# Technical Appendix 7.5

## Bat Survey Report

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# 1 Introduction

## 1.1 Project Background

1. This Appendix presents information relevant to the Harestanes South Windfarm Extension (hereafter the 'Proposed Development'). It should be read in conjunction with the Environmental Impact Assessment (EIA) Report for full details of the Proposed Development.

2. The 'Site' earmarked for the Proposed Development is located at Forest of Ae; encompassed by the Application Boundary as shown in **EIA Report Figure 1.2: Application Boundary**.

3. This Appendix describes the survey approach, methodology and results for bat surveys applied at the Site. This work provides an ecological baseline assessment of bat activity at the Site and has been prepared to inform that Environmental Impact Assessment for the proposed Harestanes South Windfarm Extension.

## 1.2 Ecological Background

4. The Site is located within the southern extent of the Forest of Ae. The Forest of Ae is an existing commercial forest predominately covered by Sitka spruce *Picea sitchensis* plantation with occasional lodgepole pine *Pinus contorta var. latifolia* and larch species *Larix spp.* Several watercourses transverse the area and discharge into the Water of Ae to the south, with the largest being Glenkiln Burn near the centre of the Site. Smaller watercourses within the Site include Clachanbirnie Burn and Rough Cleuch to the west and Cat Cleuch, Yellowtree Grain and tributaries of the Garrel Water to the east. The surrounding habitat is predominately plantation woodland to the north and west within the Forest of Ae and agricultural land including both arable and grazing fields to the south and east of the Site. The Site is shown in **EIA Report Figure 1.2: Application Boundary**.

5. Surrounding the Site are three existing windfarms, the operational Harestanes Windfarm, Minnygap Windfarm and Dalswinton Windfarm.

6. The operational Harestanes Windfarm is located directly north and contiguous with the Site within the Forest of Ae and was constructed in 2014. The Environmental Statement (ES) for the operational Harestanes Windfarm was produced in 2004 following surveys completed within 2002 and 2003 (Scottish Power, 2004a and Scottish Power, 2004b). ES reports for Minnygap Windfarm (Renewable Energy System [RES], 2009) and Dalswinton Windfarm (Airtricity Developments, 2003) were also available.

7. The Proposed Development would comprise up to eight three-bladed horizontal axis wind turbines with a blade tip height of up to 200 metres (m) which will be connected to the existing substation at the operational Harestanes Windfarm site. Further details of which are available in **Chapter 4: Development Description.**

# 2 Legislation

8. All bat species in the UK are afforded full statutory protection as European protected species listed on Schedule 2 of the Conservation (Natural Habitats, &c.) Regulations 1994 as amended in Scotland, which transpose into Scottish Law in the European Community's Habitats Directive (92/43/EEC). Under the terms of Regulation 39(1), with certain exceptions, it is an offence to deliberately or recklessly[1]:

- harass a wild bat or group of wild bats;
- disturb a wild bat while it is occupying a structure or place which it uses for shelter; or protection;
- disturb a wild bat while it is rearing or otherwise caring for its young;
- obstruct access to a breeding site or resting place of a wild bat, or otherwise to deny the bat use of the breeding site or resting place;
- disturb a wild bat in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs;
- disturb a wild bat in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young; or
- damage or destroy a breeding site or resting place of such an animal.

9. Of the 18 UK bat species, ten occur in Scotland: common pipistrelle P*ipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus,* Nathusius' pipistrelle *Pipistrellus nathusii*, Natterer's bat *Myotis nattereri*, Daubenton's bat *Myotis daubentonii*, noctule *Nyctalus noctula*, brown long-eared bat *Plecotus auritus*, Leisler's bat *Nyctalus leisleri*, whiskered bat *Myotis mystacinus*, and Brandt's bat *M*yotis *brandtii*.

# 3 Methodology

## 3.1 Overview

10. Habitats across the Site were assessed for their suitability for foraging, roosting and commuting during protected species walkover surveys before deploying static detectors. Areas were assessed following Bat Conservation Trust (BCT) guidelines (Collins, 2016) as negligible, low, moderate or high suitability (**Table 3.1**). The walkover survey was undertaken between April and May 2020 and incorporated each indicative turbine location as per the Layout A (Scoping Layout) in **EIA Report Figure 3.2: Design Iterations of Turbine Layout A, B and F**, and an additional 250m buffer (hereafter 'the Survey Area').

| Suitability | Roosting Habitats |
|---|---|
| Negligible | Negligible habitat features on Site likely to be used by commuting or foraging bats. |
| Low | 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.<br><br>Suitable, but 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 | 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.<br><br>Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water. |
| High | 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.<br><br>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.<br><br>Site is close to and connected to known roosts. |

Table 3.1 Commuting and foraging habitats suitability

[1] The summary is not comprehensive and is included here for illustrative purposes only. For a definitive list of offences, the reader is referred to the original legislative texts.

## 3.2 Desk Study

11. A desk study was undertaken in April 2020 to review existing ecological baseline information available in the public domain and to obtain information held by relevant third parties. For the purpose of the desk study exercise, records were collated up to a distance of 20km from the Survey Area. This desktop study area was wider than the 10km recommended in the guidelines (SNH, 2019) due to the presence of *Nyctalus* species in the area which are known to travel up to 20km from roosting locations (Mackie and Racey, 2007).

12. Information on the location of bat records was provided by the South West Scotland Environmental Information Centre (SWSEIC) for the 20km buffer but excluding an area in South Lanarkshire, for which the centre does not hold records.

## 3.3 Automated Detector Survey

13. Automated detectors (Wildlife Acoustics Song Meter Mini [© Wildlife Acoustics, Inc.]) were deployed seasonally during spring (April – May), summer (June-mid-August) and autumn (mid-August-October), inclusive, to obtain a larger data set of activity levels.

14. Following the standard recommendations (SNH, 2019), bat detectors were deployed at ten turbine locations plus a third of the additional potential turbine sites (12 detectors in total). As the turbine locations were not confirmed, detectors were deployed at locations to give the best coverage of the Site at the indicative turbine locations as set out in the Scoping Layout (Layout A) (**EIA Report Figure 3.2**) and as illustrated on **Figure 7.5.1**.

