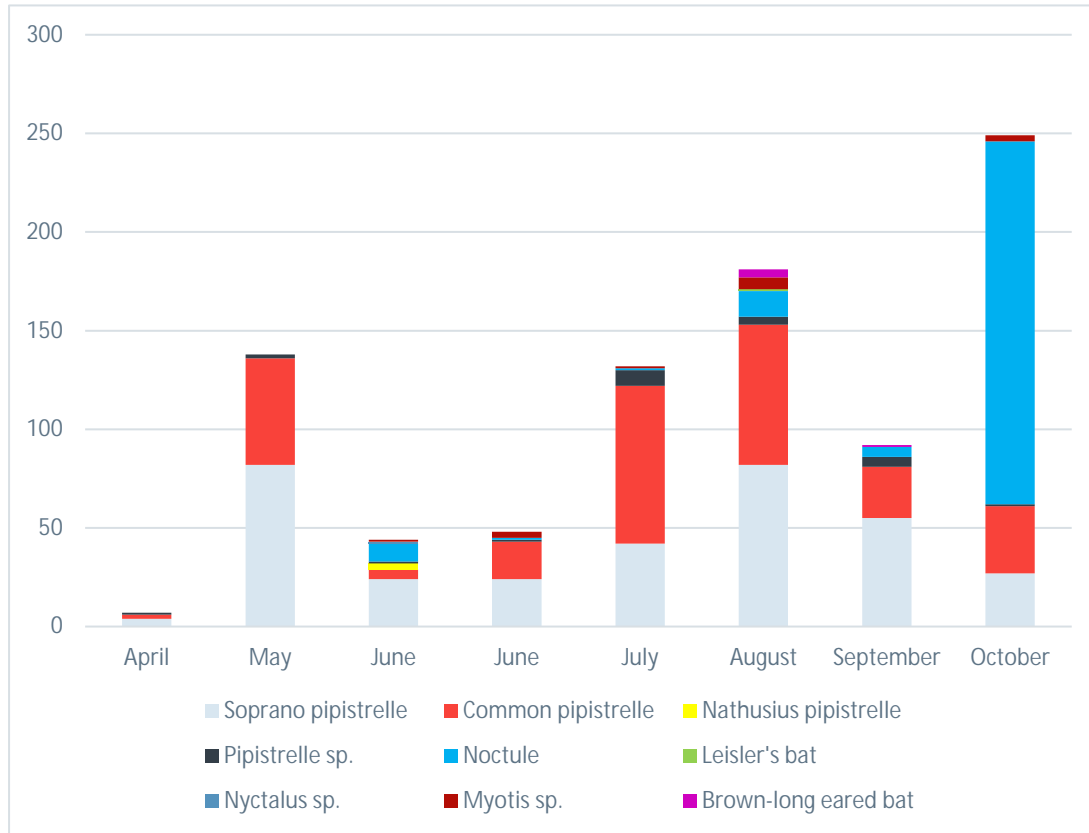
4.2.15. The most commonly recorded species across all transects was soprano pipistrelle, which constituted 38.16% of all bat passes recorded at PC locations. Common pipistrelle was the second most commonly recorded species, constituting of 32.66% of all bat passes recorded (**Chart 4-1**). Both soprano and common pipistrelle were recorded during each transect.

**Chart 4-1 – Percentage Breakdown of Bat Passes Recorded from Each Species during Bat Activity Transects Combined**



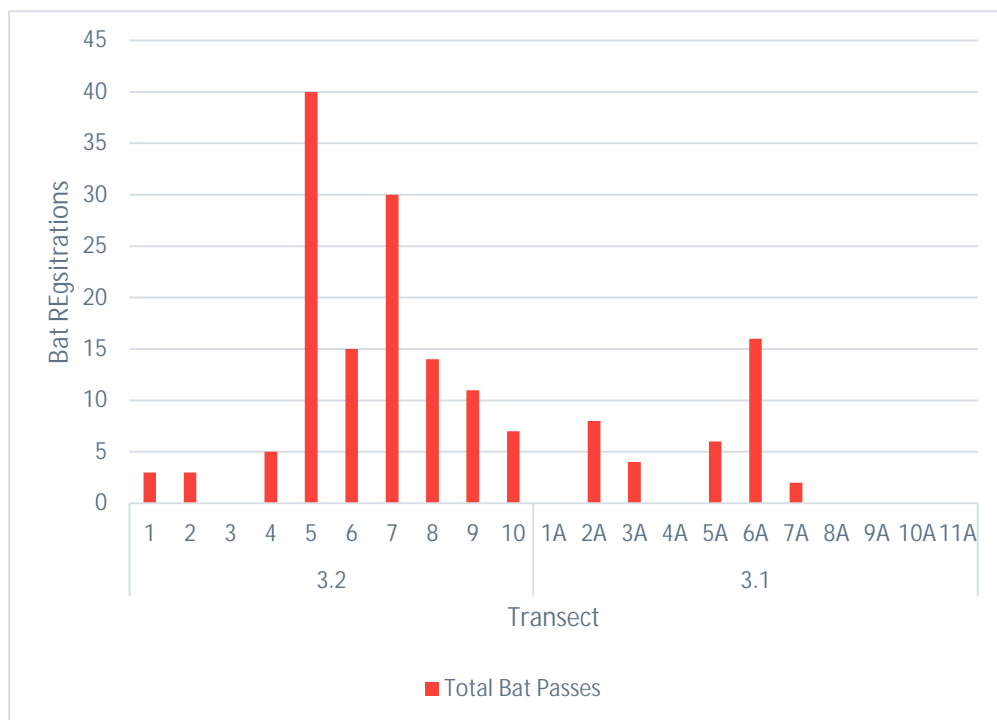
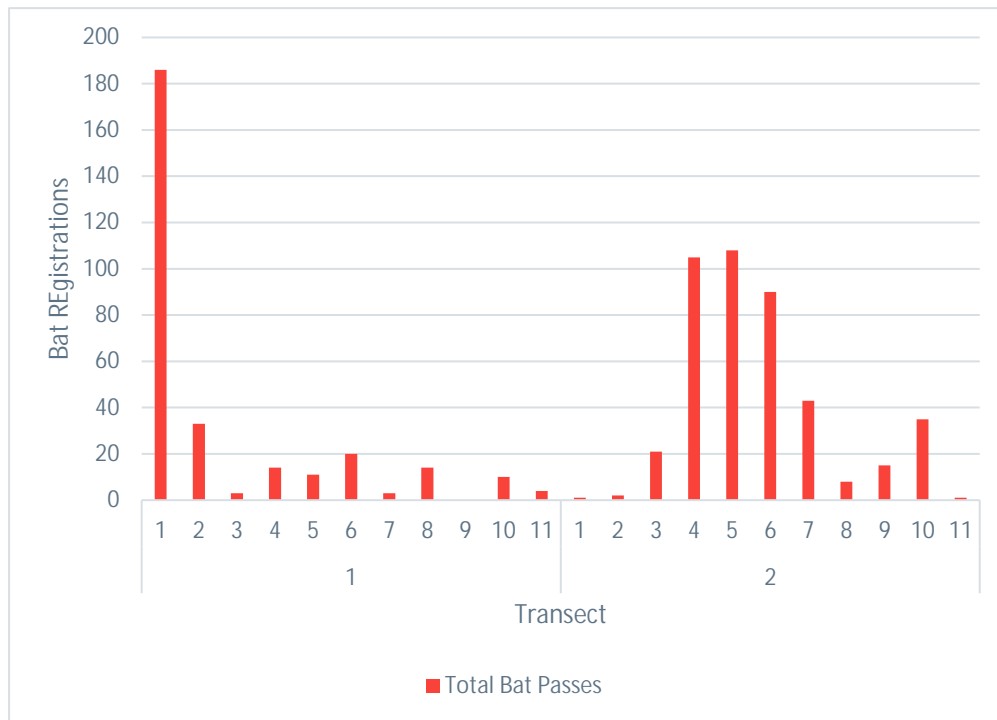
4.2.16. Bat activity levels were highest within the months of August 2018 and October 2018, and May 2019, with the lowest levels of bat activity being recorded in April 2019 (**Chart 4-2**). Bats were active throughout the active bat season with a range of bat species recorded commuting and foraging. The higher level of bat activity in October 2018 is attributable to a comparatively higher level of noctule activity recorded at PC 1 of Transect 1.

**Chart 4-2 – Seasonal Variations of Bat Activity Levels of each Species during the Combined Bat Activity Transects**



4.2.17. Bat activity was highest at PC locations along edge habitat (e.g. woodland edge). Within Transect 1, the highest level of activity was recorded along woodland at the start of surveys at PC1 and PC2. Activity was then lower as linear hedgelines and fences were followed but the linear habitat was not as prominent as the tree lines in Transects 2, 3.1 and 3.2. Transect 2 has a clear increase in activity levels at PC locations closer to woodland edge habitat (PC 4, 5, 6, 7 and 10).

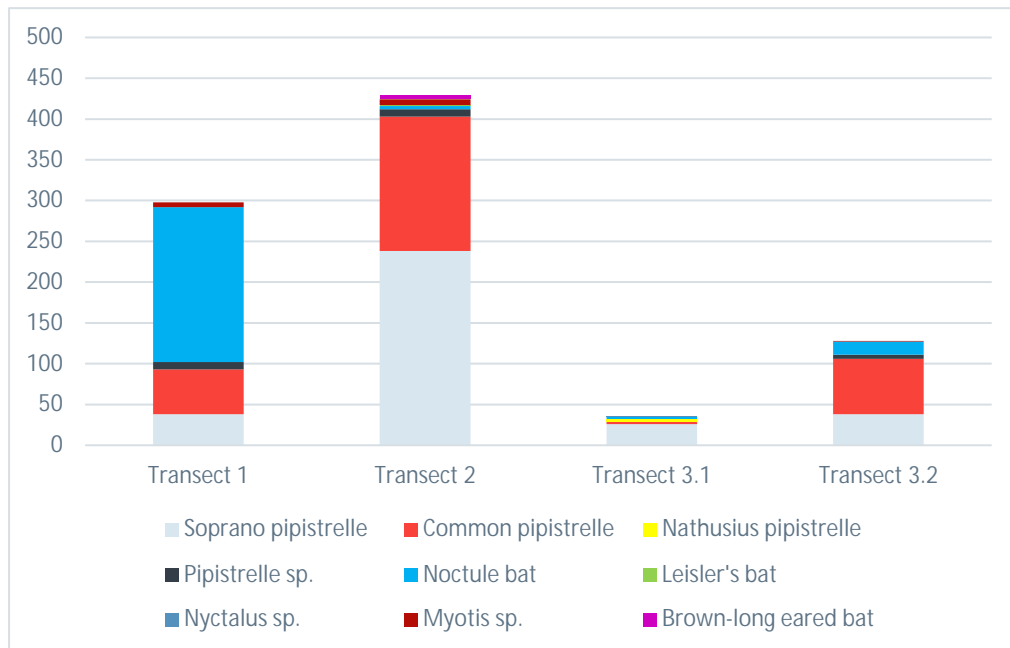
**Charts 4-3 – Bat Activity Level at each Point Count Location Separated by Transects**



4.2.18. Bat activity levels were highest for Transect 2 out of the four transects; and lowest for Transects 3.1 and 3.2. Bat activity per transect are represented in **Chart 4-4**.



**Chart 4-4 – Bat Passes per Transect**



**DEFRA LOCAL SCALE CROSSING POINT SURVEY RESULTS**

- 4.2.19. Crossing point survey locations are illustrated within **Figure 9.14: Defra Local Scale Effect Surveys, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). Crossing points with the highest levels of bat crossing activity have been summarised below.
- 4.2.20. **Table 4-6** summarises the results of the 2018 crossing point surveys, detailing the numbers of bats crossing the road at safe and unsafe heights, and showing the maximum number of bats counted during any one survey. The number of bats recorded at each individual crossing point fails to exceed the threshold of ten bats in a single survey.

**Table 4-6 – Summarised Crossing Point Survey Results**

<b>Crossing point</b>	<b>Species</b>	<b>Maximum Number of observed passes within 5 m of linear feature</b>	<b>Maximum Number of unsafe passes (0-5 m)</b>
1 (2 visits)	Soprano pipistrelle	1	1
	Pipistrelle sp.	2	0
	<i>Myotis</i> sp.	1	1
	Unknown sp.	2	1
2 (2 visits)	Soprano pipistrelle	0	0
	Common pipistrelle	1	0
	Noctule	1	0
	<i>Myotis</i> sp.	0	0
	Unknown sp.	3	1
3 (2 visits)	Soprano pipistrelle	4	0
	Common pipistrelle	5	2
	Nathusius' pipistrelle	1	1
4 (2 visits)	Soprano pipistrelle	2	2
	Common pipistrelle	3	2
	Noctule	2	2
	Unknown sp.	4	3
5 (2 visits)	Soprano pipistrelle	7	5

Crossing point	Species	Maximum Number of observed passes within 5 m of linear feature	Maximum Number of unsafe passes (0-5 m)
	Unknown sp.	1	0
6 (2 visits)	No bats recorded		

## DEFRA LANDSCAPE SCALE TRANSECT RESULTS

- 4.2.21. In 2018 a total of 733 bat passes were recorded comprising five different species/species groups during the Landscape Scale Transect Surveys. Transect routes are illustrated in **Figure 9.15: Defra Landscape Scale Effect Surveys, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). Soprano pipistrelle and common pipistrelle were the most abundant species, accounting for 43.4% and 41.1% respectively, of the total number of bat passes. Other species and species groups recorded included Myotis species, brown long-eared bat, and Nyctalus species.
- 4.2.22. The landscape scale transect with the highest activity levels was Transect 1, where a total of 196 bat passes recorded whilst walking away from the A1 carriageway and a total of 178 bat passes recorded while walking towards the A1 carriageway. **Table B-4, Appendix B** of this report presents full results of the Defra landscape scale transect surveys.
- 4.2.23. The only factor that had a significant effect on the number of bat passes was the time at which they were recorded. Results indicate that initially the number of bat passes increased with time, eventually hitting a peak, and then gradually decreasing with time (refer to **Chart 4-8 below**).
- 4.2.24. As described in Defra guidance (**Ref. 5**) this pattern of bat activity was observed both when walking away from the road (coefficient = 'Time (away)') (GEE, Wald  $x^2=11.1$ ,  $P<0.001$ ; **Table 4-7**) and towards the road (coefficient = 'Time (towards)') (GEE, Wald  $x^2=12.5$ ,  $P<0.001$ ; **Table 4-7**). The number of bat passes remained the same irrespective of changes in habitat grade (refer to habitat descriptions **Table 2-4**) and distance from the road, indicating the time relating to sunset / sunrise was the main factor in differences in activity levels.

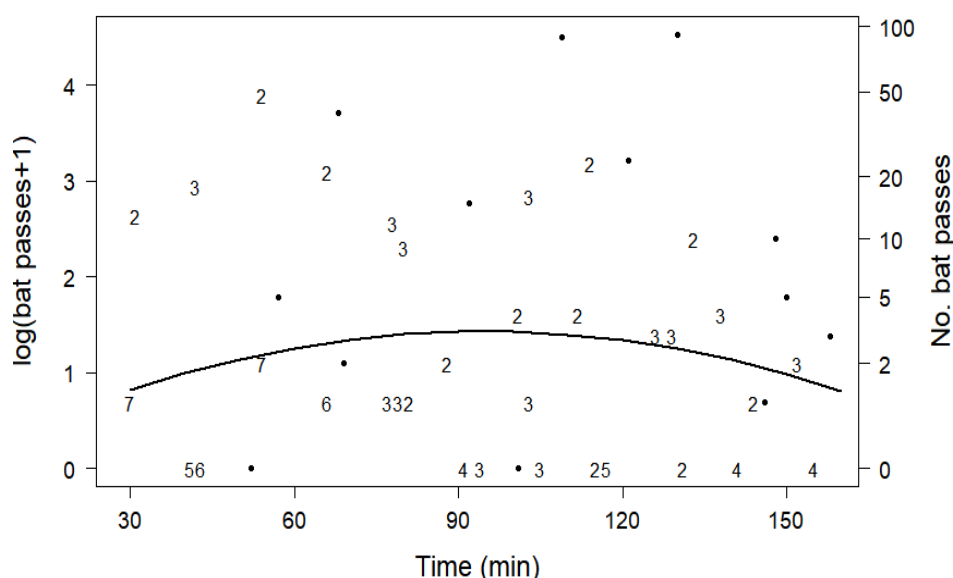
**Table 4-7 – GEE Results for Total Bat Activity (log (1 + number of Bat passes))  
 Species present per spot check)**

Coefficients	Estimate	Wald	Standard Error
Intercept	-0.184	0.2	0.409
Distance	0.000598	3.8	0.000307

Coefficients	Estimate	Wald	Standard Error
Time (away)	0.0278	11.1	0.00836
Time (towards)	-0.000147	12.5	0.0000415

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
 A variable has a significant effect when P < 0.05. This is shown by one or more stars '\*'.

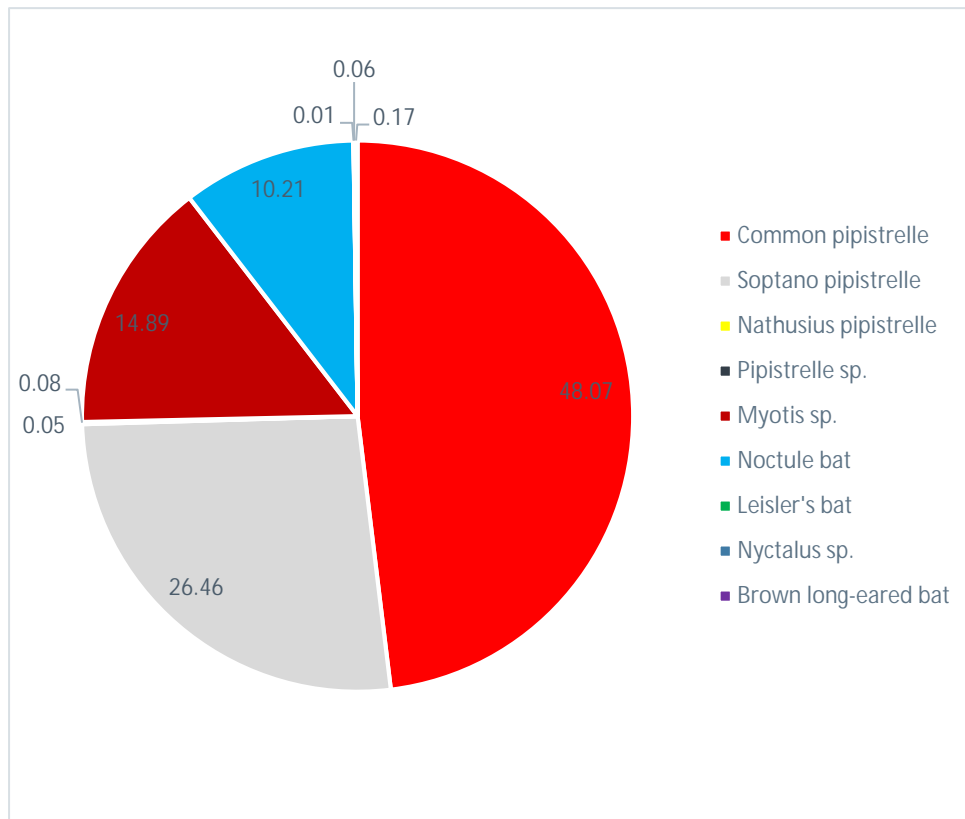
**Chart 4-8 – Effect of Distance from 0 – 1000m on Total Bat Activity with the Final GEE Model**



### AUTOMATED DETECTOR SURVEY RESULTS

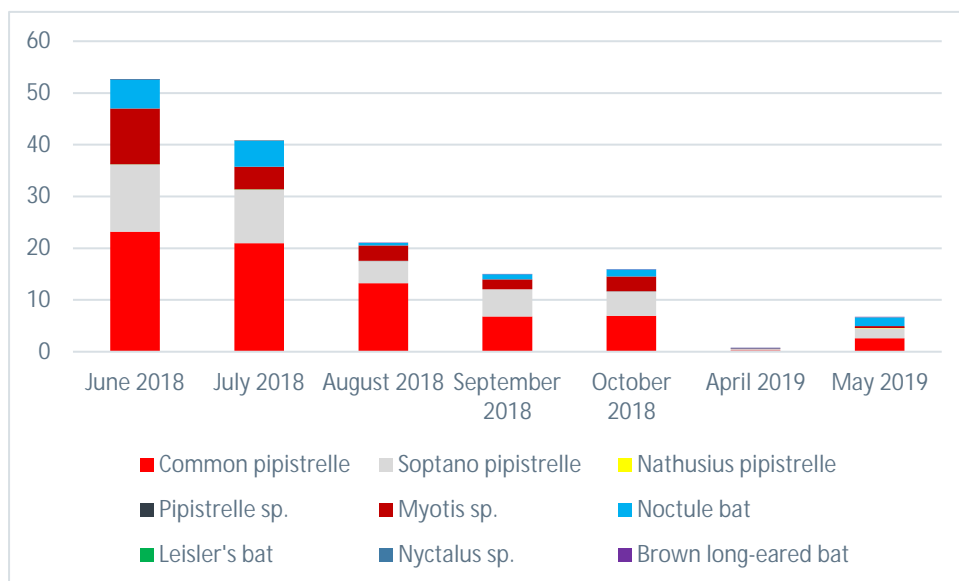
4.2.25. During the 2018 and 2019 automated detector surveys, bat calls were recorded from the following seven species / species groups: soprano pipistrelle, common pipistrelle, Nathusius' pipistrelle, noctule, Leisler's bat, brown long-eared bat and Myotis species (**Chart 4-5**). The most commonly recorded species was common pipistrelle, which constituted 48.07% of all bat registrations recorded. Soprano pipistrelle were the second most commonly recorded species, constituting of 26.46% of all bat registrations recorded (**Chart 4-5**). Both soprano and common pipistrelle were recorded at each static detector location.