15. Detectors were deployed above 2m from ground level using stakes or by attaching to suitable trees. Each detector was setup with four AA batteries and a 64 gigabyte (GB) Secure Digital (SD) memory card. A surveyor would change the batteries and SD card (if necessary) after 14 days of deployment to help ensure the full recording period was captured. Recording settings used are detailed in **Table 3.2.**

| | |
|---|---|
| Recording range | 30 minutes before sunset to 30 minutes after sunrise. |
| Trigger frequency range | 16 kHz to 250 kHz |
| Minimum event | 4 milliseconds |
| Max file length | 15 seconds |

Table 3.2 Automated detector settings

16. The detectors were put on Site during three seasons defined in the Bats and Onshore Wind Turbine Guidance (SNH, 2019):

- spring – April to May;
- summer – June to mid-August; and
- autumn – Mid-August to October.

17. The guidance recommends ten consecutive nights of data collection per season. This study went beyond this requirement, with an average of at least 32 nights of data per season. The data collection periods are listed in **Table 3.3**.

18. Bat calls registered by the automated detectors were recorded for later analysis using specialist computer software; further details of analysis are provided in **Section 2.3.**

19. Weather data was gathered from the operational Harestanes Windfarm to the north and a rain gauge installed at NY 00931 97723.

| Survey Season | Survey Dates | Detector | Habitat | Nights Recorded |
|---|---|---|---|---|
| **Spring 2020** | 30/04/20 – 01/06/20 | SMM01 | Open | 32 |
| | | SMM02 | Edge | 32 |
| | | SMM03 | Edge | 32 |
| | | SMM04 | Edge | 32 |
| | | SMM05 | Edge | 32 |
| | | SMM06 | Edge | 32 |
| | | SMM07 | Edge | 32 |
| | | SMM08 | Edge | 32 |
| | | SMM09 | Open | 32 |
| | | SMM10 | Edge | 32 |
| | | SMM11 | Edge | 32 |
| | | SMM12 | Edge | 32 |
| | | | | **384 nights / 12 detectors = average 32 nights per detector** |
| **Summer 2020** | 02/07/20 – 01/08/20 | SMM01 | Open | 30 |
| | 02/07/20 – 07/08/20 | SMM02 | Edge | 36 |
| | | SMM03 | Edge | 36 |
| | 02/07/20 – 23/07/20 | SMM04 | Edge | 21 |
| | 02/07/20 – 07/08/20 | SMM05 | Edge | 36 |
| | 02/07/20 – 08/08/20 | SMM06 | Edge | 37 |
| | 02/07/20 – 07/08/20 | SMM07 | Edge | 36 |
| | | SMM08 | Edge | 36 |
| | | SMM09 | Open | 36 |
| | | SMM10 | Edge | 36 |
| | 02/07/20 – 14/08/20 | SMM11 | Edge | 43 |
| | 02/07/20 – 07/08/20 | SMM12 | Edge | 36 |
| | | | | **419 nights / 12 detectors = average 34.92 nights per detector** |
| **Autumn 2020** | 14/08/20 – 18/09/20 | SMM01 | Open | 35 |
| | | SMM02 | Edge | 35 |
| | | SMM03 | Edge | 35 |
| | 14/08/20 – 16/09/20 | SMM04 | Edge | 33 |
| | 14/08/20 – 18/09/20 | SMM05 | Edge | 35 |
| | 14/08/20 – 17/09/20 | SMM06 | Edge | 34 |
| | 14/08/20 – 18/09/20 | SMM07 | Edge | 35 |
| | | SMM08 | Edge | 35 |
| | | SMM09 | Open | 35 |
| | | SMM10 | Edge | 35 |
| | | SMM11 | Edge | 35 |
| | | SMM12 | Edge | 35 |
| | | | | **417 nights / 12 detectors = average 34.75 nights per detector** |

Table 3.3 Deployment periods for detectors

## 3.4 Roost Assessment of Trees

20. A Preliminary Roost Assessment (PRA) of the trees within the Site was undertaken by experienced ecologists between April and May 2020. Further tree inspections were undertaken in November 2020 to account for access track realignments between the A701 and Forestry and Land Scotland (FLS) land. The following survey areas were applied during the PRA: indicative turbine locations plus a 250m buffer; proposed access tracks on FLS land plus 100m buffer; the proposed access track between A701 and FLS land plus 30m buffer. Trees were assessed visually from ground-level for their suitability to support roosting bats. Where needed, a torch, binoculars, an at-height camera (Polekam) and aerial inspections using tree climbing techniques were used to further inspect potential suitable features such as cracks, crevices and hazard beams. Notes on the feature's extent location and evidence of the potential roosting feature (PRF) was recorded. Numbered tree tags were affixed to trees surveyed in November 2020 so they could be identified during any future surveys.

21. The trees were categorised for their bat roost suitability in line with the descriptions as shown in **Table 3.4**. These descriptions were in accordance with the definitions outlined in Bat Surveys for Professional Ecologists, Good Practice Guidelines (3rd edition) (Collins, 2016).

| Suitability | Roosting Habitats |
|---|---|
| Negligible | Tree with no potential opportunities for roosting bats, or very few or minor features in an isolated/unsuitable location such that the presence of a roost is considered highly improbable. e.g. isolated from suitable foraging or commuting habitats. |
| Low | Tree with single, or few features capable of supporting individual/small numbers of bats e.g. external roosting features such as fascia or soffit boards, in which bats are considered less likely to be present. Or, a greater number or variety of features located in sub-optimal habitat such that bats would be less likely to use it e.g. isolated from foraging or commuting habitats. |
| Moderate | Tree exhibiting features with definite bat roost potential, but with only one or two suitable features suitable for larger roosts, or multiple features with the potential to be used by individual/small numbers of bats. Surrounding area includes good quality foraging habitat for bats e.g. broadleaved woodland, tree-lined watercourses and grazed parkland such that the presence of a roost is considered probable. |
| High | Tree with highly suitable features capable of supporting larger roosts, and/or multiple roost locations. Generally, these trees are located in proximity to highly suitable foraging/commuting habitat such that the presence of a roost is considered highly probable. |

Table 3.4 Roost suitability categorisation

22. Trees assessed between April and May 2020 which could not be fully inspected from ground level were subject to a number of activity surveys appropriate for their suitability (Collins, 2016). Dusk activity surveys started 15 minutes prior to sunset and finished 90 minutes after, and dawn activity surveys started 90 minutes prior to sunrise and finished 15 minutes after. Each tree was surveyed by at least one experienced bat surveyor. Each surveyor had a Batbox Duet recording onto an MP3 player for analysis to be completed after the survey.

## 3.5 Automated Detector Analysis

23. The recordings of bat echolocation calls collected during the automated detector surveys were analysed using specialist computer software (Wildlife Acoustics Kaleidoscope Pro 5.1.3). All files were analysed using the built-in auto-identification software. The analysis of each of these files enables identification/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.