**Chart 4-5 – Total Bat Registrations by Species**



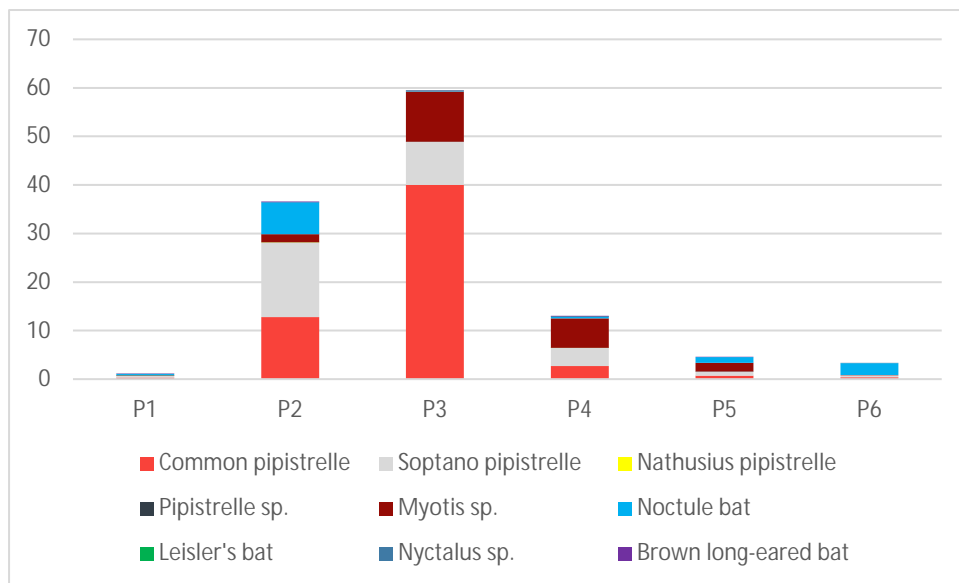
4.2.26. The peak levels of bat pph were recorded during June 2018 (peak activity season month), with the lowest levels of bat activity recorded in April 2019 (transitional period) (**Chart 4-6**).

**Chart 4-6: Activity (pph) by Survey Month**



4.2.27. The levels of bat activity varied between static detector locations, with static P3 (located at a crossing point in edge habitat) the most active static location with an average of 59.40 pph. The next detector with the next highest level of activity was static P2 (located between a woodland and two waterbodies) with an average of 36.57 bat pph (**Chart 4-7**). The lowest bat activity levels were recorded at P1 with only 1.11 bat pph (located in open habitat, set back from the A1 carriageway).

**Chart 4-7 Activity (pph) by Automated Detector Location**



## 5. CONSERVATION EVALUATION

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- 5.1.1. Results from the suite of surveys prescribed above have been used to inform the importance classification for individual bat species/species groups recorded. This is presented within **Table 5-1**. This is supplemented with classifications at the individual roost level within **Table 5-2**.

**Table 5-1 – Receptor Valuation and Rationale – Bat species**

Receptor	Importance	Rationale for Importance
Common pipistrelle	Local	Common pipistrelle was the second most recorded bat overall during surveys and are widespread and common throughout the UK ( <b>Ref. 9</b> ). Small numbers of roosting common pipistrelles were encountered during surveys and would be expected to be encountered frequently in the wider area beyond the Order Limits. No maternity colonies or mating roosts were recorded. Due to the species widespread distribution and common occurrence in the UK, individuals of this species are assessed to represent key roosting, foraging and commuting bats at a <b>Local</b> level.
Soprano pipistrelle	Local	Soprano pipistrelle was the most recorded bat overall during surveys and are widespread and common throughout the UK ( <b>Ref. 9</b> ). Small numbers of roosting soprano pipistrelles, along with one mating roost was encountered during surveys and they would be expected to be encountered frequently in the wider area beyond the Order Limits. No maternity colonies were recorded. Due to the numbers present within the region, and distribution throughout the UK, individuals of this species are assessed to represent key roosting, foraging and commuting bats at a <b>Local</b> level.
Brown long-eared bat	Local	Brown long-eared bats were one of the least recorded bat species overall during surveys and are widespread and common throughout the UK ( <b>Ref. 9</b> ). The absence of recorded data for brown long-eared bats is common due to the nature of their echolocation being very quiet or non-existent and often the species is under recorded. No roosts were recorded within the Bat Survey Area. Due to the small numbers of bats recorded during surveys, (with that number skewed by the difficulty of recording the species), individuals of this species are assessed to represent key roosting, foraging and commuting bats at a <b>Local</b> level.
Leisler's bat	Local	Leisler's bats were the least recorded bat species overall and are widespread within England, Wales and southern Scotland but are rarer throughout their distribution range ( <b>Ref. 9</b> ). No roosting bats were recorded during surveys. The low numbers of recorded bats may be slightly higher due to a potential overlap with noctules with some recordings analysed identified as <i>Nyctalus</i> species only due to analysts not being able to confidently categorise calls to either species. Following a precautionary approach, bats/calls identified as <i>Nyctalus</i> species have been included within the count of Leisler's bat passes. The overall valuation of individuals of this species are assessed to represent roosting, foraging and commuting bats at a <b>Local</b> level.
Nathusius' pipistrelle	County	Nathusius' pipistrelle was the second least recorded bat overall during surveys. The species is widespread within the UK but population numbers decrease progressively in line with more northern latitudes ( <b>Ref. 9</b> ). Population numbers within Alnwick are most likely at a level with which to consider this a Rare or Rarest species. Limited numbers of Nathusius' pipistrelle were encountered during surveys and no Nathusius' pipistrelle roosts were recorded within the Bat Survey Area. Due to the small numbers of bats recorded, their considered 'rare' status for the region, and the transient nature of their roosting habits making discoveries of roosting Nathusius' challenging; individuals of this species are assessed to represent key roosting, foraging and commuting bats at a County level ( <b>Ref. 3</b> ).
<i>Myotis</i> species	County	<i>Myotis</i> bats were the third most recorded bat species overall and are widespread but rarer throughout the UK ( <b>Ref. 9</b> ). Only Natterer's bats were confirmed roosting during surveys and this valuation does not take these maternity roosts into consideration (these have been assessed separately). It is difficult to analyse the calls of <i>Myotis</i> bats down to species level. Natterer's bats are confirmed due to the present of the roosts above and Daubenton's and whiskered / Brandt's bats are known to occur within Northumberland. Individuals of the <i>Myotis</i> species group are assessed to represent key roosting, foraging and commuting bats at a <b>County</b> level.
Natterer's bat	Regional	Natterer's bat maternity colonies were recorded within bat boxes to the north of Part B. Analysing bat bioacoustics data of <i>Myotis</i> species down to individual species level is incredibly difficult as the overlap between <i>Myotis</i> species is quite large ( <b>Ref. 6</b> ). Therefore, generally species of <i>Myotis</i> were not separated to species level during data analysis process. Thus, specific levels of Natterer's bat recorded are unknown past the maternity roosts recorded. Natterer's bat are widespread within the UK but are a rarer species ( <b>Ref. 9</b> ). Owing to the identification of maternity roosts, individuals of this species are assessed to represent key roosting, foraging and commuting bats at a Regional level.
Noctule	Regional	Noctules were the fourth most recorded bat species overall and are widespread within England, Wales and southern Scotland but are rarer throughout their distribution range ( <b>Ref. 9</b> ). A large maternity roost of a significant number was recorded along with droppings within a bat box, and a single noctule emerging from a roost. Due to their large size and increased flight speed, noctules can fly a great distance. This means that the maternity roost is important for this colony of bats. Due to them being a



Receptor	Importance	Rationale for Importance
		rarer species, it is highly unlikely that another maternity colony is present within the Order Limits or Study Area. Noctule are known, like other predominantly tree roosting species, to be transient. Their transient nature is dependent on weather, the feature they are roosting within and the roost type. They have been recorded to change roosts every 10-15 days, which means features within the surrounding area may also be used opportunistically for roosting ( <b>Ref. 3</b> ). Owing to the presence of a substantial maternity colony and established roost, individuals of this species are assessed to represent key roosting, foraging and commuting bats at a Regional level.

**Table 5-2 – Receptor Importance and Rationale – Individual Roost**

Importance	Feature	Rationale for Importance
Local	Building - B10B - Soprano pipistrelle – Non-breeding Building - B102B - Common pipistrelle/soprano pipistrelle x 3 – Non-breeding Building - B6C - Common pipistrelle – Non-breeding Building - B6K - Common pipistrelle x 2 – Non-breeding Building - B6M - Common pipistrelle – Non-breeding Building - HF1 - Common/soprano pipistrelle – Non-breeding Building - HH1 - Soprano pipistrelle x 4 –Non-breeding Building - HH2 - Soprano pipistrelle x 4 – Non-breeding Building - SF3 - Common pipistrelle – Non-breeding Building - SF5 - Common pipistrelle x 3 and soprano pipistrelle x 3– Non-breeding Bat box – Red 4 - Soprano pipistrelle – Droppings Bat box - Green 104 - Soprano pipistrelle – Non-breeding Bat box – Green 86 - Soprano pipistrelle – Mating roost Bat box – Red 60 - Soprano pipistrelle – Non-breeding	Roosts recorded within buildings / bat boxes comprising individual or small numbers of bats or mating roosts of a common species. Aside from a sole mating roost of a common bat species, these have been assessed as transient, non-breeding roosts of common bat species in features which are abundant in the local area ( <b>Ref. 9</b> ).
County	Building - B4B - Unknown species – Non-breeding Building - B102B – Noctule – Non- breeding Building - HH1 - <i>Nyctalus</i> sp. – Non-breeding Building - SF3 - Unidentified species – Non-breeding Bat box - Green 108 - Unidentified bat – Droppings Bat box - Green 104 - Unidentified bat – Droppings Bat box – Green 101 - Unidentified bat – Droppings Bat box – Green 86 - Natterer’s bat – Droppings	Roost recorded within these buildings / bat boxes were confirmed through presence of individual bats or the presence of bat droppings. These have been assessed as transient non-breeding roosts of rarer bat species ( <b>Ref. 9</b> ).  As a precautionary approach, unknown species have been assessed as rarer species due to the confirmed presence of rarer species within the Study Area.

Importance	Feature	Rationale for Importance
	Bat box – Green 0902 - Natterer’s bat and noctule – Droppings Bat box – Green 0903 - Natterer’s bat – Droppings	
Regional	Tree - G02 - Noctule - maternity roost	Confirmed roost recorded within a beech tree comprising a maternity colony of over 80 noctule bats. Noctule are considered a rarer species ( <b>Ref. 9</b> ) within England and the size of this roost is unlikely to be matched within the local area.
	Bat box - Green 104 - Natterer’s bat – Maternity colony Bat box – Green 82 - Natterer’s bat – Maternity colony Bat box – Red 60 - Natterer’s bat – Maternity colony	Roosts confirmed through direct presence of bats during close proximity, internal visual inspection of bat boxes. Roosts have been assessed as maternity roosts of a rarer bat species in features of a limited resource within woodland within the Order Limits.

## 6. POTENTIAL IMPACTS

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### 6.1. CONSTRUCTION

6.1.1. During construction bats and their roosts may be temporarily or permanently affected as a result of the following:

- a. Loss of transitory roosts utilised by soprano pipistrelle, common pipistrelle and noctule associated with the demolition of buildings to accommodate the new Charlton Mires Junction
- b. Disturbance and effective 'loss' of roosts associated with the required translocation of bat boxes with known breeding, maternity and transitory bat roosts
- c. Disturbance to bat roosts, including a noctule maternity roost, through construction affiliated activities and vehicle movements
- d. Habitat fragmentation affecting commuting and foraging habitat through clearance of land to facilitate construction
- e. Habitat degradation through pollution, discharge of materials or hydrological impacts
- f. Injury/mortality from tree felling and direct collision with traffic

### 6.2. OPERATION

6.2.1. During operation bats and their roosts may be affected as a result of the following:

- a. Disturbance of individuals within roosts due to road noise levels;
- b. Disturbance of individuals whilst commuting and foraging due to road noise levels and light from traffic movements;
- c. Direct mortality through potential collisions with traffic movements whilst crossing the widened carriageway; and
- d. Habitat degradation, severance and fragmentation associated with the widening of the A1 carriageway, junctions, access tracks and inclusion of roadside lighting.

## 7. MITIGATION

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- 7.1.1. The mitigation measures described below feed into a larger list of prescribed measures that would be implemented during construction of Part B. A full list is provided in technical **Chapter 9: Biodiversity, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) and located within the **Outline CEMP (Application Document Reference: TR010041/APP/7.3)**.
- 7.1.2. Those measures that are of relevance to bats have been extracted and are provided in **Table 7-1** below alongside Part B-wide delivery mechanisms and preliminary activities, that whilst not specifically pertaining to the protection of bats, span all receptors and best practice for Part B construction.
- 7.1.3. Part B mitigation measures are illustrated in **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).

**Table 7-1 – Design and Mitigation Measures and their Delivery Mechanisms**

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
<b>Delivery Mechanisms and Preliminary Activities</b>						
Delivery Mechanism and Preliminary Activity	EC01	Throughout Part B	Pre-Construction	All permits and assents would be requested and granted prior to the commencement of works. This may include for example, but not limited to, an Environment Agency Permit for works in and around watercourses.	To protect sites, habitats and fauna.	Natural England/Environment Agency
Delivery Mechanism and Preliminary Activity	EC02	Throughout Part B	Pre-Construction	Pre-construction surveys would be undertaken to verify and, where required, update the baseline ecological conditions set out in this ES. The scope of the pre-construction surveys would be discussed with Natural England prior to being undertaken and would be specific to each ecological receptor under consideration.	To update the baseline ecological conditions set out in this ES.	Natural England
Delivery Mechanism and Preliminary Activity	EC03	Throughout Part B	Pre-Construction	<p>Prior to construction a suitably qualified (or team of suitably qualified) Ecological Clerk of Works (ECoW) and a named bat licensed ecologist would be appointed and would be responsible for implementation of the Ecological Management Plan (EMP) and measures within the <b>Outline CEMP (Application Document Reference: TR010041/APP/7.3)</b> and subsequent CEMP prepared by the main contractor. The ECoW would:</p> <ul style="list-style-type: none"> <li>– Provide ecological advice over the entire construction programme, at all times as required;</li> <li>– Undertake or oversee pre-construction surveys for protected species in the areas affected by Part B;</li> <li>– Monitor ecological conditions during the construction stage to identify additional constraints that may arise as a result of natural changes to the ecological baseline over time.;</li> <li>– Provide an ecological toolbox talk to site personnel to make them aware of ecological constraints and information, identify appropriate mitigation developed do minimise impacts and make site personnel aware of their responsibility with regards to wildlife. The toolbox talk would include, as required, all ecological receptors considered within this ES;</li> <li>– Monitor the implementation of mitigation measures during the construction stage to ensure compliance with protected species legislation and commitments within this ES.</li> </ul>	To ensure the implementation of the EMP.	None required

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
				The ECoW would have previous experience in similar ECoW roles, be approved by the Applicant, and be appropriately qualified for the role. The ECoW would be appointed in advance of the main construction programme commencing to ensure pre-construction surveys are undertaken and any advance mitigation measures required are implemented.		
Delivery Mechanism and Preliminary Activity	EC04	Throughout Part B	Pre-Construction	The main contractor would obtain and comply with the requirements of any protected species derogation licences in respect of works that have the potential to breach applicable conservation legislation necessary to construct Part B. Licensing may be for UK and/or European protected species.	To comply with conservation legislation.	Natural England
Delivery Mechanism and Preliminary Activity	EC05	Throughout Part B	Pre-Construction & Construction	Any tree felling would be carried out by experienced main contractors to reduce direct mortality of protected species according to agreed felling methods between the main contractors and the ECoW.	To protect fauna during removal of habitat.	None required
Delivery Mechanism and Preliminary Activity	EC06	Throughout Part B	Pre-Construction	A pre-commencement inspection by the ECoW would be undertaken within woodland prior to any felling to confirm the absence of dreys between February to September. Where deemed necessary, felling would be supervised by the ECoW.	To protect red squirrel.	None required
Delivery Mechanism and Preliminary Activity	EC07	Throughout Part B	Pre-Construction and Construction	Implementation of and adherence to the measures contained within the <b>Outline CEMP (Application Document Reference: TR010041/APP/7.3)</b> that details efforts taken to avoid, minimise and reduce impacts as a result of Part B construction. This is considered particularly important for works in and around watercourses. This includes measures to avoid disturbance of sensitive species and habitats by noise, dust and air pollution.  A pre-commencement walkover survey would be undertaken to confirm the absence of invasive non-native species. Should invasive species be recorded within the construction area, this would be addressed through implementation of the Biosecurity Method Statement (EC08), to be developed at detailed design. These measures have been included within the Outline CEMP.	To protect flora and fauna.	None required
Delivery Mechanism and	EC08	Throughout Part B	Construction	Given the presence of Schedule 9 invasive non-native species, a Biosecurity Method Statement would be developed and implemented throughout construction. The Method Statement would detail the location and extent of any invasive species or	To prevent the spread of invasive species.	None required

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
Preliminary Activity				other biosecurity concerns, appropriate measures to control or eradicate the species from an area (if applicable), measures to prevent the spread of the species and good site hygiene practices (such as 'Check, Clean, Dry' ).		
<b>General Mitigation</b>						
General	EC09	Throughout Part B	Pre-Construction & Construction	Site/ vegetation clearance and tree felling would be kept to a minimum and only where essential to facilitate construction, to reduce the impacts of habitat loss and fragmentation. Areas of clearance, particularly those within temporary works, shall be identified within a method statement and agreed with the ECoW.  Site clearance of dense vegetation would be undertaken carefully (use of hand tools) and by experienced main contractors to reduce the risk of mortality to wildlife. Care should be afforded to dense stands of bramble or similar vegetation, which may be used by sheltering hedgehog or other wildlife, particularly during the winter months.	To reduce the impact to fauna and flora.	None required
General	EC10	Throughout Part B	Pre-Construction, Construction & Post-Construction	Plant and personnel would be constrained to a prescribed working corridor through the use of, where practicable, temporary barriers to minimise damage to habitats and potential direct mortality and disturbance to animals located within and adjacent to the Order Limits.	To protect habitats and fauna.	None required
General	EC11	Throughout Part B	Pre-Construction & Construction	Stand-off distances around watercourses and other sensitive habitats (such as woodland) would be implemented prior to commencement of works and clearly demarked on site through the use of physical barriers (fencing, tape or similar). The buffer around trees/ woodland/ hedgerows would be in accordance with good practice to take into account root protection zones.	To protect habitats and fauna.	None required
General	EC12	Throughout Part B	Construction	Works during the construction period would be undertaken during daylight hours (07:00 to 19:00), Monday to Friday to reduce the impact to nocturnal and crepuscular species; particularly bats, barn owl and badger. However, extended hours, including nighttime, would be required for some construction operations. Should night working be required, this would be discussed with the ECoW and appropriate mitigation put in place (particularly concerning lighting). Appropriate mitigation would be determined by the ECoW but is likely to include:	To reduce disturbance impacts during construction.	None required

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
				<ul style="list-style-type: none"> <li>- Avoidance of direct lighting on any buildings or trees that contain bat roosts or barn owl nest/ roost sites;</li> <li>- Avoidance of artificial lighting of watercourses, particularly during the hours of darkness to prevent impacts to fish behaviour or passage;</li> <li>- Avoidance of light spill using directional and or baffled lighting;</li> <li>- The use of movement triggers, thus lighting only turns on when people (large objects) move through the area (use within compound);</li> <li>- Reducing the height of lighting columns to reduce light spill onto adjacent habitats;</li> <li>- Variable lighting regimes (VLR) - switching off when human activity levels are low i.e. 21:00 to 05:30;</li> <li>- Avoid use of blue-white short wavelength lights and high UV content. Work during hours of darkness would be avoided as far as practicable and where necessary directed lighting would be used to minimise light pollution/glare;</li> <li>- Temporary lighting used for construction would be switched-off when not in use and positioned so as not to spill on to adjacent land, sensitive receptors or retained vegetation within the area surrounding the works;</li> <li>- Directed lighting would be used to minimise light pollution/glare, including for construction compounds;</li> <li>- Lighting levels would be kept to the minimum necessary for security and safety.</li> </ul>		
General	EC13	Throughout Part B	Construction	<p>To prevent entrapment of wildlife, any trenches or voids would be excavated and infilled within the same working day. If this is not possible, the void would be securely covered overnight, or a suitable means of escape provided (such as a ramp at no greater than a 45° angle). Any void would then be visually inspected prior to re-starting works to confirm the absence of entrapped wildlife. All escape measures would be discussed and agreed with the ECoW to ensure they are suitable for the size of void and wildlife that may become trapped. If deemed appropriate, the ECoW may enforce additional measures, such as the installation of temporary amphibian/reptile fencing around the void to prevent entry.</p>	To protect wildlife.	None required



Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
General	EC14	Throughout Part B	Construction & Post-Construction	Planting of detention basins to include a diverse floral community and enhance their attraction to wildlife. A diverse floral community refers to providing a range and mixture of floral species, including flowering plants and grasses, that provide resources and niches to a variety of invertebrates which in turn provide a resource for species that prey on the invertebrates. This would be achieved using a native and locally appropriate seed mix.	To improve the value of detention basins to support biodiversity.	None required
General	EC15	Throughout Part B	Operation	Implementation of an Ecological/Environmental Management Plan to detail the monitoring and maintenance of habitat and mitigation/compensation features following creation and installation. The Ecological/Environmental Management Plan would be developed at detailed design. The requirement for an Ecological/Environmental Management Plan is captured within the <b>Outline CEMP (Application Document Reference: TR010041/APP/7.3)</b> .	To maintain the ecological value of retained and created habitats long-term.	None required
<b>Ecological Receptor Specific Mitigation</b>						
Bats	BAT01	Throughout Part B	Construction	The use of construction lighting would be in accordance with BS5489 Code of Practice for the Design of Road Lighting and follow best available guidance on lighting with regards to protected species ( <b>Ref. 13</b> ). The construction lighting design would take into account the need to avoid illuminating sensitive mammal habitats (e.g. for bats and badgers) in locations such as: adjacent to watercourses; along woodland edges; and, where there is known activity identified through pre-construction ecological surveys (refer to Mitigation Item EC02). Where this is not possible the Contractor would consult with the ECoW on any exceptions in advance of construction activities.	To protect sensitive mammal habitats from illumination.	Exceptions to be agreed with Natural England
Bats	BAT02	Throughout Part B	Construction	Construction works to be undertaken taking into account sensitive ecological seasons (e.g. breeding, hibernation or migration seasons) and the potential impact that the type of construction work could have on bats within that season.  The key sensitive periods for bats are between May-August (inclusive) when bats form maternity roosts; and between November-February (sometimes extending into October and March dependent on weather conditions) when bats occupy hibernation roosts.	To protect bats during construction works.	Natural England

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
Bats	BAT03	Throughout Part B	Pre-Construction & Construction	An (Species Protection Plan) SPP to be produced in consultation with Natural England during detailed design. Where appropriate, the SPP would include monitoring regimes during construction. The SPP would cover mitigation and compensation for known roosts to be affected by Part B which would require licensing, citing any necessary licences obtained and the conditions associated with such licensing. The SPP is identified within the <b>Outline CEMP (Application Document Reference: TR010041/APP/7.3)</b> .	To comply with conservation legislation and to protect bats.	Natural England (if required)
Bats	BAT04	Throughout Part B	Construction	No construction works (including enabling works) would take place within 30 m of known roost locations that are not to be lost directly to Part B. Where essential works are required, the nature of the works would be discussed with the ECoW to establish what mitigation measures are required. Works would only take place with the agreement of the ECoW and following any application for necessary licensing/adherence to licence conditions.	To prevent disturbance to bats leaving/entering roosts.	Natural England
Bats	BAT05	Throughout Part B	Construction	All trees assessed with bat roost potential (Low, Moderate or High) that require to be pruned or felled to accommodate Part B would be subject to a pre-felling inspection and/or dusk/dawn re-entry survey (as determined by the ECoW) no more than 24 hours prior to works in search of roosting bats. Upon completion, those trees where suitability for roosting bats remains (Moderate or High potential), although presence of a roost has not been confirmed, should be soft-felled under ecological supervision (by the ECoW (suitably experienced and licensed)). This would consist of the removal of major branches and limbs followed by section felling of the main trunk, with these lowered to the floor for inspection by the ECoW.	To comply with conservation legislation and protect roosting bats.	None required
Bats	BAT06	Throughout Part B	Construction	Any bats present within roosts would be translocated to bat boxes erected to mitigate the loss of the roost and proportionate to the type of roost to be lost. Location of bat box placement would be under direction and guidance of a bat licensed ecologist. Thereafter, the roost and any features within 10 m (in all directions) would be filled/blocked appropriately.	To comply with conservation legislation and protect roosting bats.	Natural England
Bats	BAT07	Throughout Part B	Construction	Where possible, trees would be retained and pruned/modified so as not to pose a health and safety concern for the new road layout. Pruning of any retained trees should reduce limbs and retain parts of the tree which can be utilised by wildlife. Suitable	To provide bat roosting habitat and ensure future viability of roosting bats in the area. Measure would contribute to ameliorating the loss of	None required

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
				features for roosting bats can then be created. This would be carried out under the guidance of a bat licensed ecologist.	roosting opportunities (trees/buildings).	
Bats	BAT08	Throughout Part B Bat Roosts at Charlton Mires Farm Complex (B6C, B6K and B6M) and East Cottage B102B	Pre-Construction & Construction	European Protected Species licences would be obtained for all bat roosts to be lost during construction of Part B. Any bat roosts to be lost would be mitigated through the erection of bat boxes (or other suitable roosting features), prior to the loss of any roost. The requirement for replacement roosts would be determined following pre-construction surveys (refer to EC02). Where roosts have already been identified during baseline surveys, locations for compensatory bat boxes have been identified and are presented within <b>Figure 7.10: Landscape Mitigation Plan, Volume 6</b> of this ES ( <b>Application Document Reference: TR010041/APP/6.6</b> ). However, their ultimate placement within those predefined areas would be completed under guidance of a Suitably Qualified Ecologist/ECow. The specification of mitigation bat box would be proportionate to that of the roost to be lost and selected by the suitably qualified ecologist/ECow, with two suitable bat boxes provided for each roost lost.	To comply with conservation legislation and protect roosting bats. To replace bat roosting habitat.	Natural England
Bats	BAT09	Northern Woodland Roosts (Bat Boxes)	Pre-Construction & Construction	The woodland to the north of Part B (Central OS Grid Ref: NU 17110 21927) would be lost to facilitate Part B construction. This woodland has 12 recorded bat roosts within it including roosts of Regional importance. All 12 bat roosts are within bat boxes which would be translocated to an adjacent woodland (Central OS Grid Ref: NU 17216 21929) by an experienced bat licensed ecologist and under a Natural England licence. Further details can be found in the <b>Consents and Agreements Position Statement (Application Document Reference: TR010041/APP/3.3)</b> .  In addition to boxes being translocated, the area next to the A1 where trees are to be replanted, adjacent to where the woodland is being lost (near central OS Grid Ref: NU 17111 21977), 12 rocket style bat boxes on poles (Nestbox, Eco Rocket Bat Box with 6 m Pole) would be installed in amongst the newly planted woodland. A further 12 bat boxes would be installed within the existing adjacent woodland that extends eastwards from the Order Limits. As the area supports a significant number of bat roosts, this increased mitigation and compensation would help to ensure when boxes are translocated, ample roosting opportunities are present for bats within the area.  Areas have been identified for these bat boxes and are presented within the <b>Figure 7.10: Landscape Mitigation Plan,</b>	To comply with conservation legislation and protect roosting bats. To enhance bat roosting habitat and ensure future viability of roosting bats in the area.	Natural England

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
				<b>Volume 6 of this ES (Application Document Reference: TR010041/APP/6.6).</b>		
Bats	BAT10	Throughout Part B	Pre-Construction & Construction	To further increase suitable roosting locations for bats and compensate for the loss of roosting opportunities within trees being felled to facilitate Part B, a minimum of five rocket style bat boxes <sup>5</sup> (Nestbox, Eco Rocket Bat Box, two as cavity option, three as crevice, with 6 m Pole) would be erected between the noctule maternity roost and a known foraging location at Heckley Fence, as shown within <b>Figure 7.10: Landscape Mitigation Plan, Volume 6 of this ES (Application Document Reference: TR010041/APP/6.6)</b> (near central OS Grid Ref: NU 19117 16651). The siting of the bat boxes would be determined by the appointed Suitably Qualified Ecologist/ECOW.	To provide bat roosting habitat and ensure future viability of roosting bats in the area. Measure would contribute to ameliorating the loss of roosting opportunities (trees/buildings).	None required
Bats	BAT11	Tree G02 (OS Grid Ref: NU 18588 16149)	Pre-Construction & Construction	<p>Construction of and access along the proposed access track (entering the field around OS Grid Ref: NU 18558 16175) in proximity to tree G02 should be undertaken outside the bat maternity season (mid-May to mid-August inclusive) to ensure the noctule maternity roost present is not disturbed by construction works.</p> <p>Camera trap monitoring of the roost would be implemented continuously throughout the construction stage (using a suitably high trigger speed camera, with the camera trap installed and checked with as little disturbance and noise as possible).</p> <p>Camera trap footage would be reviewed monthly to ensure bats are not leaving the roost due to noise disturbance as a result of construction traffic/works.</p> <p>Camera trap monitoring would be further supplemented with activity surveys of the roost conducted once a month in the active bat season (May to September). Activity surveys would be undertaken by an experienced bat licensed ecologist, taking counts of the number of bats emerging/re-entering the roost.</p> <p>The results of the activity surveys would be compared to the 2019 survey results to discern whether there is any reduction in the numbers of bats, which may indicate that construction has compromised the use of the roost by bats.</p>	To comply with conservation legislation and protect roosting bats.	None required

<sup>5</sup> <https://www.nestbox.co.uk/products/eco-rocket-bat-box>

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
				<p>If bats' behaviour is observed to deviate from anticipated norms (e.g. emergence and flight activity during daylight hours), or if there is a drastic difference in the range of numbers of roosting bats utilising the roost compared to data accumulated across surveys in 2019, additional mitigation would be required. Any further mitigation requirements would be determined by an experienced bat licensed ecologist and in liaison with Natural England.</p>		

## 8. RESIDUAL IMPACTS

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- 8.1.1. This section assumes the adoption of mitigation measures detailed above in **Table 7-1** and as such detailed assessment is only provided on residual impacts. Pre-mitigation impact characterisation is provided for these impacts. Those features assessed of 'less than Local' importance have not been assessed further.
- 8.1.2. A summary of impacts, mitigation and residual impacts (if any) is provided within **Table 8-2**. Only those features assessed as being of Local importance and above have considered.
- 8.1.3. In this section the residual impacts, and their effects resulting from Part B on roosts listed in **Table 5-2** are considered, along with associated implications for the species described in **Table 5-1**.

### 8.2. CONSTRUCTION

#### Roosts to be Lost to Part B

- 8.2.1. Twenty roosts would be permanently lost as a result of construction of Part B. Of these, 12 roosts would be lost from bat boxes due to the felling of woodland to the north of Part B. These 12 roosts are detailed below:
- a. Natterer's bat – Identified through the presence of droppings<sup>6</sup> = 4
  - b. Natterer's bat – Maternity colony = 3
  - c. Noctule – Identified through the presence of droppings<sup>8</sup> = 1
  - d. Soprano pipistrelle – Identified through the presence of droppings<sup>8</sup> = 1
  - e. Soprano pipistrelle – Mating roost = 1
  - f. Soprano pipistrelle – Non-breeding = 2
- 8.2.2. The remaining eight roosts would be lost from structures associated with the Charlton Mires Farm and associated outbuildings (B6C, B6K and B6M) and East Cottage (B102B) through the demolition of these structures to facilitate Part B construction. Roosts that would be lost include:
- a. Common pipistrelle – Non-breeding (B102B x 2, B6C x 1, B6K x 2, B6M x 1)
  - b. Common / soprano pipistrelle – Non-breeding (B102B x 1)
  - c. Noctule – Non-breeding (B102B x 1)
- 8.2.3. In order to ensure compliance with the relevant protective legislation pursuant to bats and their roosts, applications to Natural England for European Protected Species derogation licences for the loss of bat roosts would be required. These applications would be informed

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<sup>6</sup> Indeterminable roost type

by the results of further surveys undertaken as part of pre-construction works. Bespoke mitigation and method statements for the loss of any roosts would be informed by updated survey results.

- 8.2.4. Damage to other identified roosts during construction and operation of Part B is considered unlikely given their relative distances to Part B and Order Limits.
- 8.2.5. Following successful application of EPS licences and implementation of associated mitigation and compensation, it is considered that Part B would result in effects of **Slight Adverse (Not Significant)** as a result of the loss of roosts. Impacts on known roosts which would be lost to Part B are further detailed in **Table 8-2** below.

**Roosts to be Disturbed by Part B**

- 8.2.6. Ten roosts are identified at risk of disturbance from construction and operation of Part B. These roosts are summarised in **Table 8-1** below and further detailed within Table 8-2:

**Table 8-1 – Roosts at risk of disturbance from Part B**

Building / Tree Location	Type of Roost	Distance from Part B (m)
G02	Noctule – Maternity roost	15
HH3	Common pipistrelle non-breeding roosts Soprano pipistrelle non-breeding roosts	10
B10B	Soprano pipistrelle non-breeding roosts	5
SF3	Common pipistrelle non-breeding roosts Unspecified, likely soprano/common pipistrelle roost non-breeding roosts	2
SF5	Common pipistrelle non-breeding roosts x 2 Soprano pipistrelle non-breeding roosts	0
B4B	Unspecified, likely soprano/common pipistrelle non-breeding roosts	0

- 8.2.7. These roosts are at risk of disturbance from construction activities. The level of disturbance would likely be higher the closer the roosts are to the construction envelope. Construction work undertaken within 30 m of known roosts should incorporate measures to limit the risk of disturbance to roosting bats as defined in mitigation item BAT04.
- 8.2.8. Impacts may also occur on features that are suitable to support roosting bats but at which no confirmed roosts were identified. These features would be subject to pre-construction surveys to confirm the presence or absence of roosting bats immediately prior to works. The

results of these surveys would inform any need for further mitigation at these locations in line with mitigation item EC2.

- 8.2.9. Following the successful implementation of mitigation, it is considered that Part B would result in effects of **Slight adverse** (Not significant) upon the noctule maternity roost, and **Neutral** effects (not significant) upon all other identified roosts within Part B. Disturbance impacts to known roosts are provided in **Table 8-2** below.

#### **Impact on Habitats**

- 8.2.10. Habitat would be permanently lost along defined corridors adjacent to the existing A1 carriageway, with additional land take required for the construction of junctions at East Cottage and Charlton Mires Farm. Suitable foraging and commuting habitat is present along the majority of Part B, which has different levels of suitability but is used by a variety of bat species. Habitat loss would result in changes to foraging and commuting pathways. However, given the abundance of habitat remaining in the wider area and that to be created as part of mitigation incorporated into the Part B design, construction impacts on bats as a result of the loss of foraging habitat would result in **Neutral effects (Not Significant)**.
- 8.2.11. Only those features assessed as being of Local importance and above have been further considered within **Table 8-2**.
- 8.2.12. None of the residual impacts on the individual roosts described herein would result in any significant effects on the species listed in **Table 5-1** at a population level.



**Table 8-2 – Summary of Specific Impacts, Mitigation, and Residual Impacts (Construction)**

Feature	Potential Impact	Characterisation of Impact (Pre-mitigation)	Mitigation	Residual Impact
Building – B102B Importance: Local/County  Building – B6C Importance: Local  Building – B6K Importance Local/County  Building – B6M Importance: Local	Loss of roosts	Extent: Loss of individual, non-breeding roosts associated with the demolition of buildings at Charlton Mires Farm and East Cottage. Six individual transitional common pipistrelle roosts, one unidentified pipistrelle transitional roost, and one individual transitional noctule roost.  Effect: Direct negative Duration: Permanent Frequency and timing: One-time event Reversibility: Irreversible Likelihood: Certain  Impact Descriptor: Moderate adverse	EC01 EC02 EC03 EC04 EC05 EC12 BAT02 BAT03 BAT04 BAT05 BAT06 BAT07 BAT08 BAT09 BAT10	Slight Adverse (Not Significant)
Bat box – Red 4 Importance: Local  Bat box – Green 104 Importance: Regional  Bat box – Green 101 Importance: County  Bat box – Green 86	Loss of roosts	Extent: Loss of individual, non-breeding roosts for pipistrelle, Natterer’s bat and noctule. Three maternity roosts for Natterer’s bat and single soprano pipistrelle mating roost. During bat box checks undertaken over the activity survey season: three separate boxes supported over 10 Natterer’s bats (likely the same maternity colony); one supported a soprano pipistrelle mating roost; two supported individual soprano pipistrelles; two additional boxes contained Natterer’s bat droppings; one box contained noctule droppings; one box contained soprano pipistrelle droppings; and two boxes contained droppings which were absent of bats during all inspections but containing bat droppings.  These boxes are all located within the Order Limits and would be lost as a result of construction of Part B, by virtue of the woodland block being felled to facilitate construction. Boxes would be moved from their current location as a result of woodland felling and therefore roosts effectively lost.  Effect: Direct negative Duration: Permanent Frequency and timing: One-time event Reversibility: Irreversible Likelihood: Certain	EC01 EC02 EC03 EC04 EC05 EC012 BAT01 BAT02 BAT03 BAT04 BAT05 BAT06 BAT07 BAT08	Slight Adverse (Not Significant)

Feature	Potential Impact	Characterisation of Impact (Pre-mitigation)	Mitigation	Residual Impact
Importance: County  Bat box – Green 0903  Importance: County  Bat box – Green 82  Importance: Regional  Bat box – Red 60  Importance: Regional		Impact Descriptor: Large adverse	BAT09 BAT10	
Tree – G02  Importance: Regional	Disturbance	Extent: Potential disturbance to a noctule maternity roost with a peak count of 80+ bats. Roost has potential for supporting hibernating bats during winter. Whilst the roost is not located in proximity to the main A1 carriageway, risk of disturbance exists as a result of the proposed construction and use of an access track to the north of the roost. Given the roosts proximity, indirect disturbance effects may result from construction and traffic movements/use of the track during construction.  Effect: Indirect negative Duration: Short term Frequency and timing: Recurring Reversibility: Reversible Likelihood: Likely  Impact Descriptor: Large adverse	EC01 EC02 EC03 EC10 EC12 BAT01 BAT02 BAT03 BAT04 BAT05 BAT10 BAT11	Slight Adverse (Not Significant)
Building – HH3  Importance: Local	Disturbance	Extent: Disturbance of ten bat roosts which are located within 30 m of Part B consisting of the following: – Common pipistrelle non-breeding roosts are present at HH3, SF3 and SF5	EC01 EC02 EC03	Neutral (Not Significant)

Feature	Potential Impact	Characterisation of Impact (Pre-mitigation)	Mitigation	Residual Impact
Building – B10B Importance: Local  Building – SF3 Importance: Local  Building – SF5 Importance: Local  Building – B4B Importance: Local		<ul style="list-style-type: none"> <li>– Soprano pipistrelle non-breeding roosts are present at B10B, HH3, SF5</li> <li>– Unspecified, likely soprano/common pipistrelle roost non-breeding roosts are present at B4B and SF3</li> </ul> Effect: Indirect negative Duration: Short term Frequency and timing: Recurring Reversibility: Reversible Likelihood: Likely  Impact Descriptor: Slight adverse	EC12 BAT01 BAT02 BAT03 BAT04 BAT10	

### 8.3. OPERATION

- 8.3.1. Operational impacts upon bats include noise, direct mortality, and the extension of habitat severance effects of associated with the widening of the A1 carriageway, junctions and access roads.