24. It should be recognised that a series of separate sound files may represent a series of different bats commuting within the range of an automated detector, or a smaller number of bats repeatedly triggering the detector (e.g. bats making repeated foraging passes within the range of a detector).

25. 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 3.5**.

| Signal of Interest | |
|---|---|
| Kilohertz | 8 - 120 kHz |
| Milliseconds | 2 – 500 ms |
| Minimum number of pulses | 2 |

Table 3.5 Kaleidoscope Pro 5.1.3 Auto Identification Parameters

26. Files that were filtered out using the parameters in **Table 3.5** were saved as 'Noise' files. All files labelled as noise during the auto-identification process were manually checked to ensure no bat activity was missed.

27. All remaining sound files were classified to species level by the auto-identification system. Files were attributed with a specific species identification or classified as 'NoID' where the call parameters could not be identified by the software. Following the auto-identification process, all calls were manually checked to verify the auto-identification, and to identify calls classified as 'NoID' where possible.

28. Data logs are generated by the automated detectors which detail the recording history for the periods they were deployed. These logs were assessed to identify the duration which the detectors were deployed. Where the data log indicated a fault, or where log information was not assessible, bat recordings were confined to all recordings up until the last full night prior to the final recording. These decisions were accounted for when calculating the bat activity index value (BAIV) to ensure fair comparisons were made between data sets.

29. For automated detector surveys, the BAIV of each species was calculated for each automated detector. The automated detector data is represented as bat passes per night. This BAIV was calculated by dividing the number of bat passes recorded during each survey visit by the total number of nights the automated detector was deployed during that survey period, using the aforementioned data logs.

## 3.6 Bat Call Identification

30. For manual identification, where possible, bat calls were identified to species level. However, species of the genus *Myotis* are grouped together in, and are collectively referenced to, as *Myotis* species (*sp*.) because, in most cases, their call characteristics are similar in structure and have overlapping call parameters, making species identification problematic (Russ, 2012). *Myotis sp*. likely to be encountered within the geographical region within which the Survey Area is located include: Daubenton's bat, Natterer's bat and whiskered bat.

31. Similarly, *Pipistrellus sp*. and *Nyctalus sp*. were also used to describe calls where it was not possible to distinguish species within the respective genus. For *Pipistrellus sp*. specifically, criteria set out in **Table 3.6** were used to classify calls.

32. Further to this, calls for common/Nathusius' pipistrelle were labelled *Pipistrellus nathusii* as Ecobat[2], the web-based platform for analysis of wind farm data, does not have a label for identifying possible common/Nathusius' pipistrelle. No calls identified during the analysis were categorically Nathusius' pipistrelle, so all mention of Nathusius' pipistrelle within this report should be taken as possible Nathusius'/common pipistrelle.

[2] http://www.ecobat.org.uk/

33. The call identification references used for analysis are set out in **Table 3.7**. Individual species included under each genus are only those which have a known distribution in the Survey Area (i.e. not all species which fall under that genus). Again, it is noted that *Myotis sp*. are not identified to species level in any case.

| Common Name | Peak Frequency of Call |
|---|---|
| Common pipistrelle | ≥42 and <49KHz |
| Soprano pipistrelle | ≥51KHz |
| Nathusius' pipistrelle | <40KHz |
| Common/soprano pipistrelle | ≥49 and <51KHz |
| Common/Nathusius' pipistrelle | ≥40 and <42KHz |

Table 3.6 *Pipistrellus sp*. Call Classification Parameters

| Genus | Common name | Scientific name / call identification reference |
|---|---|---|
| *Pipistrellus* sp. | Common pipistrelle | *Pipistrellus pipistrellus* |
| | Soprano pipistrelle | *Pipistrellus pygmaeus* |
| | Nathusius' pipistrelle | *Pipistrellus nathusii* |
| *Myotis* sp. | Unidentified *Myotis sp*. | *Myotis* |
| *Nyctalus* sp. | Noctule bat | *Nyctalus noctula* |
| | Leisler's bat | *Nyctalus leisleri* |

Table 3.7 Call identification references

## 3.7 Quantifying Bat Activity

34. In order to allow an objective assessment of bat activity, a measure of relative activity was obtained using the online tool Ecobat, which is hosted and developed by the Mammal Society (Lintott *et al.,* 2017). The data input reveals a percentile score and categorised level of bat activity and the results can be interpreted at the local scale and Site scale. For the purpose of this report, a single labelled Kaleidoscope file of up to 12 seconds in length containing a sequence of bat pulses was counted as one bat registration (i.e. a single bat pass). If the file had multiple bats present, this entry was duplicated so that Ecobat counted each bat registration as a separate bat pass.

35. Data were entered to allow analysis for within night variation (as opposed to just between nights).

36. The data set range used for reference for the percentile analysis was stratified include:

- only records from within 30 days of the survey date;
- only records from within 100km$^2$ of the survey location; and
- records using any make of bat detector.

## 3.8 Assessing Potential Risk

37. The potential vulnerability of bat population to windfarms is based on the collision risk, the relative abundance and the activity at the Site. **Table 3.8** shows the potential vulnerability of bat population in Scotland based on the collision risk (inferred by a number of factors including habitat preference, flight speed, foraging techniques, and echolocation characteristics) and relative abundance.

38. The risk factors of the Site also need to be considered (**Table 3.9**) based on the habitat types present and the size of the proposed project. The bat activity output from Ecobat (**Table 4.5**) can then be assessed alongside the risk factors of the Site (**Table 3.9**) and taking into account the relative species vulnerability (**Table 3.8)** to complete an overall risk assessment (**Table 3.10**). This overall risk can then guide the decision-making process in relation to the mitigation options.

| Relative Abundance | Collision Risk | | |
|---|---|---|---|
| | Low | Medium | High |
| Common Species | | | Soprano pipistrelle<br>Common pipistrelle |
| Rarer species | Brown long-eared bat<br>Daubenton's bat<br>Natterer's bat | | |
| Rarest species | Whiskered bat<br>Brandt's bat | | Noctule bat<br>Leisler's bat<br>Nathusius' pipistrelle |
| Green = low population vulnerability<br>Amber = medium population vulnerability<br>Red = high population vulnerability | | | |

Table 3.8 Level of potential vulnerability of population of British bat species in Scotland (SNH, 2019, adapted from Wray *et al*., 2010)

| Site Risk Level (1-5) | | Project Size | | |
|---|---|---|---|---|
| | | Small | Medium | Large |
| Habitat Risk | Low | 1 | 2 | 3 |
| | Moderate | 2 | 3 | 4 |
| | High | 3 | 4 | 5 |
| Green (1-2) = lowest/low site risk<br>Amber (3) = medium site risk<br>Red (4-5) = high/highest site risk | | | | |
| **Habitat Risk** | **Description** | | | |
| Low | Small number of potential roost feature, of low quality.<br>Low quality foraging habitat that could be used by a small number of foraging bats.<br>Isolated site not connected to the wider landscape by prominent linear features. | | | |
| Moderate | Buildings, trees or other structures with moderate-high potential as roost sites on or near the site.<br>Habitat could be used extensively by foraging bats.<br>Site is connected to the wider landscape by linear features such as scrub, tree lines and streams. | | | |
| High | Numerous suitable buildings, tree (particularly mature ancient woodland) or other structures with moderate-high potential as roost sites on or near the site, and/or confirmed roosts present close to or on the site.<br>Extensive and diverse habitat mosaic of high quality for foraging bats.<br>Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows.<br>At/near edge of range and/or on an important flyway.<br>Close to key roost and/or swarming site. | | | |
| **Project Size** | **Description** | | | |
| Small | Small scale development (≤10 turbines). No other wind energy developments within 10 km. Comprising <50 m in height. | | | |
| Medium | Larger developments (between 10 and 40 turbines). May have some other wind developments within 5 km. Comprising turbines 50-100 m in height. | | | |
| Large | Largest developments (>40 turbines) with other wind energy developments within 5 km. Comprising turbines >100 m in height. | | | |

Table 3.9 Site risk levels based on habitat risk and project description (SNH, 2019)

| Site Risk Level (from Table 3.9) | Ecobat Activity Category (Table 4.5) | | | | | |
|---|---|---|---|---|---|---|
| | Nil (0) | Low (1) | Low-moderate (2) | Moderate (3) | Moderate-high (4) | High (5) |
| Lowest (1) | 0 | 1 | 2 | 3 | 4 | 5 |
| Low (2) | 0 | 2 | 4 | 6 | 8 | 10 |
| Medium (3) | 0 | 3 | 6 | 9 | 12 | 15 |
| High (4) | 0 | 4 | 8 | 12 | 16 | 20 |
| Highest (5) | 0 | 5 | 10 | 15 | 20 | 25 |
| Green (0-4) = low risk<br>Amber (5-12) = medium risk<br>Red (15-25) = high risk | | | | | | |

Table 3.10 Overall risk assessment (SNH, 2019)

## 3.9 Limitations

39. The automated detectors were located as close as possible to turbine locations. There were 15 proposed turbine locations initially and through following the guidance, 12 detectors were required to be deployed, meaning not all turbine locations were surveyed with a detector. Automated detectors were placed as close to turbine locations in the nearest suitable location so they represented the habitats in which the turbines will be constructed.

40. Locations of detectors moved slightly (within 100m) in the spring recording session due to ongoing forestry operations. This movement of the detectors was not of a distance substantial enough to affect the comparison of the automated detector locations results.

41. Due to a defect within the coding for the online tool Ecobat (used for analysis of bat activity), not all bat passes were included within the final Ecobat analysis of factors including times of emergence relative to sunset and median bat activity level. The omitted bat passes represent less than 1% of all passes recorded throughout all automated detector surveys (spring, summer, autumn), and is considered not to represent a material impact upon the overall assessment.

42. Ecobat analysis of percentile data (on relative intensity of activity) covered 81% of all raw data rather than the whole dataset. It is however, considered that this 81% is representative of the entire dataset; and in addition, the proposed mitigation is considered to be sufficiently robust to account for impacts on all bats recorded. Regardless of the Ecobat output.

43. Ecobat analysis has no allowance for entering nights where no bat passes are recorded, so the results of the analysis are based only on presence data. Automated bat detectors were deployed and recording on 1,220 nights but only recorded bats on 801 of these nights. As the Ecobat calculation is based only on these 801 nights, the level of bat activity is in reality lower than that indicated by the Ecobat analysis.

44. During the survey period the layout of the turbines went through revisions and the number of turbines proposed was reduced to eight. Of the revised turbine locations automated detectors were still situated near five of the locations. Positioning of the detectors was not changed during the revisions as they provided an adequate coverage of the Site and the habitats within. The positions of the detectors and their relation to revised turbine locations do not affect the outcome of our assessment due to the number of bat passes recorded within the selection of habitats present within the Site.

45. Due to limitations within the species list that Ecobat provides, all possible Nathusius' pipistrelle bat passes needed to be assigned to the *Pipistrellus nathusii* species tag. There were no categoric Nathusius' pipistrelle calls identified during the analysis process; therefore, any mention of Nathusius' pipistrelle passes within the report should be taken as a possible Nathusius pipistrelle pass.

46. Trees assessed in November 2020, were undertaken outwith the active bat season, and as such, finding evidence of roosting bats (including bats and droppings) is less likely. Further surveys of these trees with suitable PRFs are recommended to be completed within the active bat season (May to September, inclusive).

# 4 Results

## 4.1 Desk study

47. The desk study returned 785 records between 2009[3] and 2020 which included records for all nine Scottish bat species. A summary of the records is provided in **Table 4.1** which is split into species and type of record. Records which were not identified to species level have not been included in the summary below.

| Species | Type of record | No. of records | Nearest record (orientation and distance) | Record date | Description | Record source |
|---|---|---|---|---|---|---|
| Brown long-eared | Foraging and commuting | 41 | 0m (on Site boundary) north west | 2016 | One call recorded on bat detector. | Southern Scotland Bat Survey ran by British Trust for Ornithology (BTO). |
| | Roosts | 6 | 200m south west | 2009 and 2010 | Maternity in 2009 and male summer roost in 2010. | Bat records for Dumfries and Galloway provided by SWSEIC. |
| Common pipistrelle | Foraging and commuting | 113 | 0m (within Site boundary) | 2016 | One call recorded on bat detector. | Southern Scotland Bat Survey ran by BTO. |
| | Roosts | 5 | 5.8km north east | 2014 | 85 individual bats recorded from roost. | SNH Bat Carework Recording Log 2014. |
| Daubenton's bat | Foraging and commuting | 63 | 0m (on Site boundary) north west | 2016 | One non-social call recorded on bat detector. | Southern Scotland Bat Survey ran by BTO. |
| | Roosts | 2 | 19km north west | 2010 | Maternity roost with seven individuals recorded in both June and July. | Bat Records for Dumfries and Galloway provided by SWSEIC. |
| Leisler's bat | Foraging and commuting | 21 | 5.3km south west | 2016 | One non-social call recorded on bat detector. | Southern Scotland Bat Survey ran by BTO. |
| | Roosts | 0 | - | - | - | - |
| Nathusius' pipistrelle | Foraging and commuting | 1 | 12.8km north east | 2016 | One non-social call recorded on bat detector. | Southern Scotland Bat Survey ran by BTO. |
| | Roosts | 0 | - | - | - | - |
| Natterer's bat | Foraging and commuting | 44 | 2.6km south | 2016 | Five non-social calls recorded on bat detector. | Southern Scotland Bat Survey ran by BTO. |