#### Operational Noise Impacts

- 8.3.2. Levels of noise are not expected to increase significantly during the hours in which bats would be active within Part B (refer to **Chapter 6: Noise and Vibration, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)). Bats present in the area of Part B would already be habituated to noise from the existing A1 carriageway. As a result, the impact of noise on bats resulting from Part B and widened carriageway are assessed to result in an effect that is **Neutral (Not Significant)**.

#### Operational Habitats Impacts

- 8.3.3. The number of bats recorded crossing the road were below the threshold set out in the Defra guidelines (**Ref. 5**) to warrant further survey effort. Bats may still be affected during operation of Part B due to the increase in road width creating a larger 'void' which bats must fly over in order to exploit habitat on either side of the carriageway. This larger 'void' may also result in increased mortality rates due to potential collision events with traffic.
- 8.3.4. Whilst a small number of bats, any bats crossing the A1 carriageway may alter their commuting and foraging habits to accommodate this obstacle or may cease crossing of the carriageway altogether. The wider landscape is dominated by habitats that were also recorded within the Order Limits and Survey Area, with pockets of woodland, linear features including hedgerows and watercourses, waterbodies and arable land providing ample opportunities for foraging and commuting either side of the carriageway in the event bats cease to cross the widened carriageway.
- 8.3.5. Since the recorded number of bats crossing the A1 carriageway did not meet the Defra threshold and in cognisance of an abundance of alternative supporting habitat in the wider landscape, the widened carriageway would result in an effect that is **Neutral (Not Significant)**.
- 8.3.6. With the widening of the road, construction of access roads and junctions, habitat within Part B may be severed and fragmented. As the planting mitigation plan (**Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**)) includes replanting where habitat is being severed or fragmented, including the planting of linear features, trees and woodland, impacts during operation of Part B would result in an effect that is **Neutral (Not Significant)**.

## 8.4. MONITORING

### Loss of Roosts

- 8.4.1. It is likely that any Natural England (NE) EPS licences issued for Part B would require conditions for monitoring to be undertaken. Monitoring recommendations have therefore been identified in relation to the loss of bat roosts at Charlton Mires Farm, East Cottage, and bat boxes in the northern woodland. These recommendations would be subject to consultation and agreement with NE and would require agreement in advance of construction commencement, with stipulations of the extent, type and duration of any monitoring required.

### Bat Boxes

- 8.4.2. Following the installation of compensatory bat boxes for those bat roosts lost as a result of Part B, a monitoring program would be devised and implemented. Monitoring and inspections of bat boxes should, as a minimum, be undertaken twice a year during May and August, during the first, third and fifth years after translocation of boxes to their receptor location. This additionally applies to any additional boxes erected as compensation or those boxes newly erected as mitigation. This minimum monitoring program may be otherwise altered dependent on specific licence conditions and discussion with NE. Results of monitoring surveys should be compiled to determine the effectiveness of mitigation employed and subsequently identifying further mitigation or maintenance requirements (e.g. pruning of tree limbs to maintain access to a bat box).

### Landscape Scale

- 8.4.3. In accordance with Defra guidelines (**Ref. 5**) and given activity levels recorded during Landscape Scale Surveys, monitoring of all of transects is required during construction and post-construction. In line with the guidelines, it is recommended that Landscape Scale Surveys are repeated once during the construction stage and for a minimum of three years' post-construction. Monitoring should be completed at the same time of year as baseline surveys were completed.
- 8.4.4. Following completion of surveys during construction, an interim assessment of bat activity against baseline survey results should be undertaken following Defra guidelines (**Ref. 5**). Following completion of the entire monitoring program a final assessment, completing the statistical analyses following the Defra guidelines (**Ref. 5**), would be undertaken. This assessment would consider the success of mitigation implemented, in line with the standards detailed within the guidelines (**Ref. 5**). The results of the assessment would aid in determining whether mitigation / compensation has been sufficient to sustain the bat population, or where further mitigation may be required.

## 9. CONCLUSIONS

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- 9.1.1. A suite of bat surveys undertaken across the 2018 and 2019 bat survey seasons were completed to determine the importance of the Order Limits and Survey Area for bats. Several species of bat were confirmed from analysis of results from surveys including manual transects, dusk emergence and pre-dawn return surveys, Defra landscape scale and local scale surveys. Species included common pipistrelle, soprano pipistrelle, noctule, and Natterer's bat, as well as bats from the *Nyctalus* and *Myotis* species groups. Key results included the following:
- 9.1.2. Natterer's bat breeding roosts were confirmed within bat boxes located within woodland to the north of the Order Limits, spread between two boxes during an initial inspection of boxes, and recorded in a differing third box (located within approximately 10 m of the first two boxes) during a subsequent inspection visit. A soprano pipistrelle mating roost, comprising 10 individuals, and two individual soprano pipistrelle roosts were also confirmed within bat boxes within the woodland. Bat boxes are to be effectively 'lost' to Part B through the felling of the woodland they currently occupy, and therefore translocation is proposed as mitigation for all bat boxes present.
- 9.1.3. Single roosts were additionally recorded within a number of buildings across the Order Limits, primarily comprising individual bats. Six individual non-breeding roosts would be lost, associated with the demolition of Charlton Mires Farm and East Cottage. These roosts would be compensated for through the erection of new bat boxes.
- 9.1.4. A noctule maternity roost was also recorded during surveys, located within Tree G02, south of a proposed access track to facilitate construction. Following activity surveys over repeated months during the active season, a peak count of over 80 bats was recorded exiting the roost, however, this number is not likely representative of the true number of bats utilising the roost given sounds of bats still within the roost could still be heard. This roost may be subject to disturbance associated with the construction of a new access track north of the roost, and movement of construction traffic along it. Additionally, an additional ten roosts recorded may also be subject to disturbance as result of construction of Part B.
- 9.1.5. Natterer's bat and noctule have been assessed to be of Regional importance given their status as rarer bat species and owing to the confirmed presence of maternity roosts for both species. All other species recorded during surveys have been assessed of Local or County importance (Local: common pipistrelle, soprano pipistrelle, BLE, Leisler's bat, and County: *Myotis* sp. and *Nathusias* pipistrelle), comprising species that are more common and widespread and taking into account the types of roosts recorded (primarily individual non-breeding roosts).
- 9.1.6. Given the presence of maternity roosts and a mating roost within bat boxes in the northern woodland, mitigation is primarily centred around the translocation of bat boxes into woodland to the east, which would not be subject to felling. The translocation of boxes would also be supplemented within the erection of further bat boxes in the receptor

woodland location to provide additional roosting opportunities. With regards the noctule maternity roost, mitigation revolves around reducing potential disturbance impacts through sensitively timed works and construction access, no construction lighting or light-spill upon woodland within which the roost is contained. These measures would be supplemented by monitoring of the roost in search of changes in behaviour or roost status that may indicate indirect impacts upon the roost, which would necessitate further mitigation.

- 9.1.7. With the implementation of mitigation proposed herein, no significant residual impacts are anticipated upon bats as a result of Part B construction and operation.

## 10. REFERENCES

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- Ref. 1** Jacobs UK Ltd (2017). A1 in Northumberland: Bat Roost Potential Survey Report 2017.
- Ref. 2** Jacobs UK Ltd (2017). A1 Alnwick to Ellingham: Extended Phase 1 Habitat Survey Report
- Ref. 3** BTHK (2018). Bat Roosts in Trees – A Guide to Identification and Assessment for Tree-care and Ecology Professionals. Pelagic Publishing. Exeter.
- Ref. 4** Collins, J. (ed), (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3<sup>rd</sup> edn). The Bat Conservation Trust. London.
- Ref. 5** Berthinussen & Altringham, (2015) WC1060 Development of a Cost-Effective Method for Monitoring the Effectiveness of Mitigation for Bats Crossing Linear Transport Infrastructure. University of Leeds.  
<http://sciencesearch.defra.gov.uk/Default.aspx?Module=More&Location=None&ProjectID=18518>
- Ref. 6** Russ, J. (2012). British Bat Calls: A Guide to Species Identification. Pelagic Publishing. Exeter.
- Ref. 7** CIEEM (2019). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. CIEEM, Winchester. (Version 1.1, September 2019)
- Ref. 8** Design Manual for Roads & Bridges (2010). Interim Advice Note (IAN) 130/10 - Ecology and Nature Conservation: Criteria for Impact Assessment
- Ref. 9** Wray, S., Wells, D., Long, E., Mitchell-Jones, T. (2010). Valuing Bats in Ecological Impact Assessment. CIEEM In Practice: December 2010, p.23.
- Ref. 10** Limpens, H., Kapteyn K. (1991). Bats, their behaviour and linear landscape elements. Dutch Mammal Society.
- Ref. 11** GB Non-Native Species Secretariat Check, Clean, Dry campaign.  
<http://www.nonnativespecies.org/checkcleandry/>
- Ref. 12** British Standards Institution (2012). *BS5837:2012 Trees in relation to design, demolition and construction. Recommendations*. April 2012.
- Ref. 13** Bat Conservation Trust (2018). *Bats and artificial lighting in the UK: Bats and the Build Environment series*.



# Appendix A

SURVEY INFORMATION

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**Table A-1: Tree Surveys - Trees subject to Activity Survey**

Tree	Grid Ref	Suitability	Survey dates		
			First	Second	Third (High only)
6B	NU 19529 15902	High	Cattle in Field – Unable to Survey		
3B	NU 19571 15834	High	Cattle in Field – Unable to Survey		
4B.4	NU 19601 15851	High	Cattle in Field – Unable to Survey		
4B.5	NU 19601 15851	High	Cattle in Field – Unable to Survey		
5B	NU 19517 15896	High	Cattle in Field – Unable to Survey		
12B	NU 19495 16178	Moderate	Cattle in Field – Unable to Survey		
14B	NU 19421 16486	Moderate	Dusk 27.05.19	Dawn 26.06.19	
T2003	NU 18660 18176	Moderate	Dusk 21.05.19	Dawn 04.06.19	
T2004	NU 18663 18173	Moderate	Dawn 21.05.19	Dusk 03.06.19	
T2005	NU 18663 18170	Moderate	Dusk 21.05.19	Dawn 04.06.19	
T2006	NU 18658 18156	Moderate	Dusk 21.05.19	Dawn 04.06.19	
31B	NU 18799 18134	Moderate	Dawn 21.05.19	Dusk 03.06.19	
T2009	NU 18102 19807	Moderate	Dusk 22.05.19	Dawn 05.06.19	
T2010	NU 18102 19822	High	Dusk 22.05.19	Dawn 05.06.19	Dusk 18.06.19

Tree	Grid Ref	Suitability	Survey dates		
			First	Second	Third (High only)
T2008	NU 18184 19220	Moderate	Dawn 24.05.19	Dusk 06.06.19	
59B	NU 17390 21341	Moderate	Dusk 22.05.19	Dawn 11.06.19	
65B	NU 17293 21424	High	Dusk 22.05.19	Dawn 19.06.19	
G02	NU 18588 16149	Confirmed	Dawn 28.05.19	Dusk 11.06.19	Dusk 25.06.19
G04	NU 18589 16133	Moderate	Dawn 28.05.19	Dusk 11.06.19	
W02	NU 18089 20219	Moderate	Dawn 22.05.19	Dusk 10.06.19	
T2202	NU 18816 20245	Moderate	Dusk 23.05.19	Dawn 07.06.19	
96B	NU 18982 19731	Moderate	Dusk 28.05.19	Dawn 04.07.19	
98B	NU 18977 19751	High	Dusk 28.05.19	Dusk 20.06.19	Dawn 04.07.19
170B	NU 18930 19936	High	Dusk 23.05.19	Dawn 07.06.19	Dusk 20.06.19
208B	NU 17155 21937	High	Dawn 20.06.19	Dusk 04.07.19	Dusk 18.07.19
67Arb	NU 17191 21929	Moderate	Dusk 20.05.19	Dawn 06.06.19	
66Arb	NU 17164 21836	Moderate	Dusk 20.05.19	Dawn 06.06.19	
20Arb	NU 19139 16716	Moderate	Dawn 29.05.19	Dawn 21.06.19	
20.1Arb	NU 19139 16716	Moderate	Dawn 29.05.19	Dawn 21.06.19	

Tree	Grid Ref	Suitability	Survey dates		
			First	Second	Third (High only)
AddT	NU 17954 20115	Moderate	Dusk 10.06.19	Dawn 25.07.19	

**Table A-2: Building Suitability**

Building	Grid Ref	Prior Suitability	Reviewed roost Suitability	Survey period
B10B	NU 17420 21255	Confirmed roost suitability	N/A	2018
B11B	NU 17170 21936	High suitability building	N/A	2018
B4B	NU 17818 20034	Moderate suitability building	N/A	2018 and 2019
B8B	NU 18225 20693	Moderate suitability building	N/A	2018
B1B	NU 19625 15631	Low suitability building	N/A	2018
B101B	NU 17741 20647	Low suitability building	Moderate suitability building	2018
B6B_1	NU 17743 20678	Low suitability building	High suitability building	2018
B100B	NU 17554 21051	Low suitability building	High suitability building	2018

<b>Building</b>	<b>Grid Ref</b>	<b>Prior Suitability</b>	<b>Reviewed roost Suitability</b>	<b>Survey period</b>
B102B	NU 17787 20638	Low suitability building	High suitability building	2018 and 2019
B5B	NU 17836 20034	Low suitability building	N/A	2018
B105B	NU 17776 20415	Low suitability building	N/A	2018
Charlton Mires Farm - Building complex - B6A	NU 17728 20678	N/A	High suitability building	2019
Charlton Mires Farm - Building complex - B6B_2	NU 17739 20685	N/A	Low suitability building	2019
Charlton Mires Farm - Building complex - B6C	NU 17744 20682	N/A	Confirmed roost - from last year's surveys	2019
Charlton Mires Farm - Building complex - B6D	NU 17750 20689	N/A	Negligible suitability building	2019
Charlton Mires Farm - Building complex - B6E	NU 17753 20683	N/A	Low suitability building	2019
Charlton Mires Farm - Building complex - B6F	NU 17764 20680	N/A	Low suitability building	2019
Charlton Mires Farm - Building complex - B6G	NU 17772 20689	N/A	Moderate suitability building	2019
Charlton Mires Farm - Building complex - B6H	NU 17778 20681	N/A	High suitability building	2019

<b>Building</b>	<b>Grid Ref</b>	<b>Prior Suitability</b>	<b>Reviewed roost Suitability</b>	<b>Survey period</b>
Charlton Mires Farm - Building complex - B6I	NU 17780 20668	N/A	Negligible suitability building	2019
Charlton Mires Farm - Building complex - B6J	NU 17782 20660	N/A	Moderate suitability building	2019
Charlton Mires Farm - Building complex - B6K	NU 17774 20666	N/A	Confirmed roost - single common pipistrelle	2019
Charlton Mires Farm - Building complex - B6L	NU 17755 20671	N/A	Low suitability building	2019
Charlton Mires Farm - Building complex - B6M	NU 17733 20668	N/A	Negligible suitability building	2019
Charlton Mires Farm - Building complex - B6N	NU 17719 20666	N/A	Moderate suitability building	2019
Charlton Mires Farm - Building complex - B7	NU 17721 20682	N/A	Negligible suitability building	2019
Charlton Mires Farm - Building complex - C1	NU 17775 20654	N/A	Moderate suitability building	2019
Charlton Mires Farm - Building complex - C2	NU 17788 20656	N/A	Moderate suitability building	2019
Heckley fence – Building complex - HF1	NU 18719 17266	N/A	High suitability building	2019
Heckley fence – Building complex - HF2	NU 18713 17307	N/A	High suitability building	2019

<b>Building</b>	<b>Grid Ref</b>	<b>Prior Suitability</b>	<b>Reviewed roost Suitability</b>	<b>Survey period</b>
Heckley fence – Building complex - HF3	NU 18676 17294	N/A	Negligible suitability building	2019
Heckley House - Building complex - HH1	NU 18674 16180	N/A	High suitability building	2019
Heckley House - Building complex - HH2	NU 18674 16180	N/A	High suitability building	2019
Heckley House - Building complex - HH3	NU 18778 16235	N/A	High suitability building	2019
Heckley House - Building complex - HH4	NU 18770 16245	N/A	High suitability building	2019
Heckley House - Building complex - HH5	NU 18784 16251	N/A	High suitability building	2019
Heckley House - Building complex - HH6	NU 18810 16245	N/A	High suitability building	2019
South Farm – Building complex - SF1	NU 19285 18980	N/A	High suitability building	2019
South Farm – Building complex - SF2	NU 19199 18903	N/A	High suitability building	2019
South Farm – Building complex - SF3	NU 19174 18941	N/A	High suitability building	2019
South Farm – Building complex - SF4	NU 19242 18954	N/A	High suitability building	2019

<b>Building</b>	<b>Grid Ref</b>	<b>Prior Suitability</b>	<b>Reviewed roost Suitability</b>	<b>Survey period</b>
South Farm – Building complex - SF5	NU 19228 18976	N/A	High suitability building	2019
South Farm – Building complex - SF6	NU 19228 19004	N/A	High suitability building	2019
South Farm – Building complex - SF7	NU 19218 19042	N/A	High suitability building	2019
South Farm – Building complex - SF8	NU 19194 18975	N/A	High suitability building	2019

**Table A-3 - Summary of Roost Locations along Part B. Distances are given for the Structures Closest Point to Part B**

<b>Building Location</b>	<b>Type of Roost</b>	<b>OS Grid reference</b>	<b>Distance from Part B (m)</b>
B10B – 1	Soprano pipistrelle – Non-breeding, summer roost	NU 17420 21255	5
B4B – 1	Unspecified bat – Non-breeding, summer roost	NU 17818 20034	0
B102B – 1	Common pipistrelle – Non-breeding, Summer roost	NU 17787 20638	0
B102B – 2	Common pipistrelle – Non-breeding, Summer roost	NU 17787 20638	0
B102B – 3	Common/soprano pipistrelle – Non-breeding, Summer roost	NU 17787 20638	0



<b>Building Location</b>	<b>Type of Roost</b>	<b>OS Grid reference</b>	<b>Distance from Part B (m)</b>
B102B – 4	Noctule – Non-breeding, Summer roost	NU 17787 20638	0
B6C – 1	Possible Common pipistrelle – Non-breeding, Summer roost	NU 17744 20682	0
B6K – 1	Common pipistrelle – Non-breeding, Summer roost	NU 17774 20666	0
B6K – 2	Common pipistrelle – Non-breeding, Summer roost	NU 17774 20666	0
B6M – 1	Common pipistrelle – Non-breeding, Summer roost	NU 17733 20668	0
HF1 – 1	Common/soprano pipistrelle – Non-breeding, Summer roost	NU 18719 17266	20
HH1 – 1.1	Soprano pipistrelle – Non-breeding, Summer roost	NU 18648 16155	29
HH1 – 1.2	Nyctalus species – Non-breeding, Summer roost	NU 18648 16155	30
HH1 – 2	Soprano pipistrelle – Non-breeding, Summer roost	NU 18648 16155	31
HH1 – 3	Soprano pipistrelle – Non-breeding, Summer roost	NU 18648 16155	32
HH1 – 4	Soprano pipistrelle – Non-breeding, Summer roost	NU 18648 16155	33

<b>Building Location</b>	<b>Type of Roost</b>	<b>OS Grid reference</b>	<b>Distance from Part B (m)</b>
HH2 – 1	Soprano pipistrelle – Non-breeding, Summer roost	NU 18674 16180	20
HH2 – 2	Soprano pipistrelle – Non-breeding, Summer roost	NU 18674 16180	20
HH2 – 3	Soprano pipistrelle – Non-breeding, Summer roost	NU 18674 16180	20
HH2 – 4	Soprano pipistrelle – Non-breeding, Summer roost	NU 18674 16180	20
HH3 – 1	Common pipistrelle – Non-breeding, Summer roost	NU 18778 16235	10
HH3 – 2	Soprano pipistrelle – Non-breeding, Summer roost	NU 18778 16235	10
SF3 – 1	Common Pipistrelle – Non-breeding, Summer roost	NU 19174 18941	2
SF3 – 2	Unspecified species, Possible common/soprano pipistrelle– Non- breeding, Summer roost	NU 19174 18941	2
SF5 – 1	Common Pipistrelle – Non-breeding, Summer roost	NU 19228 18976	0
SF5 – 2	Common Pipistrelle – Non-breeding, Summer roost	NU 19228 18976	0
SF5 – 3	Soprano pipistrelle– Non-breeding, Summer roost	NU 19228 18976	0

Building Location	Type of Roost	OS Grid reference	Distance from Part B (m)
Wall towards the east of SF5	Common pipistrelle – Non-breeding, Summer roost  Soprano pipistrelle– Non-breeding, Summer roost	NU 19228 18976	50

**Table A-4: Building Surveys - Survey Dates and Timings - Buildings Identified by Jacobs**

Jacobs Building	Survey Date	Type of Survey	Number of Surveyors	Sunrise/ Sunset	Survey Start Time	Survey End Time
B1B	15/08/2018	Dawn	2	05:40	03:40	05:55
B4B	14/08/2018	Dusk	3	20:45	20:30	22:15
	29/08/2018	Dawn	3	06:06	04:06	06:06
	20/08/2019	Dusk	3	20:28	20:13	21:58
B5B	24/08/2018	Dawn	4	05:56	03:56	05:56
B6B	30/08/2018	Dawn	2	06:08	04:06	06:21
	05/09/2018	Dusk	2	19:51	19:30	21:51
	11/09/2018	Dusk	2	19:34	19:19	21:04
B8B	31/07/2018	Dusk	4	21:14	21:00	22:45
	23/08/2018	Dawn	4	05:52	03:52	05:52
B10B	30/07/2018	Dusk	6	21:15	21:00	23:00
	23/08/2018	Dusk	6	20:24	20:09	21:54
	06/09/2018	Dawn	6	06:20	04:20	06:35
B11B	31/07/2018	Dawn	3	05:11	03:11	05:26
	13/08/2018	Dusk	3	20:46	20:31	22:16
	28/08/2018	Dusk	3	20:11	19:56	21:41
B100B	15/08/2018	Dusk	2	20:42	20:27	22:13
B101B	30/08/2018	Dawn	3	06:08	04:08	06:22
B102B	22/08/2018	Dusk	6	20:26	20:11	21:56
	31/07/2019	Dawn	4	05:11	03:41	05:11

Jacobs Building	Survey Date	Type of Survey	Number of Surveyors	Sunrise/Sunset	Survey Start Time	Survey End Time
	14/08/2019	Dusk	4	20:45	20:33	22:15
B105B	29/08/2019	Dusk	3	20:08	20:04	21:38

**Table A-5: Building Surveys - Survey Dates and Timings - Additional Buildings Surveyed by WSP**

Additional Buildings	Survey date	Survey type	Positions	Sunset/Sunrise	start time	end time
Charlton Mires Farm Building - complex	30/08/2018	Dawn	G1, Y2	06:06	04:06	06:21
	05/09/2018	Dusk	G1, Y2	19:51	19:30	21:51
	11/09/2018	Dusk	G1, Y2	19:34	19:19	21:04
	15/05/2019	Dawn	B1, B2, B3	04:59	03:18	05:00
	18/07/2019	Dawn	B2, Y1, Y2, Y3, Y4	04:49	03:19	05:04
	31/07/2019	Dusk	B4, Y1, Y2, Y3, Y4	21:15	21:00	22:44
	01/08/2019	Dawn	B1, B2, B3, G1, G2	05:12	03:42	05:27
	15/08/2019	Dawn	B1, B2, Y3, Y4	05:39	04:09	05:54
	15/08/2019	Dusk	B3, B4, G2, Y1, Y2, G1	20:42	20:27	22:12
Heckley Fence - Building Complex	26/06/2019	Dusk	1, 3	21:53	21:38	23:23
	27/06/2019	Dawn	6, 5	04:26	02:56	04:41
	27/06/2019	Dusk	2, 9	21:53	21:38	23:23
	28/06/2019	Dawn	7, 8	04:27	02:57	04:42
	08/07/2019	Dusk	3, 2	21:47	21:32	23:17
	09/07/2019	Dawn	1, 6	04:37	03:07	04:52

<b>Additional Buildings</b>	<b>Survey date</b>	<b>Survey type</b>	<b>Positions</b>	<b>Sunset/Sunrise</b>	<b>start time</b>	<b>end time</b>
	09/07/2019	Dusk	7, 8	21:46	21:31	23:16
	22/07/2019	Dusk	3, 7	21:30	21:15	23:00
	23/07/2019	Dawn	5, 9	04:57	03:27	05:12
	23/07/2019	Dusk	6, 8	21:28	21:13	22:58
	01/08/2019	Dusk	9, 5	21:12	20:57	22:42
	20/08/2019	Dawn	5, 9	05:49	04:19	06:04
Heckley House - Building Complex	01/07/2019	Dusk	1, 2	21:51	21:36	23:21
	02/07/2019	Dawn	3, 4	04:30	03:00	04:45
	02/07/2019	Dusk	5, 6	21:51	21:36	NR
	03/07/2019	Dawn	7, 8	04:31	03:00	04:46
	03/07/2019	Dusk	9, 10	21:50	21:45	23:20
	15/07/2019	Dusk	3, 4	21:40	21:24	23:09
	16/07/2019	Dawn	1, 2	04:46	03:16	05:01
	16/07/2019	Dusk	7, 8	21:38	21:23	23:08
	17/07/2019	Dawn	5, 6	04:47	03:17	05:02
	24/07/2019	Dusk	9, 11, 12, 13	21:26	21:11	22:56
	29/07/2019	Dusk	1, 2	21:17	21:02	22:47
	30/07/2019	Dawn	3, 4	05:09	03:39	05:24
	30/07/2019	Dusk	5, 6	21:15	21:00	22:45
	31/07/2019	Dawn	7, 8	05:11	03:41	05:26
	31/07/2019	Dusk	4, 14	21:14	20:09	22:44
	08/08/2019	Dusk	9, 10, 11, 12, 13	20:57	20:42	22:27
09/08/2019	Dawn	14, 15	05:37	03:57	05:37	
19/08/2019	Dusk	14, 15	20:33	20:17	22:03	

<b>Additional Buildings</b>	<b>Survey date</b>	<b>Survey type</b>	<b>Positions</b>	<b>Sunset/Sunrise</b>	<b>start time</b>	<b>end time</b>
	10/09/2019	Dusk	10, 11, 12, 13	21:45	21:30	22:15
South Farm - Building Complex	07/08/2018	Dawn	1, 2	05:24	03:54	05:39
	22/07/2019	Dusk	1, 2	21:29	21:14	22:59
	23/07/2019	Dawn	5, 6	04:57	03:27	05:12
	23/07/2019	Dusk	3, 4	21:28	21:13	22:58
	24/07/2019	Dusk	7, 8	21:26	21:11	22:56
	02/08/2019	Dawn	9, 10	05:14	03:44	05:29
	06/08/2019	Dusk	5, 6	21:02	20:54	22:32
	07/08/2019	Dusk	9, 10	20:59	20:44	22:29
	08/08/2019	Dawn	3, 4	05:25	03:55	05:40
	19/08/2019	Dusk	1, 2	20:32	20:17	22:02
	20/08/2019	Dawn	7, 8	05:48	04:18	06:03
	20/08/2019	Dusk	1, 2	20:31	20:16	22:00
	21/08/2019	Dawn	3, 4	05:50	04:20	06:05
	29/08/2019	Dusk	9, 10	20:09	19:54	21:39

**Table A-6: Activity Surveys – Transect Survey Dates and Timings**

<b>Transect</b>	<b>Survey Date</b>	<b>Type of Survey</b>	<b>Sunrise/Sunset</b>	<b>Survey Start Time</b>	<b>Survey End Time</b>
1	18/06/2018	Dusk	21:51	21:51	24:00
1	19/06/2018	Dawn	04:24	02:14	04:29
1	04/07/2018	Dusk	21:50	21:55	00:06
1	29/08/2018	Dusk	20:08	20:12	23:03
1	25/09/2018	Dusk	18:57	18:57	20:54

Transect	Survey Date	Type of Survey	Sunrise/ Sunset	Survey Start Time	Survey End Time
1	02/10/2018	Dusk	19:11	19:11	21:28
1	01/04/2019	Dusk	19:44	19:44	21:33
1	07/05/2019	Dusk	20:55	20:55	22:57
2	20/06/2018	Dawn	02:42	02:24	04:26
2	05/07/2018	Dusk	21:49	21:50	23:50
2	07/08/2018	Dusk	21:00	21:00	23:40
2	04/09/2018	Dusk	19:54	19:54	21:24
2	11/10/2018	Dusk	18:54	18:54	20:05
2	23/04/2019	Dusk	20:27	20:27	22:27
3	20/06/2018	Dusk	21:52	21:52	23:51
3	21/06/2018	Dawn	04:25	02:24	04:23
3	09/07/2018	Dusk	21:46	21:46	23:22
3	08/08/2018	Dusk	20:58	20:58	23:26
3	05/09/2018	Dusk	19:52	19:52	21:38
3	09/04/2019	Dusk	20:11	20:11	21:57
3	14/05/2019	Dusk	21:08	21:08	23:08

**Table A-7: Tree Surveys – Survey Weather Conditions**

Tree	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
12B	NA	Start	-	-	-	-	-	-

Tree	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
		End	-	-	-	-	-	-
14B	27/05/2019 (dusk)	Start	8	8	1	-	-	87
		End	8	8	1	-	-	89
14B	26/06/2019 (dawn)	Start	11	8	2	N	1	88
		End	11	5	2	N	1	89
170B	23/05/2019 (dusk)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
170B	07/06/2019 (dawn)	Start	7	5	1	-	0	89
		End	6	3	1	-	0	91
170B	20/06/2019 (dusk)	Start	12	2	2	NE	0	72
		End	10	2	2	NE	0	82
20.1Arb	29/05/2019 (dawn)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
20.1Arb	21/06/2019 (dawn)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
20.1Arb	-	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
208B	20/06/2019 (dawn)	Start	11	3	-	-	0	87
		End	11	7	-	-	0	89
208B	04/07/2019 (dusk)	Start	14	7	-	-	-	70



Tree	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
		End	14	7	-	-	-	68
20Arb	29/05/2019 (dawn)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
20Arb	21/06/2019 (dawn)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
31B	21/05/2019 (dawn)	Start	8	0	1	0	0	91
		End	-	-	-	-	-	-
31B	29/05/2019 (dusk)	Start	12	1	-	-	-	68
		End	10	1	-	-	-	72
31B	03/06/2019 (dusk)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
3B	-	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
4B.4	-	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
45.B	-	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
59B	22/05/2019 (dusk)	Start	13	1	1	-	0	59
		End	11	1	1	-	0	63

Tree	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
59B	11/06/2019 (dawn)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
5B	-	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
65B	22/05/2019 (dusk)	Start	13	1	1	-	0	59
		End	11	1	1	-	0	63
65B	19/06/2019 (dawn)	Start	11	6	-	-	2	80
		End	14	8	-	-	2	91
66Arb	20/05/2019 (dusk)	Start	12	6	1	-	0	89
		End	11	4	1	-	0	89
66Arb	06/06/2019 (dawn)	Start	9	7	1	-	0	87
		End	10	4	1	-	0	90
67Arb	20/05/2019 (dusk)	Start	12	6	1	-	0	89
		End	11	4	1	-	0	89
67Arb	06/06/2019 (dawn)	Start	9	7	1	-	0	87
		End	10	4	1	-	0	90
6B	-	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
96B	23/05/2019 (dusk)	Start	14	1	1	-	0	57
		End	-	-	-	-	-	-
98B	28/05/2019 (dusk)	Start	8	4	1	-	0	76

Tree	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
		End	7	3	1	-	0	83
98B	20/06/2019 (dawn)	Start	12	2	2	NE	0	72
		End	10	2	2	NE	0	82
98B	04/07/2019 (dawn)	Start	11	1	-	-	-	86
		End	10	3	-	-	-	88
G02	25/05/2019 (dusk)	Start	11	8	4	N	0	92
		End	11	8	4	N	1	93
G02	28/05/2019 (dawn)	Start	7	6	1	-	0	94
		End	7	3	1	-	0	90
G02	11/06/2019 (dawn)	Start	9	4	2	N	0	86
		End	9	5	3	N	0	88
G02	11/06/2019 (dusk)	Start	11	7	4	N	0	85
		End	11	8	5	N	0	83
G04	28/05/2019 (dawn)	Start	7	6	1	-	0	94
		End	7	3	1	-	0	90
G04	11/06/2019 (dusk)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
T20	27/05/2019 (dusk)	Start	8	8	1	-	-	87
		End	8	8	1	-	-	89
T20	21/06/2019 (dawn)	Start	9	7	1	-	-	87
		End	9	5	1	-	-	83

Tree	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
T2003	21/05/2019 (dusk)	Start	11	4	1	-	0	85
		End	8	2	1	-	1	94
T2003	29/05/2019 (dusk)	Start	12	1	-	-	-	68
		End	10	1	-	-	-	72
T2003	04/06/2019 (dawn)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
T2004	21/05/2019 (dawn)	Start	8	0	1	-	-	91
		End	-	-	-	-	-	-
T2004	30/05/2019 (dawn)	Start	10	3	1	-	-	81
		End	9	2	1	-	-	85
T2004	03/06/2019 (dusk)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
T2005	21/05/2019 (dusk)	Start	11	4	1	-	0	85
		End	8	2	1	-	1	94
T2005	30/05/2019 (dawn)	Start	10	3	1	-	-	81
		End	9	2	1	-	-	85
T2005	04/06/2019 (dawn)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
T2006	21/05/2019 (dusk)	Start	11	4	1	-	0	85
		End	8	2	1	-	1	94

Tree	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
T2006	30/05/2019 (dawn)	Start	10	3	1	-	-	81
		End	9	2	1	-	-	85
T2006	04/06/2019 (dawn)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
T2008	24/05/2019 (dawn)	Start	8	1	2	-	0	78
		End	8	1	2	-	0	80
T2008	06/06/2019 (dusk)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
T2009	22/05/2019 (dawn)	Start	6	3	1	-	0	97
		End	6	3	1	-	0	91
T2009	30/05/2019 (dusk)	Start	12	4	1	-	0	79
		End	11	7	1	-	0	83
T2009	05/06/2019 (dusk)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
T2009	18/06/2019 (dusk)	Start	18	2	1	-	0	67
		End	12	3	1	-	0	78
T2010	22/05/2019 (dawn)	Start	6	3	1	-	0	97
		End	6	3	1	-	0	91
T2010	30/05/2019 (dusk)	Start	12	4	1	-	0	79
		End	11	7	1	-	0	83

Tree	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
T2010	05/06/2019 (dusk)	Start	-	-	-	-	-	-
		End	-	-	-	-	-	-
T2010	18/06/2019 (dusk)	Start	18	2	1	-	0	67
		End	12	3	1	-	0	78
T21	21/06/2019 (dawn)	Start	9	7	1	-	-	87
		End	9	5	1	-	-	83
T22	27/05/2019 (dusk)	Start	8	8	1	-	-	87
		End	8	8	1	-	-	89
T22	21/06/2019 (dawn)	Start	9	7	1	-	-	87
		End	9	5	1	-	-	83
T2202	23/05/2019 (dusk)	Start	14	1	1	-	0	57
		End	-	-	-	-	-	-
T2202	07/06/2019 (dawn)	Start	7	5	1	-	0	89
		End	6	3	1	-	0	91
W02	22/05/2019 (dawn)	Start	6	3	1	-	0	97
		End	6	3	1	-	0	91
W02	10/06/2019 (dusk)	Start	11	8	2	N	0	89
		End	11	5	1	N	0	87

**Table A-8: Building Surveys - Survey Weather Conditions - Buildings identified by Jacobs**

Building	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
B1B	15/08/2018 (dawn)	Start	17	7	2	WSW	0	88
		End	15	8	4	WSW	0	82
B4B	14/08/2018 (dusk)	Start	18	6	3	SW	0	82
		End	17	6	5	SW	0	86
B4B	29/08/2018 (dawn)	Start	12	8	1	NE	0	85
		End	13	8	2	NE	0	84
B4B	20/08/2019 (Dusk)	Start	13.00	0.00	2.00	WSW	0	81
		End	12.00	0.00	1	SW	0	72
B5B	24/08/2018 (dawn)	Start	10	0	3	SW	0	86
		End	9	1	3	W	0	84
B6B	30/08/2018 (dawn)	Start	9	0	4	W	0	83
		End	8	0	4	WSW	0	83
B6B	05/09/2018 (dusk)	Start	13	2	1	SE	0	77
		End	12	0	1	S	0	90
B6B	11/09/18 (dusk)	Start	14	6	5	NE	0	67
		End	13	5	4	NE	0	77
B8B	31/07/2018 (dusk)	Start	17	3	5	E	0	64
		End	16	3	5	SE	0	71
B8B	23/08/2018	Start	11	7	1	NE	0	85

Building	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
	(dawn)	End	9	7	2	NE	0	90
B10B	30/07/2018 (dusk)	Start	16	6	1	SW	0	98
		End	13	2	3	SW	0	98
B10B	23/08/2018 (dusk)	Start	11	1	1	NE	0	83
		End	10	0	1	NE	0	87
B10B	06/09/2018 (dawn)	Start	13	2	1	SW	0	88
		End	10	2	1	W	0	73
B11B	31/07/2018 (dawn)	Start	11	1	1	-	0	-
		End	12	7	2	5	0	-
B11B	13/08/2018 (dusk)	Start	16	7	0	N/A	0	93
		End	15	8	0	N/A	0	96
B11B	28/08/2018 (dusk)	Start	16	2	1	NE	0	69
		End	15	2	2	NE	0	73
B100B	15/08/2018 (dusk)	Start	18	8	4	SW	Light	93
		End	16	8	3	SW	0	88
B101B	30/08/2018 (dawn)	Start	9	2	4	W	0	84
		End	7	3	2	W	0	87
B102B	22/08/2018 (dusk)	Start	15	1	1	E	0	71
		End	13	1	1	E	0	76
B102B		Start	17.00	8.00	4.00	ENE	0	94



Building	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
	31/07/2019 (Dawn)	End	16.00	8.00	1	ENE	3	94
B102B	14/08/2019 (Dusk)	Start	14.00	8.00	2.00	S	0	96
		End	14.00	8.00	2	SSE	0	99
B105B	29/08/2018 (dusk)	Start	14	1	1	-	0	63
		End	12	0	0	N/A	0	68

**Table A-9: Building Surveys - Survey Weather Conditions - Additional Buildings Surveyed by WSP**

Building Complex	Survey date	Survey type		Temp (°C) Start / End	Cloud cover (oktas) Start / End	Wind speed (beaufort) Start / End	Wind direction Start / End	Rainfall Start / End
Charlton Mires Farm Building - complex	30/08/2018	Dawn	G1, Y2	9 / 6	0 / 0	4 / 4	W / WSW	0 / 0
	05/09/2018	Dusk	G1, Y2	13 / 12	2 / 0	0 / 1	SE / S	0 / 0
	11/09/2018	Dusk	G1, Y2	14 / 13	5 / 5	5 / 4	NE / NE	0 / 0
	15/05/2019	Dawn	B1, B2, B3	9 / 9	1 / 0	0 / 0	- / -	0 / 0