[3] 2009 was included as the data was requested in March 2020 prior to the activity season for 2020.

| Species | Type of record | No. of records | Nearest record (orientation and distance) | Record date | Description | Record source |
|---|---|---|---|---|---|---|
| | Roosts | 1 | 10km west | 2009 | Hibernation roost with three individuals. | Bat Records for Dumfries and Galloway provided by SWSEIC. |
| Noctule bat | Foraging and commuting | 76 | 2.6km south | 2016 | Four non-social calls recorded on bat detector. | Southern Scotland Bat Survey ran by BTO. |
| | Roosts | 0 | - | - | - | - |
| Soprano pipistrelle | Foraging and commuting | 155 | 0m (within the Site boundary) | 2016 | Three calls recorded on bat detector. | Southern Scotland Bat Survey ran by BTO. |
| | Roosts | 30 | 0m (within the Site boundary) | 2013 | Maternity roost with 22 individuals within Forest of Ae. The roost was recorded in September and it was noted that it had started to disperse. | Bat Records for Dumfries and Galloway provided by SWSEIC. |
| Whiskered/Brandt's bat | Foraging and commuting | 20 | 5km south west | 2016 | Three non-social calls recorded on bat detector. | Southern Scotland Bat Survey ran by BTO. |
| | Roosts | 0 | - | - | - | - |

Table 4.1 Summary of bat desk study records

## 4.2 Roost Surveys – Trees

48. Two dead Scot's pine *Pinus sylvestris* trees found during the April to May 2020 surveys (Tree 1 – NY 02505 93977, Tree 2 – NY 02607 94077), shown on **Figure 7.5.2**, were identified as having moderate suitability for roosting bats. Both trees had various PRFs surrounding the trees. These features were unable to be fully inspected from ground level with torch, endoscope and at-height camera (PoleKam) and the condition in which they were in would have made it too dangerous for them to be climbed and inspected. No evidence of roosting bats was found during the ground assessment of the two trees.

49. Two activity surveys of the trees were undertaken to further survey them for the presence of roosting bats (one dusk survey in August, the one dawn survey in September). A small number of bat passes were recorded on each of the surveys, but no roosting bats were observed emerging or re-entering either tree.

50. A further 27 trees were identified as having suitability to support roosting bats in November 2020 (**Figure 7.5.2**) at the south of the Site adjacent to the access route. Three trees had low suitability, 21 had moderate suitability and three had high suitability for roosting bats. Details of the trees, PRFs and recommended further surveys for each individual tree can be found in **Appendix C.**

## 4.3 Bat Activity Results

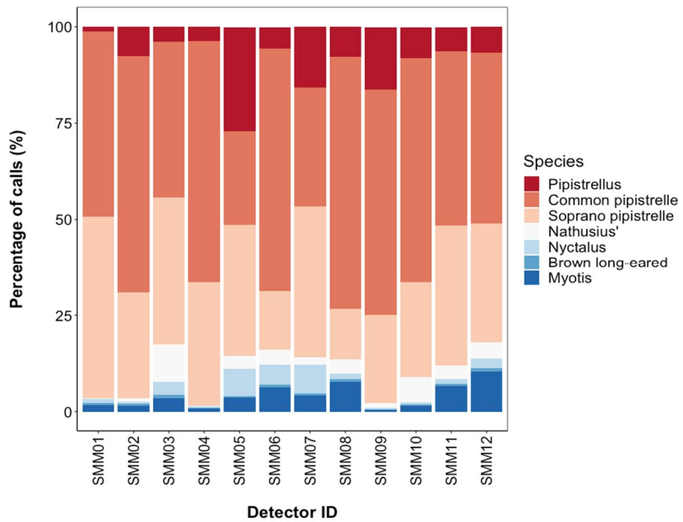
51. Twelve detectors were deployed throughout the Site over the three survey seasons. This amounted to 1,220 nights of recording time (384 nights in spring, 419 nights in summer and 417 nights in autumn). The location of the detectors is shown in **Figure 7.5.1, Appendix A**.

52. In addition to the summaries of Ecobat data presented in the following sections, box plots of each detector are included in **Appendix B**.

53. Throughout this period six species (or genera in difficult to identify species) were recorded: soprano pipistrelle, common pipistrelle, Nathusius' pipistrelle, *Myotis* species, *Nyctalus* species and brown long-eared bat. Over the whole survey period across all of the detectors, the total number of bat passes was 65,584, shown in **Table 4.2** and **Graph 4.1**. The most widely recorded species was common pipistrelle (57.7% of all bat passes), followed by soprano pipistrelle (28.2% of all bat passes) with detectors SMM04, SMM09 and SMM10 recording the most passes.

| Species | Passes (No.) | Percentage of total (%) |
|---|---|---|
| Pipistrelle sp. | 5,501 | 8.4 |
| Common pipistrelle | 37,843 | 57.7 |
| Soprano pipistrelle | 18,512 | 28.2 |
| Nathusius' pipistrelle | 1,570 | 2.4 |
| *Myotis* sp. | 643 | 1.0 |
| *Nyctalus* sp. | 206 | 0.3 |
| Brown long-eared | 1,309 | 2.0 |
| **Total** | **65,584** | **100** |

Table 4.2 Total bat passes recorded for each species




Graph 4.1 Percentage species composition of passes at each detector

54. Due to the variability of bat activity levels each night, the median pass rate is used to represent the data. This provides a more reliable value than the mean of the dataset as it is unlikely to be normally distributed (Lintott and Matthews, 2018).