Building Complex	Survey date	Survey type		Temp (°C) Start / End	Cloud cover (oktas) Start / End	Wind speed (beaufort) Start / End	Wind direction Start / End	Rainfall Start / End
	18/07/2019	Dawn	B2, Y1, Y2, Y3, Y4	14 / 12	7 / 7	1 / 0.5	SW / SW	0 / 0
	31/07/2019	Dusk	B4, Y1, Y2, Y3, Y4	16 / 16.4	8 / 8	2 / 3	N / S	0 / 0
	01/08/2019	Dawn	B1, B2, B3, G1, G2	15.6 / 15.5	8 / 8	4 / 4	NNW / NNW	0 / 0
	15/08/2019	Dawn	B1, B2	13.7 / 14	1 / 1	1 / 1	SW / SSW	0 / 0
	15/08/2019	Dawn	B3, B4, G2, Y1, Y2, G1	13.7 / 14	1 / 1	1 / 1	SW / SSW	0 / 0
Heckley Fence - Building Complex	26/06/2019	Dusk	1, 3	19 /	0 /	/	/	/
	27/06/2019	Dawn	6, 5	11 / 11	0 / 0	1 / 1	- / -	- / -
	27/06/2019	Dusk	2, 9	13 / 12	1 / 1	- / -	- / -	- / -
	28/06/2019	Dawn	7, 8	12 / 12	6 / 1	1 / 1	- / -	- / -
	08/07/2019	Dusk	3, 2	/	/	/	/	/
	09/07/2019	Dawn	1, 6	/	/	/	/	/

<b>Building Complex</b>	<b>Survey date</b>	<b>Survey type</b>		<b>Temp (°C) Start / End</b>	<b>Cloud cover (oktas) Start / End</b>	<b>Wind speed (beaufort) Start / End</b>	<b>Wind direction Start / End</b>	<b>Rainfall Start / End</b>
	09/07/2019	Dusk	7, 8	/	/	/	/	/
	22/07/2019	Dusk	3, 7	19 / 19	3 / 5	2 / 2	SW / SW	- / -
	23/07/2019	Dawn	5, 9	14 / 17	7 / 8	0.5 / 1	SSE / S	- / -
	23/07/2019	Dusk	6, 8, 9, 5	18 / 16	1 / 1	1 / 1	SW / SSW	- / -
	20/08/2019	Dawn	5, 9	13.6 / 12.6	8 / 7	2 / 2	SW / W	- / -
Heckley House	01/07/2019	Dusk	1, 2	17 / 10	3 / 1	1 / 1	NR / NR	0 / 0
Heckley House - Building Complex	02/07/2019	Dawn	3, 4	10 / 10	1 / 1	1 / 1	NR / NR	0 / 0
	02/07/2019	Dusk	5, 6	17 / 12	3 / 2	1 / 1	NR / NR	0 / 0
	03/07/2019	Dawn	7, 8	11 / 8	1 / 2	1 / 1	NR / NR	0 / 0
	03/07/2019	Dusk	9, 10	15 / 13	1 / 1	0 / NR	N/A / NR	0 / NR
	15/07/2019	Dusk	3, 4	14 / 14	4 / 0	1 / 1	S / S	0 / 0
	16/07/2019	Dawn	1, 2	12 / 13	0 / 1	1 / 0	SW / SW	0 / 0
	16/07/2019	Dusk	7, 8	17 / 16	6 / 0	1 / 1	SW / SW	0 / 0
	17/07/2019	Dawn	5, 6	14 / 14	0 / 7	1 / 2	SW / SW	0 / 0

Building Complex	Survey date	Survey type		Temp (°C) Start / End	Cloud cover (oktas) Start / End	Wind speed (beaufort) Start / End	Wind direction Start / End	Rainfall Start / End
	24/07/2019	Dusk	9, 11, 12, 13	18 / 17	2 / 4	1 / 1	SSW / SSW	0 / 0
	29/07/2019	Dusk	1, 2	17 / 16	8 / 3	1 / 1	WSW / WSW	- / -
	30/07/2019	Dawn	3, 4	12 / 12	7 / 6	1 / 1	WNW / NW	0 / 0
	30/07/2019	Dusk	5, 6	17 / 17	9 / 9	1 / 2	ENE / E	1 / 0
	31/07/2019	Dawn	7, 8	17 / 17	8 / 8	1 / 1	NE / NE	0 / 1
	31/07/2019	Dusk	4, 14	17 / 15	5 / 2	1 / 2	NNW / NNW	0 / 0
	08/08/2019	Dusk	9, 10, 11, 12, 13	13.9 / 13.5	1 / 2	1 / 2	NE / E	0 / 0
	09/08/2019	Dawn	14, 15	14.7 / 14.9	8 / 8	3 / 3	ESE / ESE	0 / 2
	19/08/2019	Dusk	14, 15	13.7 / 12.7	1 / 1	1 / 1	SW / SW	0 / 0
10/09/2019	Dusk	10, 11, 12, 13	17 / -	7 / -	1 / -	- / -	0 / -	
South Farm -	22/07/2019	Dusk	1, 2	21 / 19	2 / 3	1 / 2	SSE / SSW	0 / 0

<b>Building Complex</b>	<b>Survey date</b>	<b>Survey type</b>		<b>Temp (°C) Start / End</b>	<b>Cloud cover (oktas) Start / End</b>	<b>Wind speed (beaufort) Start / End</b>	<b>Wind direction Start / End</b>	<b>Rainfall Start / End</b>
Building Complex	23/07/2019	Dawn	5, 6	17 / 17	5 / 8	2 / 1	SSW / S	0 / 0
	23/07/2019	Dusk	3, 4	19 / 18	0 / 0	0 / 0	SE / S	0 / 0
	24/07/2019	Dusk	7, 8	19 / 20	2 / 2	1 / 1	S / SSW	0 / 0
	02/08/2019	Dawn	9, 10	15 / 15	8 / 8	1 / 1	N / N	0 / 0
	06/08/2019	Dusk	5, 6	13 / 13.2	7 / 3	2 / 1	S / S	0 / 0
	07/08/2019	Dusk	9, 10	15.8 / 14	8 / 5	1 / 1	WSW / W	1 / 0
	08/08/2019	Dawn	3, 4	11.9 / 12.1	0 / 0	1 / 1	WSW / W	0 / 0
	19/08/2019	Dusk	1, 2	13 / 11	1 / 0	3 / 2	SW / SW	0 / 0
	20/08/2019	Dawn	7, 8	12.9 / 12.7	7 / 7	3 / 1	W / W	0 / 0
	20/08/2019	Dusk	1, 2	12.4 / 9	0 / 0	1 / 1	SW / SW	0 / 0
	21/08/2019	Dawn	3, 4	10.7 / 10.4	7 / 8	1 / 2	SSE / S	0 / 0
	29/08/2019	Dusk	9, 10	16.7 / 16	6 / 3	0.5 / 0.5	SW / SSW	0 / 0

**Table A-10: Activity Surveys – Transect Survey Weather Conditions**

Transect	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
1	18/06/2018 (dusk)	Start	13	8	4	-	light	-
		End	-	2	1	-	0	-
1	19/06/2018 (dawn)	Start	10	1	1	SW	0	79
		End	8	0	1	S	0	87
1	04/07/2018 (dusk)	Start	15	4	2	N	0	-
		End	16	3	0	N/A	0	-
1	29/08/2018 (dusk)	Start	14	2	2	W	0	60
		End	12	0	2	W	0	70
1	25/09/2018 (dusk)	Start	14	8	4	NE	0	62
		End	13	8	6	NE	0	67
1	02/10/2018 (dusk)	Start	10.5	0	3	WSW	0	-
		End	7.5	0	1	WSW	0	-
1	01/04/2019 (Dusk)	Start	8	8	2	S	0	73
		End	7	8	4	SE	0	7979
1	07/05/2019	Start	6	8	2	ESE	0	79
		End	6	8	2	ESE	Mod	88
2	20/06/2018 (dawn)	Start	13	7	5	-	light	100
		End	15	8	3	-	light	100
2	05/07/2018 (dusk)	Start	14	8	1	E	0	-
		End	14	8	1	E	0	-
2	07/08/2018 (dusk)	Start	16	5	0	N/A	0	65
		End	12	5	1	-	0	85

Transect	Date		Temp (°C)	Cloud cover (oktas)	Wind speed (beaufort)	Wind direction	Rainfall	Humidity
2	04/09/2018 (dusk)	Start	13	8	3	SE	0	89
		End	-	-	-	-	-	-
2	11/10/2018 (dusk)	Start	16	8	2	N	0	88
		End	14	8	4	NW	0	87
2	23/04/2019 (dusk)	Start	9	4	2	ESE	0	88
		End	8	0	2	ESE	0	91
2	14/05/2019 (dusk)	Start	14	1	1	SE	0	
		End						
3	20/06/2018 (dusk)	Start	11	4	2	SSW	0	79
		End	10	3	2	SSW	0	79
3	21/06/2018 (dawn)	Start	8	1	3	SW	0	76
		End	8	1	2	SW	0	76
3	09/07/2018 (dusk)	Start	13	4	0	N/A	0	-
		End	13	8	1	S	0	-
3	08/08/2018 (dusk)	Start	14	5	2	WSW	0	60
		End	13	0	2	WSW	0	70
3	05/09/2018 (dusk)	Start	14	4	1	NW	0	75
		End	12	1	1	N	0	89
3	09/04/2019 (dusk)	Start	6	3	1	E	0	-
		End	5	1	1	E	0	-
3	14/05/2019 (dusk)	Start	14	1	1	SE	0	70
		End	10	0	1	SW	0	91

**Table A-11: Activity Surveys –Automatic Detector Deployment Period Survey Weather Conditions**

Month	Date	Sunrise	Sunset	Detector Location						Max Temp. (°C)	Min Temp. (°C)
				1	2	3	4	5	6		
June 2018	18/06/18	04:24	21:52	*D	D	-	-	-	-	19	10
	19/06/18	04:24	21:52	-	-	D	D	D	D	17	7
	20/06/18	04:24	21:53	-	-	-	-	-	-	19	10
	21/06/18	04:24	21:53	-	-	-	-	-	-	18	8
	22/06/18	04:25	21:53	-	-	-	-	-	-	17	9
	23/06/18	04:25	21:53	-	-	-	-	-	-	17	9
	24/06/18	04:25	21:53	-	-	-	-	-	-	18	8
	25/06/18	04:26	21:53	-	-	-	-	-	-	19	9
	26/06/18	04:26	21:53	-	**C	-	-	-	-	15	10
	27/06/18	04:27	21:53	C	-	C	C	C	C	15	11
July 2018	10/07/18	04:39	21:45	D	D	D	D	D	D	19	12
	11/07/18	04:40	21:44	-	-	-	-	-	-	18	12
	12/07/18	04:41	21:43	-	-	-	-	-	-	18	13
	13/07/18	04:43	21:42	-	-	-	-	-	-	19	14
	14/07/18	04:44	21:41	-	-	-	-	-	-	26	13
	15/07/18	04:45	21:39	-	-	C	-	-	-	24	11
	16/07/18	04:47	21:38	-	C	-	-	-	-	19	14
	17/07/18	04:48	21:37	-	-	-	-	-	-	19	13
	18/07/18	04:50	21:35	C	-	-	C	C	C	20	11
August 2018	07/08/18	05:24	20:59	D	D	D	D	D	D	22	14
	08/08/18	05:26	20:57	-	-	-	-	-	-	21	11



Month	Date	Sunrise	Sunset	Detector Location						Max Temp. (°C)	Min Temp. (°C)	
				1	2	3	4	5	6			
	09/08/18	05:28	20:55	-	-	-	-	-	-	20	9	
	10/08/18	05:30	20:53	-	-	-	-	-	-	16	9	
	11/08/18	05:32	20:51	-	-	-	-	-	-	20	8	
	12/08/18	05:34	20:49	-	-	-	-	-	-	17	13	
	13/08/18	05:36	20:46	C	C	C	C	C	C	-	18	15
	14/08/18	05:38	20:44	-	-	-	-	-	-	C	20	14
September 2018	04/09/18	06:18	19:53	D	D	D	D	D	D	13	11	
	05/09/18	06:20	19:50	-	-	-	-	-	-	15	9	
	06/09/18	06:22	19:48	-	-	-	-	-	-	15	8	
	07/09/18	06:23	19:45	-	-	-	-	-	-	17	6	
	08/09/18	06:25	19:42	-	-	-	-	-	-	17	8	
	09/09/18	06:27	19:40	-	-	-	-	-	-	20	11	
	10/09/18	06:29	19:37	C	C	C	C	C	C	15	10	
October 2018	02/10/18	07:11	18:40	D	D	D	D	D	D	15	8	
	03/10/18	07:13	18:38	-	-	-	-	-	-	16	7	
	04/10/18	07:15	18:35	-	-	-	-	-	-	18	11	
	05/10/18	07:17	18:32	-	-	-	-	-	-	11	7	
	06/10/18	07:19	18:30	-	-	-	-	-	-	11	5	
	07/10/18	07:21	18:27	-	-	-	-	-	-	14	4	
	08/10/18	07:23	18:25	C	C	-	-	C	C	16	12	
	09/10/18	07:25	18:22	-	-	-	-	-	-	17	10	
	10/10/18	07:27	18:20	-	-	-	-	-	-	15	7	

Month	Date	Sunrise	Sunset	Detector Location						Max Temp. (°C)	Min Temp. (°C)
				1	2	3	4	5	6		
	11/10/18	07:29	18:17	-	-	-	-	-	-	15	8
	12/10/18	07:31	18:15	-	-	C	-	-	-	19	8
April 2019	02/04/19	06:36	19:45	D	D	D	D	D	D	7	3
	03/04/19	06:33	19:47							7	1
	04/04/19	06:31	19:49							8	3
	05/04/19	06:28	19:51							9	5
	06/04/19	06:26	19:53							8	4
	07/04/19	06:23	19:55							8	6
	08/04/19	06:21	19:57							8	6
	09/04/19	06:18	19:59	C	C	C	C	C	C	9	5
May 2019	15/05/19	04:57	21:09	D	D	D	D	D	D	16	7
	16/05/19	04:56	21:11							12	8
	17/05/19	04:54	21:13							14	7
	18/05/19	04:52	21:15							12	9
	19/05/19	04:50	21:16							15	9
	20/05/19	04:49	21:18							14	10
	21/05/19	04:47	21:20							12	7
	...12/06/19			C		C	C		C		
	...07/19							C			
	...07/19				C						
*D = Deployed **C = Collected											

**Table A-12: DEFRA Local Scale Effect Surveys – Survey Weather Conditions**

<b>Crossing point</b>	<b>Date</b>		<b>Temp (°C)</b>	<b>Cloud cover (%)</b>	<b>Wind speed (beaufort)</b>	<b>Rainfall</b>
1	12/06/2018 (dawn)	Start	10	50	8	0
		Middle	10	30	8	0
		End	9	-	8	0
1	04/07/2018 (dusk)	Start	15	50	<10	0
		Middle	15	70	<10	0
		End	15	100	<10	0
2	11/06/2018 (dusk)	Start	12	100	5	0
		Middle	12	100	6	0
		End	11	95	6	0
2	05/07/2018 (dawn)	Start	15	70	6	0
		Middle	15	70	6	0
		End	15	70	6	0
3	02/07/2018 (dusk)	Start	13	100	8	0
		Middle	13	100	10	0
		End	13	100	8	0
3	05/07/2018 (dawn)	Start	17	90	<5	0
		Middle	17	60	<5	0
		End	17	50	<10	0
4	03/07/2018 (dusk)	Start	14	0	3	0
		Middle	13	0	5	0
		End	-	-	-	-
4	05/07/2018 (dusk)	Start	15	100	5	0
		Middle	14	100	5	0

<b>Crossing point</b>	<b>Date</b>		<b>Temp (°C)</b>	<b>Cloud cover (%)</b>	<b>Wind speed (beaufort)</b>	<b>Rainfall</b>
		End	-	-	-	-
5	01/08/2018 (dawn)	Start	14	10	15	0
		Middle	13	5	11	0
		End	13	15	11	0
5	08/08/2018 (dawn)	Start	11	25	9	0
		Middle	11	5	11	0
		End	11	5	9	0
6	12/06/2018 (dusk)	Start	13	95	13	0
		Middle	13	95	11	0
		End	13	85	11	0
6	05/07/2018 (dusk)	Start	14	90	4	0
		Middle	14	90	4	0
		End	14	90	4	0

# Appendix B

SURVEY RESULTS

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**Table B-1: Trees Surveys - Results**

Tree ID	Species	Grid Ref	Suitability	Recommendation	Potential Roost Feature
2B	Ash	NU 19513 15585	Low	Reinspection	Small dense coverage of ivy
6B	Ash	NU 19529 15902	High	Activity survey	Multiple PRFs around the tree.
68B	Horse Chestnut	NU 17150 21938	Moderate	Reinspection	Southern aspect collapsed with nest within main trunk, debris indicating use by barn owl e.g. pellets and bones. Raised bark throughout particularly eastern aspect. Northern aspect limb 4m has raised bark.
67B	Mixed	NU 17191 21929	Moderate	Activity Surveys	Dead branches were present, but no cavities were recorded. A weld caused by stems rubbing together was present.
66B	Sweet Chestnut	NU 17164 21836	Moderate	Activity Surveys	Large cavity present on main stem around 2m facing west.
9B	Ash	NU 19255 16144	Low	Reinspection	Several large cavities, smooth inner section but do not lead into the heartwood extensively.
10B	Oak	NU 19266 16145	Low	Reinspection	One obvious rot pocket and superficial Ivy present.
3B	Dead Ash	NU 19571 15834	High	Activity Surveys	Lifting bark present and a large extending cavity South facing at 0.5m high.
4B	Ash	NU 19601 15851	High	Reinspection	Multiple large Ash trees present in the area with PRFs. Area has cattle grazing in it frequently so we were unable to inspect further.
5B	Ash	NU 19517 15896	High	Activity Surveys	Tree had hollow trunk and multiple rot holes.
12B	Ash	NU 19495 16178	Moderate	Activity Surveys	Sideways-facing rot holes, some thick ivy cover and a very large tear-out feature over the water.
13B	Ash	NU 19435 16240	Low	Reinspection	Cavities between dual trunks and a small shallow fissure.
14B	Ash	NU 19421 16486	Moderate	Activity Surveys	Hollow cavity in trunk at lower level, broken limb with probable cavity facing up and a sideways-facing rot hole.
15B	Ash	NU 19139 16514	Low	Reinspection	Large open cavity present which does not extend far within the tree.
16B	Ash	NU 19088 16665	High	Reinspection	Horizontal hazard beam present.
17B	Beech	NU 19125 16691	Low	Reinspection	Two west facing rot holes were present at a height of 4m and 7m. Do not extend far back within the tree.
18B	Oak	NU 19084 16693	Low	Reinspection	Long fissure in scaffold limb with additional fissures on the western aspect at 4m which is open to water egress.
20B	Ash	NU 19139 16716	High	Activity Surveys	Four south-facing rot holes at various heights. All four south facing rot holes enter into the tree for approx. 5cm and lead to heartwood.
23B	Ash	NU 19157 17357	Low	Reinspection	The tree had a split bough and rot holes present.
T2003	Oak	NU 18660 18176	Moderate	Activity Surveys	Mature tree with dense ivy cover.
T2004	Ash	NU 18663 18173	Moderate	Activity Surveys	Mature tree with dense ivy cover.
T2005	Sycamore	NU 18663 18170	Moderate	Activity Surveys	Mature tree with dense ivy cover.
T2006	Alder	NU 18658 18156	Moderate	Activity Surveys	Mature tree with dense ivy cover.
T2002	Birch	NU 18683 18154	Moderate	Reinspection	Split limb on western aspect - remnant cavity behind. Also, second limb, directly beneath with horizontal cavity, fairly shallow but extends back.
T2001	Birch	NU 18711 18155	Moderate	Reinspection	Fallen tree with hollow central trunk section. Feeding remains of bird of prey on top.
27B	Birch	NU 18719 18141	Moderate	Reinspection	Tree had hollow trunk and knot holes.

Tree ID	Species	Grid Ref	Suitability	Recommendation	Potential Roost Feature
28B	Birch	NU 18721 18143	Moderate	Reinspection	The tree had a hollow trunk.
29B	Birch	NU 18721 18152	Low	Reinspection	Tree with broken branches and knot holes. Limb on south aspect with hollow cavity.
30B	Birch	NU 18719 18154	Low	Reinspection	The tree had a rotten hollow trunk.
31B	Ash	NU 18799 18134	Moderate	Activity Surveys	Multiple tear outs were present with rotten heartwood beneath creating crevices.
T2006	Ash	NU 18788 18776	Moderate	Reinspection	Mature tree with single cavity in limb on eastern aspect.
T2007	Ash	NU 18178 18186	High	Activity Surveys	Expansive cavity present.
32B	Ash	NU 18791 18141	Moderate	Reinspection	Hollow core at base of twin trunks, crevice caused by rubbing branches. Fallen limb with large hazard beam from resulting fall.
37B	Ash	NU 18780 18188	Low	Reinspection	The tree had broken and split limbs.
40B	Ash	NU 18813 18192	Low	Reinspection	Dead and broken branches were present on the tree.
42B	Oak	NU 18837 18183	High	Activity Surveys	A large tear out was present, as well as a crevice caused by rubbing branches, a hazard beam in a limb on the eastern side of the tree with side-facing opening, a knot hole on the northern aspect and lifted bark
43B	Sycamore	NU 18849 18193	Low	Reinspection	A tear-out was present on the southern aspect at an approximate height of 8m.
44B	Wych Elm	NU 18849 18195	Low	Reinspection	A frost crack was present leading to a crevice at the top as well as a small knot hole.
45B	Horse Chestnut	NU 18860 18191	Low	Reinspection	Small rot holes were present next to branches as well as a hollow trunk with a low entrance
46B	Horse Chestnut	NU 18888 18193	Low	Reinspection	A tear-out was present near the top of the tree and a broken branch with a small crevice behind on eastern aspect.
47B	Ash	NU 18912 18195	Low	Reinspection	A tear out on the southern aspect was present which has created a shallow crevice.
202B	Ash	NU 18099 19829	Moderate	Reinspection	No potential features were observed from a distance but the size of the tree suggested features may have been present
203B	Ash	NU 18099 19809	Moderate	Reinspection	No potential features were observed from a distance but the size of the tree suggested features may have been present
T2009	Ash	NU 18102 19807	Moderate	Activity Surveys	Tree has seven tear outs, all seem to go down. Rot on split limb on east aspect of trunk. Hollow on west aspect of a limb.
T2010	Ash	NU 18102 19822	High	Activity Surveys	Two rot holes in SE aspect of tree. Both seem to extend up the trunk. Extensive internal rot with cavities access of SE, SW and large basal rot on W aspect
204B	Mixed	NU 18195 19190	Low	Reinspection	Mixed plantation woodland which featured young and semi-mature oak, sycamore, sitka spruce, ash, silver birch, yew and cherry laurel. No obvious potential roost features were observed but that woodland was considered to have potential to support roosting bats
T2008	Sycamore	NU 18184 19220	Moderate	Activity Surveys	Semi mature tree with tear out wounds.
48B	Ash	NU 17832 20046	Low	Reinspection	Holes present in trunk leading to potential voids.
49B	Ash	NU 17808 20087	Moderate	Reinspection	A rot hole with staining was present.
201B	Mixed	NU 17918 20089	Low	Reinspection	Mixed plantation woodland that contained mature, semi-mature Scots Pine, ash, larch, beech and willow. A higher proportion of semi-mature trees were present close to the A1. No obvious features of roost potential were observed, although the woodland was considered to have potential to support roosting bats

Tree ID	Species	Grid Ref	Suitability	Recommendation	Potential Roost Feature
51B	Sycamore	NU 17274 20397	Low	Reinspection	A rot pocket was present on the eastern-facing limb leading to a potential void
52B	Ash	NU 17270 20399	Moderate	Reinspection	Fissure present in trunk leading to potential void.
59B	Horse Chestnut	NU 17390 21341	Moderate	Activity Surveys	Several fissures were present on the eastern aspect.
60B	Sycamore	NU 17041 21341	Moderate	Reinspection	Several cracks and fissures were present where the stem had collapsed.
61B	Sycamore	NU 16781 21370	Moderate	Reinspection	Several rot holes present on all aspects.
62B	Sycamore	NU 16928 21387	Moderate	Reinspection	Several hazard beams were present in the limbs on all aspects of the tree.
63B	Alder	NU 16960 21390	Moderate	Reinspection	Several long rot holes were present in stem, on all aspects of tree.
65B	Sycamore	NU 17293 21424	High	Activity Surveys	Multiple deep fissures to northwest trunk and scaffold limbs. Longitudinal cracks along underside of smaller branches were widespread.
G01	Sycamore	NU 18613 16171	Moderate	Reinspection	Crevice at top of dead wood, extends 0.5m up can be fully inspected from ground level.
G02	Birch	NU 18588 16149	High	Activity Surveys	Crevice top of dead wood of dead wood, large cavity on main stem, looks to lead into a large hollow.
G03	Birch	NU 18585 16125	Moderate	Reinspection	Knot hole 15m W facing.
G04	Dead	NU 18589 16133	Moderate	Activity Surveys	Hollow tree with multiple cavities leading into hollow.
G05	Sycamore	NU 18631 16193	Moderate	Reinspection	Large rotten pruning cut.
219	Species not recorded		Low	Reinspection	Two bird boxes present on tree.
W01	Species not recorded	NU 18442 20524	Low	Reinspection	Low cavity on tree.
W02	Birch	NU 18089 20219	Mod	Activity Surveys	Vertical split in south eastern limb 3-4m high. Ivy holding split together.
170B	Species not recorded	NU 18930 19936	High	Activity surveys	Small rot hole on east limb of tree 8m over track, Shallow
T2201	Species not recorded	NU 18812 20268	Low	Reinspection	Small shallow rot hole on east limb of tree 8m over track.
T2202	Species not recorded	NU 18816 20245	Mod	Activity Surveys	Woodpecker hole on west aspect of limb at 8m.
98Arb	Species not recorded	NU 18977 19751	Mod	Activity Surveys	Potential roost features present around the tree.
96Arb	Species not recorded	NU 18982 19731	High	Activity Surveys	Tree is rotten and has potential roost features present all around.
208	Species not recorded	NU 17155 21937	High	Activity Surveys	Very Rotten trunk and large cavities in limbs with lifted bark present.



**Table B-2: Building Surveys – Results - Buildings Identified by Jacobs**


Description of Structure / Bat Roost Suitability / Hibernation Suitability	Grid Ref	Roost Description and Location
<p>B10B - A two-storey stone build residential house approximately 100 years old with a slate roof pitches and covered with slates. The surrounding land use is residential and pasture.</p> <p>Gaps were present between the top of the eastern wall and the roof tiles. There was also a large gap above the garage door</p>	NU 17420 21255	<p>The possible bat roost was located between the guttering lining a flat rooved section at the rear of the structure (facing south west)</p> <p><b>Roost classification:</b> Soprano pipistrelle – Non-breeding</p>



Description of Structure / Bat Roost Suitability / Hibernation Suitability	Grid Ref	Roost Description and Location
<p>potentially leading into a roof void. Gaps were present under the flashing around the dormer extensions on eastern aspect.</p> <p><b>Original surveys in 2016 identified a confirmed roost due to anecdotal evidence from the owner/tenant</b></p> <p><b>Hibernation suitability – Moderate</b></p>		<p>Max count = 1, Possible re-entry, 6 September 2018</p> <p style="text-align: center;"><b>No Photograph available</b></p>
<p>B11B - Victorian era detached dwelling constructed from sandstone and bricks with a slate roof. The gable end had wooden cladding and overhanging slates on an extension. The land surrounding the building was a mixture of woodland and grazed pasture.</p> <p>A small gap was noted in the mortar on the north eastern end of the building. The soffit box on the overhung roof had gaps present. Raised tiles were observed that provided potential access for bats. There was also missing mortar beneath the building's ridge tiles</p> <p><b>Bat Roost Suitability = High (2016 survey result)</b></p> <p><b>Hibernation suitability – Moderate</b></p>	<p>NU 17170 21936</p>	<p>No roost was recorded</p>
<p>B4B - A two-storey residential cottage approximately 150 years old with a modern Dutch pitch barn style roof. The surrounding land use was residential garden and woodland, with roads to the east and west.</p> <p>Gaps present in porch fascia, and lead flashing was open to western aspect along the roof top.</p> <p><b>Bat Roost Suitability = Moderate (2016 survey result)</b></p> <p><b>Hibernation suitability – Moderate</b></p>	<p>NU 17818 20034</p>	<p>The possible bat roost was located at the centre of the flat rooved ridge of the central dormer on the east facing side of the structure</p> <p>Roost classification:                      Unspecified bat – Non-breeding                      Max count = 1, Possible re-entry, 14 August 2018</p> <p style="text-align: center;"><b>Not Photograph available</b></p>
<p>B8B - A single storey, stone detached dwelling with a slate roof. A smallholding surrounded the building on three sides. A minor road was present to the south.</p> <p>The dwelling's owner reported a crack going into the loft. There was missing mortar between the ridge tiles.</p> <p><b>Bat Roost Suitability = Moderate (2016 survey result)</b></p> <p><b>Hibernation suitability – Moderate</b></p>	<p>NU 18225 20693</p>	<p>No roost was recorded</p>

Description of Structure / Bat Roost Suitability / Hibernation Suitability	Grid Ref	Roost Description and Location
<p>B1B – Concrete culvert; approximately 30 years old. The culvert was approximately 1 m tall, 60 m long and 2 m wide. The land surrounding the culvert was arable and young plantation.</p> <p>Likely to be cracks inside the culvert, based on the culverts age and external condition.</p> <p><b>Bat Roost Suitability = Low (2016 survey result)</b></p> <p><b>Hibernation suitability – Moderate</b></p>	<p>NU 19625 15631</p>	<p>No roost was recorded</p>
<p>B101B – a well-maintained, two-storey, detached, stone dwelling. The dwelling had a hipped slate-covered roof and a single-storey extension to the east with a multi-pitched hipped slate-covered roof. Climbing foliage was present on the southern aspect which may have obscured suitability roost features. The surrounding land featured farmland and hedgerows.</p> <p>Features may have been present on the northern and eastern aspects of the building that could not be viewed.</p> <p><b>Bat Roost Suitability = Low (2016 survey result)</b></p> <p><b>Hibernation suitability – Moderate</b></p>	<p>NU 17741 20647</p>	<p>No roost was recorded</p>
<p>B100B- well maintained, single-storey, stone dwelling with associated kennels and modern pre-fabricated garage. The dwelling had a slate roof. The surrounding land comprised grazed pasture and hedgerows.</p> <p>Small gaps under ridge tiles and beneath coping stones.</p> <p><b>Bat Roost Suitability = Low (2016 survey result)</b></p> <p><b>2018 reassessment = Moderate</b></p> <p><b>Hibernation suitability – Moderate</b></p>	<p>NU 17554 21051</p>	<p>No roost was recorded</p>
<p>B102B – A well-maintained, single-storey detached stone dwelling. The dwelling had a slate roof. Two stone extensions were located on the northern side with single-pitched, slate-covered roofs. The surrounding land featured farmland and hedgerows.</p> <p><b>Bat Roost Suitability = Low (2016 survey result)</b></p> <p><b>2018 reassessment = High</b></p> <p><b>Hibernation suitability – Moderate</b></p>	<p>NU 17787 20638</p>	<p><b>1:</b> Roost is located under the gutter towards the south-eastern corner on the south facing side of the structure.</p> <p><b>Roost classification:</b></p> <p>Common pipistrelle – Non-breeding, summer roost</p> <p>Max count = 2, Emergence, 22 August 2018</p> <p><b>2:</b> The roost is located in a crevasse within the buildings stone and mortar work, approximately 1.5m above the ground on south-eastern corner on the south facing facade of the structure</p> <p><b>Roost classification:</b></p> <p>Common pipistrelle – Non-breeding, Summer roost</p>

Description of Structure / Bat Roost Suitability / Hibernation Suitability	Grid Ref	Roost Description and Location
		<p>Max count = 5, Re-entering, 22 August 2018</p>  <p>3: The roost is located at the westerly gable end of the structure  <b>Roost classification:</b>                  Common/soprano pipistrelle – Non-breeding, summer roost                  Max Count = 5, re-entry, 31 July 2019</p>  <p>4: The roost is located at the westerly gable end of the structure  <b>Roost classification:</b>                  Noctule – Non-breeding, summer roost                  Max Count = 1, emergence, 14 August 2019</p>

Description of Structure / Bat Roost Suitability / Hibernation Suitability	Grid Ref	Roost Description and Location
		
<p>B5B - A storage shed approximately 10 years old. It was wood panels construction with bitumen felt roof.</p> <p>The surrounding land use was residential garden and woodland, with roads to the east and west</p> <p>Gaps present between top of gable ends and the roof overhang on eastern and western aspects.</p> <p><b>Bat Roost Suitability = Low (2016 survey result)</b></p> <p><b>Hibernation suitability – Moderate</b></p>	<p>NU 17836 20034</p>	<p>No roost was recorded</p>
<p>B105B - Stone bus-shelter with a flat bitumen felt-covered roof. The surrounding land featured farmland and hedgerows.</p> <p>The door and window were open, providing access for bats to the inside of the building. A small gap was present between the fascia and the stonework.</p> <p><b>Bat Roost Suitability = Low (2016 survey result)</b></p> <p><b>Hibernation suitability – Moderate</b></p>	<p>NU 17776 20415</p>	<p>No roost was recorded</p>

**Table B-3: Building Surveys – Results - Additional Buildings Surveyed by WSP**

**Charlton Mires Farm Building Complex – Description**


The building complex comprising 16 discreet and interconnecting structures with a variety of ages and building material types. Construction materials include stone, timber, breeze block, steel frames and asbestos cladding. Roofing materials include slate, terracotta tiles, corrugated iron and asbestos roof sheeting. Height of the structures were of varied between one and two stories. The structures were used for agriculture use including cattle housing, machinery and tool storage these farm structures were unhabitated, the residential property for this farm has been identified as B101B and has been survey separately.

PRF were identified between degraded mortar and stonework across the complex. Roofing materials were in generally in good condition however gaps were specifically identified in the terracotta tiles roof of B6K. Structural gaps between roof joins across the structures could provide internal access in to the structures.

Due to the interconnectivity of the buildings within the complex some aspect of the individual structure could not be assessed. Further this interconnection provided opportunities for bat to commute through the interior of the structures. The open barn structure provided foraging opportunities for bats.

The building complex in close proximity to the current A1 to the west, it is surrounded by farmland.

**Building Surveys – Results – Charlton Mires Farm Building Complex**

Description of Structure/ Bat Roost Suitability/Hibernation Suitability	Grid Ref	Roost Description and Location
B6A - Two-storey stone block construction with asbestos cement sheet roof. <b>Bat Roost Suitability = High (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 17728 20678	No roost was recorded
B6B - Single pitched extension off B6A/B6C. Stone block with asbestos cement roof. <b>Bat Roost Suitability = Low (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 17739 20685	No roost was recorded
B6C -Two-storey stone block construction with asbestos cement sheet roof. <b>Bat Roost Suitability = Confirmed from 2018 surveys</b> <b>Hibernation suitability – Moderate</b>	NU 17744 20682	<p>1: Possible roost located within south facing side of the structure, light levels prevented specific location identification</p> <p><b>Roost classification:</b>                      Possible Common pipistrelle – Non-breeding, summer roost                      Max count = 1, emergence, 21 July 2019 and 15 August 2019</p> 
B6D - Timber framed lean-to with metal sheet walls and roof <b>Bat Roost Suitability = Negligible (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 17750 20689	No roost was recorded
B6E - Single-storey Stone block with pitched metal roof extension to B6C. <b>Bat Roost Suitability = Low (2019 Assessment)</b>	NU 17753 20683	No roost was recorded

<b>Hibernation suitability – Moderate</b>		
B6F - Large timber-framed shed with metal sheet roof. <b>Bat Roost Suitability = Low (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 17764 20680	No roost was recorded
B6G - Stone block with pitched metal sheet roof. <b>Bat Roost Suitability = Moderate (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 17772 20689	No roost was recorded
B6H - Stone block construction. Timber frame roof with slate tile <b>Bat Roost Suitability = High (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 17778 20681	No roost was recorded
B6I - Timber-framed, asbestos cement sheet roof. Attached into B6H. <b>Bat Roost Suitability = Negligible (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 17780 20668	No roost was recorded
B6J - Hipped extension to B6K. Stone block with slate roof. <b>Bat Roost Suitability = Moderate (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 17782 20660	No roost was recorded
B6K - Stone block construction with a Clay pan tile roof in poor condition. <b>Bat Roost Suitability = Confirmed (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 17774 20666	<b>1:</b> Roost is in a crevasse within the buildings stone and mortar work on the west facing side of the buildings. The roost is approximately 2 m above the ground <b>Roost classification:</b> Common pipistrelle – Non-breeding, summer roost Max Count = 1, re-entering, 15 May 2019



2: Roost location unspecified. Located on the south facing aspect of the structure

**Roost classification:**

Common pipistrelle – Non-breeding, Summer roost

Max Count = 1, emergence, 15 August 2019



B6L – Single storey, stone structure with slate roof,  
**Bat Roost Suitability = Low (2019 Assessment)**  
**Hibernation suitability – Moderate**


NU 17755  
 20671

No roost was recorded



<p>B6M – Breezeblock and timber cattle shed. Corrugated asbestos sheet roof.  <b>Bat Roost Suitability = Negligible (2019 Assessment)</b>  <b>Hibernation suitability – Moderate</b></p>	<p>NU 17733 20668</p>	<p>Possible roost located within the internal structural components of the open barn structure, no defined location  <b>Roost classification:</b>                  Common pipistrelle – Non-breeding, summer roost                  Max Count = 2, emergence, 15 August 2019</p>
<p>B6N - Two storey stone construction with Slate tile roof.  <b>Bat Roost Suitability = Moderate (2019 Assessment)</b>  <b>Hibernation suitability – Moderate</b></p>	<p>NU 17719 20666</p>	<p>No roost was recorded</p>
<p>B7 - Metal-frame, open sided barn. Partial breezeblock walls with corrugated asbestos cement sheet roof.  <b>Bat Roost Suitability = Negligible (2019 Assessment)</b>  <b>Hibernation suitability – Moderate</b></p>	<p>NU 17721 20682</p>	<p>No roost was recorded</p>
<p>C1 – Single stone and slate out building.  <b>Bat Roost Suitability = High (2019 Assessment)</b>  <b>Hibernation suitability – Moderate</b></p>	<p>NU 17775 20654</p>	<p>No roost was recorded</p>
<p>C2 - Single stone and slate out building.  <b>Bat Roost Suitability = High (2019 Assessment)</b>  <b>Hibernation suitability – Moderate</b></p>	<p>NU 17788 20656</p>	<p>No roost was recorded</p>
<p><b>Heckley Fence Building Complex – Description</b></p> <p>A building complex comprising of three structures, two stone built slate rooved structures and a steel beamed and corrugated iron roved open barn. One of the two stone structure is a residential building comprising of various one and two storey unites including a disused dove coat in the south westerly section. The second stone-built structure is a barn used for storage. The stone buildings had various gaps within the mortar and stonework. The slate roves were in good conditions however small gaps were present providing access to the internal roof space. Notably, the dove cote at the south-easterly extent of the residential property has numerous bat roosting features across the tower structure</p> <p>The steal beamed, corrugate irons structure was completely open used to store farm and domestic machinery.</p> <p>The building complex is surrounded by farmland</p>		

**Building Surveys – Results - Heckley Fence Building Complex**

Description of Structure/ Bat Roost Suitability/Hibernation Suitability	Grid Ref	Roost Description and Location
<p>HF1 - Two storey residential, stone walled building with slate roof with dove cote attached.  <b>Bat Roost Suitability = High (2019 Assessment)</b>  <b>Hibernation suitability – Moderate</b></p>	<p>NU 18719 17266</p>	<p>1: Roost is located within the disused dove cote towards the westerly extent of the building  <b>Roost classification:</b>                      Common/soprano pipistrelle – Non-breeding, summer roost                      Max Count = 1, re-entry, 27 June 2019 and 28 June 2019</p> 
<p>HF2 - Two storey stone barns with slate roof.  <b>Bat Roost Suitability = High (2019 Assessment)</b>  <b>Hibernation suitability – Moderate</b></p>	<p>NU 18713 17307</p>	<p>No roost was recorded</p>
<p>HF3 – steel-beamed and corrugate irons open barn.  <b>Bat Roost Suitability = Negligible (2019 Assessment)</b>  <b>Hibernation suitability – Moderate</b></p>	<p>NU 18676 17294</p>	<p>No roost was recorded</p>



**Heckley House Building Complex (West) – Description**



The westerly extent of the building complex includes a large three-storey stone built, tile rooved manor house. There were out-buildings attached to the main house structure and other structures in close proximity. These out buildings include single storey stone barns and a wooden structure. There are in varying states of repaired. A newly built single-storey stone and slate tile rooved structure was also present.