55. The median nightly pass rate of each species at each detector is show in **Table 4.3**. The highest median pass rates for each detector are in red and the lowest in blue. Nathusius' pipistrelle had the highest median pass rate of all species at detector SMM01.

| Species | Detector | Median Pass Rate (bat passes per hour, per night) | Species | Detector | Median Pass Rate (bat passes per hour, per night) |
|---|---|---|---|---|---|
| *Pipistrellus* sp. | SMM01 | 0.6 | Common pipistrelle | SMM01 | 0.3 |
| | SMM02 | 0.5 | | SMM02 | 0.4 |
| | SMM03 | 0.2 | | SMM03 | 0.4 |
| | SMM04 | 0.4 | | SMM04 | 0.3 |
| | SMM05 | 0.2 | | SMM05 | 0.5 |
| | SMM06 | 0.3 | | SMM06 | 0.3 |
| | SMM07 | 0.3 | | SMM07 | 0.4 |
| | SMM08 | 0.2 | | SMM08 | 0.3 |
| | SMM09 | 0.3 | | SMM09 | 0.3 |
| | SMM10 | 0.3 | | SMM10 | 0.4 |
| | SMM11 | 0.2 | | SMM11 | 0.3 |
| | SMM12 | 0.7 | | SMM12 | 0.3 |
| Soprano pipistrelle | SMM01 | 0.3 | Nathusius' pipistrelle | SMM01 | 1.5 |
| | SMM02 | 0.4 | | SMM02 | 0.3 |
| | SMM03 | 0.3 | | SMM03 | 0.6 |
| | SMM04 | 0.3 | | SMM04 | 0.3 |
| | SMM05 | 0.6 | | SMM05 | 0.6 |
| | SMM06 | 0.5 | | SMM06 | 0.3 |
| | SMM07 | 0.4 | | SMM07 | 0.3 |
| | SMM08 | 0.3 | | SMM08 | 0.2 |
| | SMM09 | 0.3 | | SMM09 | 0.4 |
| | SMM10 | 0.4 | | SMM10 | 0.3 |
| | SMM11 | 0.2 | | SMM11 | 0.2 |
| | SMM12 | 0.3 | | SMM12 | 0.6 |
| *Myotis* sp. | SMM01 | 0.1 | *Nyctalus* sp. | SMM01 | 0.3 |
| | SMM02 | 0.3 | | SMM02 | 0.3 |
| | SMM03 | 0.2 | | SMM03 | 0.4 |
| | SMM04 | 0.4 | | SMM04 | 0.3 |
| | SMM05 | 0.3 | | SMM05 | 0.2 |
| | SMM06 | 0.3 | | SMM06 | 0.3 |
| | SMM07 | 0.2 | | SMM07 | 0.3 |
| | SMM08 | 0.2 | | SMM08 | 0.4 |
| | SMM09 | 0.1 | | SMM09 | 0.4 |
| | SMM10 | 0.2 | | SMM10 | 0.3 |
| | SMM11 | 0.2 | | SMM11 | 0.2 |
| | SMM12 | 0.2 | | SMM12 | 0.3 |
| Brown long-eared | SMM01 | 0.8 | | | |
| | SMM02 | 0.2 | | | |
| | SMM03 | 1.1 | | | |
| | SMM04 | 0.3 | | | |
| | SMM05 | 1.4 | | | |
| | SMM06 | 0.2 | | | |
| | SMM07 | 0.3 | | | |
| | SMM08 | 0.4 | | | |
| | SMM09 | 0.4 | | | |
| | SMM10 | 0.5 | | | |
| | SMM11 | 0.2 | | | |
| | SMM12 | 0.1 | | | |

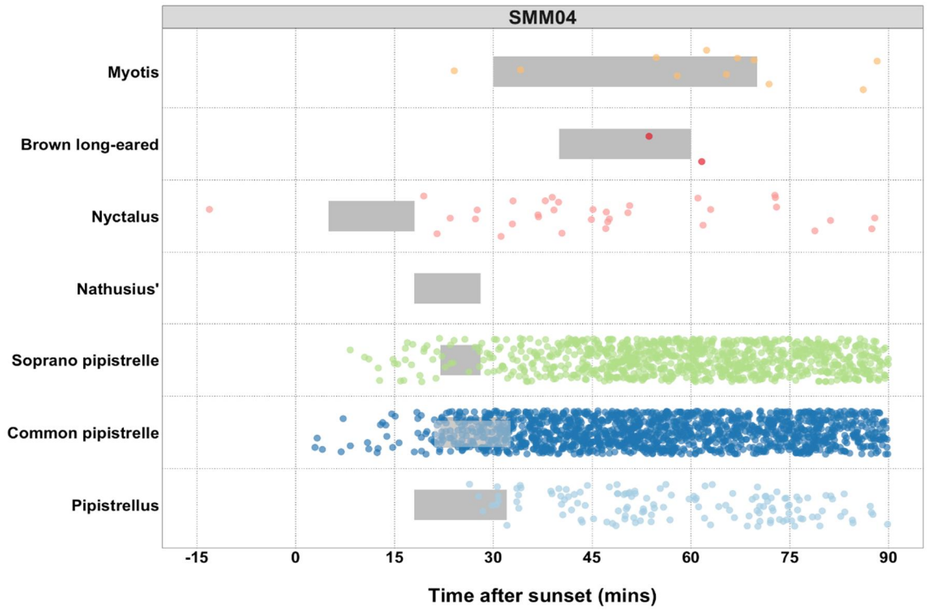
Table 4.3 Median nightly pass rate

## 4.4 Potential Roosts Within or Close to the Site

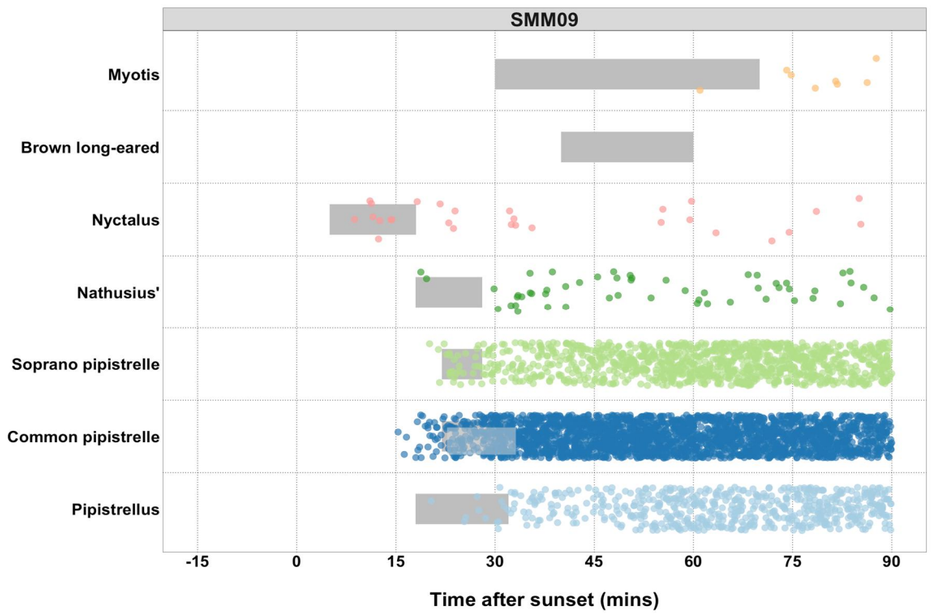
56. Data analysed though Ecobat shows the recorded data in relation to the standard roost emergence times (Russ, 2012). The results of this analysis would indicate the following detectors (**Table 4.4**) may be located within close proximity to a roost location, albeit outwith the Survey Area.

| Location | Species | Figure |
|---|---|---|
| SMM04 | Common pipistrelle | **Graph 4.2** |
| SMM09 | Soprano/ common pipistrelle | **Graph 4.3** |
| SMM10 | Soprano/common pipistrelle (*Pipistrellus sp.*) | **Graph 4.4** |
| There were other passes recorded on other detectors close to the species-specific emergence times although the numbers were not considered high enough to indicate the proximity of a roost. | | |

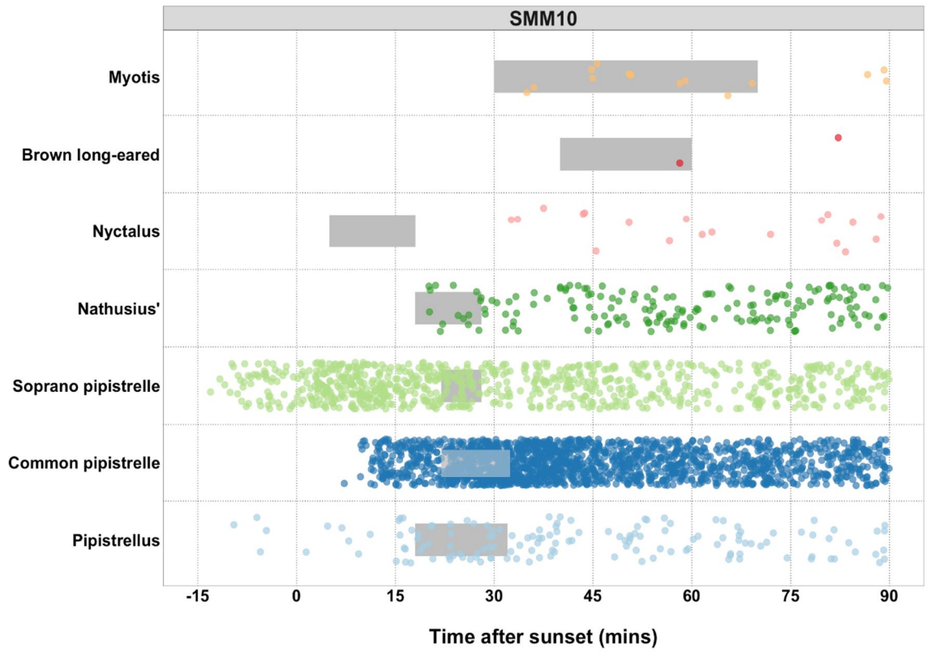
Table 4.4 Locations with bat passes indicating roosts nearby




Graph 4.2 – SMM04 species-specific emergence times. Coloured dots show the time of the recorded passes in relation to the emergence time window (grey bar).




Graph 4.3 – SMM09 species-specific emergence times. Coloured dots show the time of the recorded passes in relation to the emergence time window (grey bar).




Graph 4.4 – SMM10 species-specific emergence times. Coloured dots show the time of the recorded passes in relation to the emergence time window (grey bar).

## 4.5 Ecobat Reference Range – Data Comparison

57. The relative activity levels of bats recorded in the Site can be compared with values within the Ecobat reference database. This allows the bat activity data to be given a percentile.

58. The bat activity level is categorised using the percentiles as follows:

- low activity: 0 to 20th percentile;
- low/moderate activity: 21st to 40th percentile;
- moderate activity: 41st to 60th percentile;
- moderate/high activity: 61st to 80th percentile; and
- high activity: 81st to 100th percentile.

59. **Table 4.5** is a summary of the key metrics of each species recorded over the whole Site showing the median and maximum percentile activity levels.

| Species | Median Percentile | Activity Level | 95% CIs[4] | Max Percentile | Activity Level | Nights recorded |
|---|---|---|---|---|---|---|
| Myotis sp. | 0 | Low | 62.5 - 62.5 | 88 | High | 393 |
| Nyctalus sp. | 0 | Low | 44.5 - 71 | 85 | High | 254 |
| Pipistrellus sp. | 87 | High | 91.5 - 95.5 | 100 | High | 359 |

[4] Confidence Intervals (CIls)

| Species | Median Percentile | Activity Level | 95% CIs[4] | Max Percentile | Activity Level | Nights recorded |
|---|---|---|---|---|---|---|
| Nathusius' pipistrelle | 37 | Low/moderate | 76.5 - 76.5 | 99 | High | 201 |
| Common pipistrelle | 68 | Moderate/high | 78.5 - 87.5 | 100 | High | 653 |
| Soprano pipistrelle | 59 | Moderate | 81 - 93.5 | 100 | High | 604 |
| Brown long-eared | 0 | Low | 37 - 48 | 56 | Moderate | 147 |

Table 4.5 Summary table showing key metrics for each species recorded

60. Activity levels for each species per month were then calculated with the median and maximum percentile being examined. Examining this data allows any seasonal variations to be seen (**Table 4.6**). The highest activity levels are highlighted in red and the lowest in blue