Intention gaps in the structures were present (at the gable end of the newly built structure) as well as gaps caused by structural damage these were located at wall head and within the gable ends of structures.

There structures are surrounded by woodland and farmland

**Building Surveys – Results - Heckley House Building Complex (West)**

Description of Structure/ Bat Roost Suitability/Hibernation Suitability	Grid Ref	Roost Description and Location
<p>HH1 - Three storey stone building residential house with slate roof.</p> <p><b>Bat Roost Suitability = High (2019 Assessment)</b></p> <p><b>Hibernation suitability – Moderate</b></p>	<p>NU 18648 16155</p>	<p><b>1:</b> Roost is located under guttering on the north facing side of the structure</p> <p><b>Roost classification:</b> Soprano pipistrelle – Non-breeding, summer roost Max Count = 2, emergence, 15 July 2019</p> <p><b>Roost classification:</b> <i>Nyctalus</i> species – Non-breeding, summer roost Max count = 1, emergence, 15 July 2019</p>  <p><b>2:</b> Roost is located under the lead flashing linking the base of the north-west chimney stack.</p> <p><b>Roost classification:</b> Soprano pipistrelle – Non-breeding, summer roost Max Count= 1, re-entry, 16 July 2019</p> 

		<p><b>3:</b> Roost located under edging tiles on the north facing gable end of the structure  <b>Roost classification:</b>                  Soprano pipistrelle – Non-breeding, summer roost                  Max Count= 1, re-entry, 16 July 2019</p> <p><b>4:</b> Roost located under the guttering of the north facing side of the structure  <b>Roost classification:</b>                  Soprano pipistrelle – Non-breeding, summer roost                  Max Count= 3, emergence, 29 July 2019</p> 
<p>HH2 - Stone and wooden outbuilding associated with the manor house.  <b>Bat Roost Suitability = High (2019 Assessment)</b>  <b>Hibernation suitability – Moderate</b></p>	<p>NU 18674                  16180</p>	<p><b>1:</b> Roost located within the structural open at the structure west facing gable end  <b>Roost classification:</b>                  Soprano pipistrelle – Non-breeding, summer roost                  Max Count= 1, re-entry, 31 July 2019</p> 

**2:** Roost located at the tiled roof edge toward the east of the structure

**Roost classification:**

Soprano pipistrelle – Non-breeding, summer roost

Max Count= 1, re-entry, 31 July 2019

**3:** Roost located at the tiled roof edge toward the east of the structure

**Roost classification:**

Soprano pipistrelle – Non-breeding, summer roost

Max Count = 1, re-entry, 31 July 2019



**4:** Roost located under the roof edge at the east facing gable of the wood panelled structure.

**Roost classification:**

Soprano pipistrelle – Non-breeding, Summer roost

Max Count= 1, re-entry, 31 July 2019




### Heckley House Building Complex (East) – Description

The eastern structure of the building complex included a residential stone wall and slate rooved structure with associated storage buildings including a small single-storey stone shed with a slate roof and a newly built garage. The garage was built using material to match the other structure present within the complex. A single-storey stone barn with three rooflines (two constructed of corrugated asbestos and the third, to the north the, was of terracotta tiles) was present to the east

The residential structure and garage appeared to be well maintained, the single-storey stone storage buildings had crake within the stonework and feature with in the roof that might provide access for bat. The barn structure to the east was in a poor state of repair, gaps within the motor a stone or were identified across the structure provided significant opportunities for bat to access

There structures are surrounded by woodland and farmland

### Building Surveys – Results – Heckley House Building Complex (East)

Description of Structure/ Bat Roost Suitability/Hibernation Suitability	Grid Ref	Roost Description and Location
HH3 - Residential single storey, stone wall and slate rooved structure. <b>Bat Roost Suitability = High (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 18778 16235	<p><b>1:</b> Roost located on the on the south facing wall of the structure.                      Roost classification:                      Common pipistrelle – Non-breeding, Summer roost                      Max Count = 2, emergence, 8 August 2019</p> <p><b>2:</b> Roost located on the on the south facing wall of the structure                      Roost classification:                      Soprano pipistrelle – Non-breeding, summer roost                      Max count = 1, emergence, 22 July 2019</p> 
HH4 - Single storey stone walled, slated roved garaged. <b>Bat Roost Suitability = High (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 18770 16245	No roost was recorded

HH5 - small single-storey stone storage building with a slate roof. <b>Bat Roost Suitability = High (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 18784 16251	No roost was recorded
HH6 - Single-storey stone barn with three rooflines. <b>Bat Roost Suitability = High (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 18810 16245	No roost was recorded

#### South Farm – Building complex – Description


The building complex is large comprising of residential and farm structures. The residential structures include a newly built/refurbished structure with stone walls and slate tiled roof comprising of one and two storey structural components; an older two storey residential structure with pebble dashed walls concealing the walls structural material, this structure had a tiled roof; there was also a line of terraced houses, again the structure material was concealed by pebble dashing, this structure had a tiled roof.

There are 12 single stored, stone barns with tiles rooves, the internal structure of these barn maybe to one another. Large open barn structures were also present within the complex.

There structures are surrounded by woodland and farmland

#### Building Surveys – Results – South Farm – Building complex

Description of Structure/ Bat Roost Suitability/Hibernation Suitability	Grid Ref	Roost Description and Location
SF1 - Two storied, newly built/refurbished structure with stone walls and slate tiled roof. Not with in Bat Survey Area	NU 19285 18980	No roost was recorded
SF2 - two storey residential structure with pebble dashed walls with tiled roof. <b>Bat Roost Suitability = High (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 19199 18903	No roost was recorded
SF3 - two storey residential terrace with pebble dashed walls with tiled roof. <b>Bat Roost Suitability = High (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 19174 18941	<p><b>1:</b> Roost was located under the gutter of a single-storey lean-to extension at the northeast aspect of the building  <b>Roost classification:</b>                      Common Pipistrelle – Non-breeding, summer roost                      Max count = 1, emergence, 22 July 2019</p> <p><b>2:</b> Roost was located under a ridge tile between the 2<sup>nd</sup> and third chimneys from the eastern end of the structure  <b>Roost classification:</b>                      Unspecified species, Possible common/soprano pipistrelle– Non-breeding, summer roost</p>

		<p>Max Count = 1, re-entry, 07 August 2019</p> 
<p>SF4 - 11 single storey, stone barns with tiles rooves.  <b>Bat Roost Suitability = High (2019 Assessment)</b>  <b>Hibernation suitability – Moderate</b></p>	<p>NU 19242          18954</p>	<p>No roost was recorded</p>
<p>SF5 - Large open barn structure.  <b>Bat Roost Suitability = High (2019 Assessment)</b>  <b>Hibernation suitability – Moderate</b></p>	<p>NU 19228          18976</p>	<p>1: Roost was located within in the open barn structure, emergency was recorded form the opening in the west facing wall for the barn.  <b>Roost classification:</b>          Common Pipistrelle – Non-breeding, summer roost          Max count = 1, emergence, 23 August 2019</p> <p>2: Roost was located within in the open barn structure, emergency was recorded form the roof edge on the barns south facing gable end  <b>Roost classification:</b>          Common Pipistrelle – Non-breeding, summer roost          Max count = 1, emergence, 23 August 2019</p>





3: Roost was located within in the open barn structure, emergency was recorded form the opening in the north facing gable end of barn

**Roost classification:**

Soprano pipistrelle– Non-breeding, summer roost

Max count = 1, re-entry, 23 July 2019



4: Roost was located within a crack of a small section of stone wall, the roost was located on the southern aspect of the wall.

**Roost classification:**

Soprano pipistrelle– Non-breeding, summer roost

Max count = Emergence, 20 July 2019

**Roost classification:**

Common pipistrelle – Non-breeding, summer roost

Max count = Emergence, 20 July 2019

Stone wall towards the east of SF5.	NU 19228 18976	
SF6 - Large open barn structure. <b>Bat Roost Suitability = High (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 19228 19004	No roost was recorded
SF7 - Large open barn structure. <b>Bat Roost Suitability = High (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 19218 19042	No roost was recorded
SF8 – Stone barn. <b>Bat Roost Suitability = High (2019 Assessment)</b> <b>Hibernation suitability – Moderate</b>	NU 19194 18975	No roost was recorded

**Table B-4: DEFRA Landscape Scale Effects – Results – 2018 Transect Surveys**

Route	Direction	Date	Distance (m)	Sunset	Spot Start Time	Time After Sunset (min)	Myotis sp.	Nyctalus sp.	Brown Long-eared Bat	Common Pipistrelle	Soprano Pipistrelle	Habitat
1	away	06/08/2018	0	21:02	21:32:00	30	0	0	0	1	0	3
1	away	06/08/2018	100	21:02	21:44:00	42	0	0	0	16	2	1
1	away	06/08/2018	200	21:02	21:56:00	54	25	0	0	23	0	1

Route	Direction	Date	Distance (m)	Sunset	Spot Start Time	Time After Sunset (min)	Myotis sp.	Nyctalus sp.	Brown Long-eared Bat	Common Pipistrelle	Soprano Pipistrelle	Habitat
1	away	06/08/2018	300	21:02	22:08:00	66	0	0	0	1	0	5
1	away	06/08/2018	400	21:02	22:19:00	77	1	0	0	0	0	5
1	away	06/08/2018	500	21:02	22:36:00	94	0	0	0	0	0	5
1	away	06/08/2018	600	21:02	22:51:00	109	3	0	0	59	27	2
1	away	06/08/2018	700	21:02	23:03:00	121	1	0	0	8	15	2
1	away	06/08/2018	800	21:02	23:15:00	133	0	0	0	1	9	2
1	away	06/08/2018	900	21:02	23:28:00	146	0	0	0	1	0	2
1	away	06/08/2018	1000	21:02	23:40:00	158	0	0	0	2	1	2
1	towards	01/08/2018	0	21:12	23:47:00	155	0	0	0	0	0	1
1	towards	01/08/2018	100	21:12	23:35:00	143	1	0	0	0	0	1
1	towards	01/08/2018	200	21:12	23:22:00	130	0	0	0	8	54	1
1	towards	01/08/2018	300	21:12	23:09:00	117	0	0	0	0	0	1
1	towards	01/08/2018	400	21:12	22:56:00	104	0	0	0	6	18	1
1	towards	01/08/2018	500	21:12	22:44:00	92	0	0	0	4	9	5
1	towards	01/08/2018	600	21:12	22:31:00	79	0	0	0	2	2	1
1	towards	01/08/2018	700	21:12	22:18:00	66	0	0	0	3	18	2
1	towards	01/08/2018	800	21:12	22:06:00	54	0	0	0	9	5	2
1	towards	01/08/2018	900	21:12	21:53:00	41	0	0	0	4	2	1
1	towards	01/08/2018	1000	21:12	21:41:00	29	0	0	0	1	0	1
2	away	09/08/2018	0	20:55	21:25:00	30	0	0	0	2	0	5
2	away	09/08/2018	100	20:55	21:37:00	42	0	0	0	15	4	5
2	away	09/08/2018	200	20:55	21:49:00	54	0	0	0	1	1	1
2	away	09/08/2018	300	20:55	22:02:00	67	0	0	0	0	2	5

Route	Direction	Date	Distance (m)	Sunset	Spot Start Time	Time After Sunset (min)	Myotis sp.	Nyctalus sp.	Brown Long-eared Bat	Common Pipistrelle	Soprano Pipistrelle	Habitat
2	away	09/08/2018	400	20:55	22:14:00	79	0	0	0	1	0	5
2	away	09/08/2018	500	20:55	22:26:00	91	0	0	0	0	0	5
2	away	09/08/2018	600	20:55	22:38:00	103	2	0	0	9	7	5
2	away	09/08/2018	700	20:55	22:52:00	117	0	0	0	0	0	1
2	away	09/08/2018	800	20:55	23:04:00	129	0	0	0	0	3	5
2	away	09/08/2018	900	20:55	23:16:00	141	1	0	0	0	0	5
2	away	09/08/2018	1000	20:55	23:27:00	152	0	0	0	1	1	5
2	towards	30/07/2018	0	21:15	23:45:00	150	0	0	0	3	2	5
2	towards	30/07/2018	100	21:15	23:32:00	137	0	0	0	2	2	5
2	towards	30/07/2018	200	21:15	23:20:00	125	0	0	0	6	3	4
2	towards	30/07/2018	300	21:15	23:09:00	114	0	0	0	4	18	5
2	towards	30/07/2018	400	21:15	22:57:00	102	1	0	0	3	4	5
2	towards	30/07/2018	500	21:15	22:45:00	90	0	0	0	1	1	5
2	towards	30/07/2018	600	21:15	22:33:00	78	0	0	0	7	3	5
2	towards	30/07/2018	700	21:15	22:21:00	66	1	0	0	0	0	1
2	towards	30/07/2018	800	21:15	22:09:00	54	1	0	0	0	1	5
2	towards	30/07/2018	900	21:15	21:57:00	42	0	0	0	0	0	5
2	towards	30/07/2018	1000	21:15	21:46:00	31	0	0	0	3	10	5
3	away	23/07/2018	0	21:28	21:57:00	29	0	0	0	0	0	3
3	away	23/07/2018	100	21:28	22:09:00	41	0	0	0	0	0	3
3	away	23/07/2018	200	21:28	22:20:00	52	1	0	0	0	0	2
3	away	23/07/2018	300	21:28	22:33:00	65	0	0	0	0	1	2
3	away	23/07/2018	400	21:28	22:44:00	76	0	0	0	0	1	2

Route	Direction	Date	Distance (m)	Sunset	Spot Start Time	Time After Sunset (min)	Myotis sp.	Nyctalus sp.	Brown Long-eared Bat	Common Pipistrelle	Soprano Pipistrelle	Habitat
3	away	23/07/2018	500	21:28	22:56:00	88	0	0	0	1	1	2
3	away	23/07/2018	600	21:28	23:09:00	101	0	0	0	2	0	3
3	away	23/07/2018	700	21:28	23:20:00	112	0	0	0	4	0	4
3	away	23/07/2018	800	21:28	23:34:00	126	1	0	0	3	0	1
3	away	23/07/2018	900	21:28	23:46:00	138	0	0	0	1	2	1
3	away	23/07/2018	1000	21:28	23:59:00	151	0	0	0	0	0	1
3	towards	31/07/2018	0	21:14	23:48:00	154	0	0	0	0	0	3
3	towards	31/07/2018	100	21:14	23:36:00	142	0	0	0	0	2	3
3	towards	31/07/2018	200	21:14	23:25:00	131	30	0	0	0	0	2
3	towards	31/07/2018	300	21:14	23:12:00	118	0	0	0	0	1	2
3	towards	31/07/2018	400	21:14	23:00:00	106	0	0	0	1	0	2
3	towards	31/07/2018	500	21:14	22:48:00	94	2	0	0	0	0	2
3	towards	31/07/2018	600	21:14	22:35:00	81	1	0	0	0	0	3
3	towards	31/07/2018	700	21:14	22:23:00	69	0	0	0	0	1	2
3	towards	31/07/2018	800	21:14	22:11:00	57	0	0	0	1	2	1
3	towards	31/07/2018	900	21:14	22:08:00	54	0	0	0	0	0	1
3	towards	31/07/2018	1000	21:14	21:56:00	42	0	0	0	0	0	3
4	away	24/07/2018	0	21:26	21:56:00	30	0	0	0	0	0	1
4	away	24/07/2018	100	21:26	22:09:00	43	1	0	0	0	0	1
4	away	24/07/2018	200	21:26	22:21:00	55	0	0	0	0	1	1
4	away	24/07/2018	300	21:26	22:33:00	67	1	0	0	0	0	2
4	away	24/07/2018	400	21:26	22:46:00	80	0	0	0	1	1	1
4	away	24/07/2018	500	21:26	22:59:00	93	0	0	0	1	0	1

Route	Direction	Date	Distance (m)	Sunset	Spot Start Time	Time After Sunset (min)	Myotis sp.	Nyctalus sp.	Brown Long-eared Bat	Common Pipistrelle	Soprano Pipistrelle	Habitat
4	away	24/07/2018	600	21:26	23:11:00	105	2	0	0	0	0	5
4	away	24/07/2018	700	21:26	23:24:00	118	0	0	0	0	1	5
4	away	24/07/2018	800	21:26	23:38:00	132	0	6	0	17	9	5
4	away	24/07/2018	900	21:26	23:50:00	144	0	0	0	0	1	5
4	away	24/07/2018	1000	21:26	00:01:00	155	0	0	0	0	0	1
4	towards	01/08/2018	0	21:12	23:46:00	154	0	0	0	0	0	1
4	towards	01/08/2018	100	21:12	23:34:00	142	0	0	0	0	0	2
4	towards	01/08/2018	200	21:12	23:22:00	130	0	0	0	0	0	2
4	towards	01/08/2018	300	21:12	23:08:00	116	0	0	0	0	0	1
4	towards	01/08/2018	400	21:12	22:56:00	104	1	1	0	0	0	1
4	towards	01/08/2018	500	21:12	22:44:00	92	1	0	0	0	0	2
4	towards	01/08/2018	600	21:12	22:32:00	80	1	1	0	5	2	5
4	towards	01/08/2018	700	21:12	22:20:00	68	1	1	0	7	32	5
4	towards	01/08/2018	800	21:12	22:06:00	54	2	0	0	0	0	4
4	towards	01/08/2018	900	21:12	21:55:00	43	0	0	0	1	0	1
4	towards	01/08/2018	1000	21:12	21:42:00	30	0	16	0	1	3	1
5	away	25/07/2018	0	21:24	21:54:00	30	0	0	0	0	0	1
5	away	25/07/2018	100	21:24	22:06:00	42	0	0	0	0	0	1
5	away	25/07/2018	200	21:24	22:18:00	54	0	0	0	0	0	2
5	away	25/07/2018	300	21:24	22:29:00	65	0	0	0	0	0	2
5	away	25/07/2018	400	21:24	22:40:00	76	0	0	0	0	0	2
5	away	25/07/2018	500	21:24	22:52:00	88	0	0	0	1	4	2
5	away	25/07/2018	600	21:24	23:05:00	101	1	0	0	0	0	2

Route	Direction	Date	Distance (m)	Sunset	Spot Start Time	Time After Sunset (min)	Myotis sp.	Nyctalus sp.	Brown Long-eared Bat	Common Pipistrelle	Soprano Pipistrelle	Habitat
5	away	25/07/2018	700	21:24	23:17:00	113	0	0	0	9	3	3
5	away	25/07/2018	800	21:24	23:29:00	125	2	1	0	2	3	1
5	away	25/07/2018	900	21:24	23:41:00	137	0	0	0	6	0	1
5	away	25/07/2018	1000	21:24	23:52:00	148	0	0	0	5	5	1
5	towards	02/08/2018	0	21:10	23:42:00	152	1	0	0	2	1	1
5	towards	02/08/2018	100	21:10	23:30:00	140	0	0	0	2	1	1
5	towards	02/08/2018	200	21:10	23:19:00	129	0	0	0	4	1	3
5	towards	02/08/2018	300	21:10	23:05:00	115	0	0	0	0	0	3
5	towards	02/08/2018	400	21:10	22:53:00	103	0	0	0	1	0	3
5	towards	02/08/2018	500	21:10	22:40:00	90	0	0	0	1	0	2
5	towards	02/08/2018	600	21:10	22:27:00	77	0	0	2	6	2	3
5	towards	02/08/2018	700	21:10	22:16:00	66	0	0	0	5	8	2
5	towards	02/08/2018	800	21:10	22:03:00	53	0	0	0	3	5	1
5	towards	02/08/2018	900	21:10	21:52:00	42	0	0	0	1	0	1
5	towards	02/08/2018	1000	21:10	21:40:00	30	0	0	0	0	0	2

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