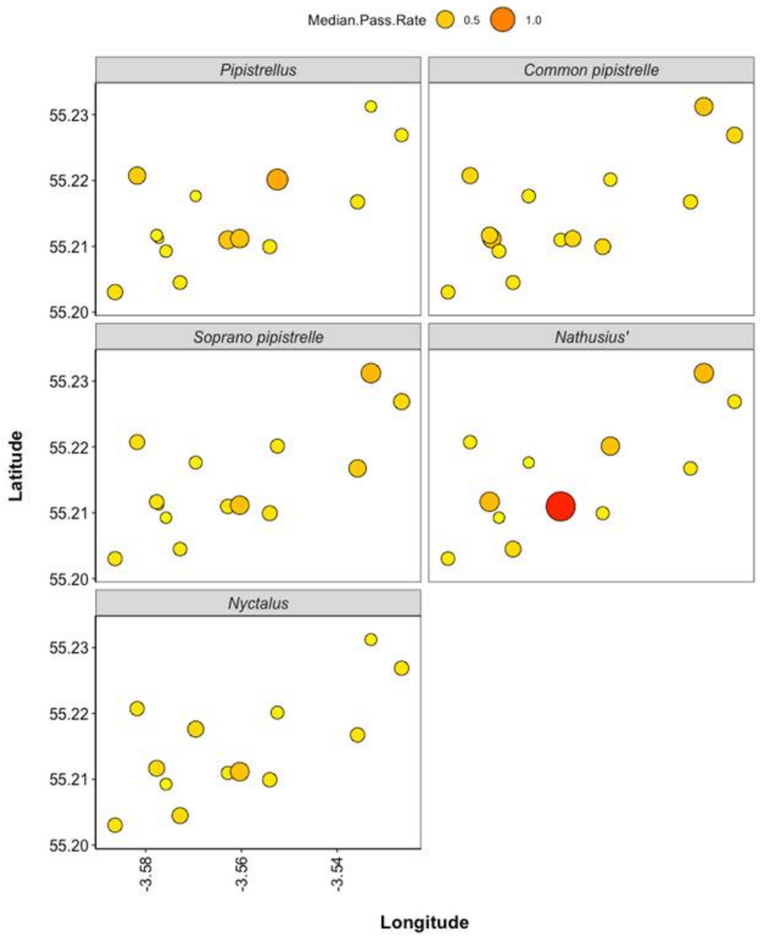
| Species | Month | Median Percentile | Activity Level | 95% CIs | Max Percentile | Activity Level | Nights recorded |
|---|---|---|---|---|---|---|---|
| Myotis sp. | May | 0 | Low | 62.5 - 62.5 | 75 | Moderate/high | 92 |
| | Jun | 40 | Low/moderate | 62.5 - 62.5 | 78 | Moderate/high | 7 |
| | Jul | 0 | Low | 62.5 - 62.5 | 88 | High | 59 |
| | Aug | 0 | Low | 62.5 - 62.5 | 79 | Moderate/high | 128 |
| | Sep | 0 | Low | 62.5 - 62.5 | 87 | High | 107 |
| *Nyctalus* sp. | May | 0 | Low | 37 - 68 | 56 | Moderate | 8 |
| | Jul | 0 | Low | 44.5 - 71 | 85 | High | 63 |
| | Aug | 37 | Low | 44.5 - 71 | 74 | Moderate/high | 126 |
| | Sep | 0 | Low | 44.5 - 71 | 71 | Moderate/high | 57 |
| *Pipistrellus* sp. | May | 87 | High | 91.5 - 95.5 | 100 | High | 61 |
| | Jun | 98 | High | 91.5 - 95.5 | 100 | High | 6 |
| | Jul | 85 | High | 91.5 - 95.5 | 99 | High | 33 |
| | Aug | 89 | High | 91.5 - 95.5 | 100 | High | 145 |
| | Sep | 86 | High | 91.5 - 95.5 | 100 | High | 114 |
| Nathusius' pipistrelle | Jul | 51 | Moderate | 61.5 - 76.5 | 87 | High | 33 |
| | Aug | 0 | Low | 76.5 - 76.5 | 99 | High | 89 |
| | Sep | 37 | Low/moderate | 76.5 - 76.5 | 93 | High | 79 |
| Common pipistrelle | May | 56 | Moderate | 78.5 - 87.5 | 100 | High | 159 |
| | Jun | 91 | High | 78.5 - 87.5 | 100 | High | 10 |
| | Jul | 58 | Moderate | 78.5 - 87.5 | 98 | High | 131 |
| | Aug | 74 | Moderate/high | 78.5 - 87.5 | 100 | High | 202 |
| | Sep | 74 | Moderate/high | 78.5 - 87.5 | 100 | High | 151 |
| Soprano pipistrelle | Apr | 0 | Low | 71 - 80 | 0 | Low | 1 |
| | May | 0 | Low | 81 - 93.5 | 96 | High | 142 |
| | Jun | 80 | High | 81 - 93.5 | 97 | High | 11 |
| | Jul | 37 | Low/moderate | 81 - 93.5 | 98 | High | 102 |
| | Aug | 71 | Moderate/high | 81 - 93.5 | 100 | High | 195 |
| | Sep | 64 | Moderate/high | 81 - 93.5 | 99 | High | 153 |
| Brown long-eared | May | 0 | Low | 37 - 48 | 56 | Moderate | 19 |
| | Jun | 0 | Low | 0 - 0 | 0 | Low | 4 |
| | Jul | 0 | Low | 0 - 0 | 37 | Low/moderate | 8 |
| | Aug | 0 | Low | 37 - 48 | 37 | Low/moderate | 69 |
| | Sep | 0 | Low | 37 - 48 | 37 | Low/moderate | 47 |

Table 4.6 Summary table showing the key metrics for each species within each month

61. Using the results from **Table 4.6** along with **Tables 3.8** to **3.10** the overall assessment of potential risk of the Site for high collision risk bat populations has been calculated as **Medium**.

# 5 Discussion

62. The automated detectors recorded bat passes at all detector locations at varying levels. Out of the species recorded on Site *Pipistrellus sp.* (including common, soprano and Nathusius' pipistrelle) and *Nyctalus sp*. (Leisler's and noctule) fall into the high risk of turbine impact category (SNH, 2019). There was not a large variation in the use of the Site by either species, with them both having similar median pass rates, comparing with the results of both species, across the whole Site (**Graph 5.1**). This is discussed further with the planned curtailment within the Bat Mitigation and Monitoring Plan (**Appendix 7.6**).




Graph 5.1 – Median pass rate across the detector locations[5]

63. Common pipistrelle had the highest level of bat activity across all seasons accounting for 57.7% of all the bat passes. Locations SMM04, SMM09, SMM10 all recorded bat passes at times that would indicate roosts nearby for both common and soprano pipistrelle. SMM10 is closest to the nearest possible roosting location which is a set of buildings around 425m south of the detector location. SMM04 and SMM09 have no known roosting locations or any known suitable roosting features nearby.

64. In addition to the Ecobat bat data analysis presented within this section, SPR has conducted detailed acoustic monitoring of bats at ten operational windfarms and acoustic monitoring aligned to the SNH (2019) guidance at three development phase projects and analysed the current data within the context of this extensive data set. The results are presented in a Bat Mitigation and Monitoring Plan (**EIA Report Appendix 7.6**).

65. Based on the calculated risk factor for pipistrelle and *Nyctalus* bats, a programme of turbine curtailment for all turbines and post construction monitoring is proposed. Based on the monitoring results, the proposed curtailment would be revised as necessary upon consultation with NatureScot. It is considered that this curtailment programme will substantially reduce the risk to bats from the Proposed Development.

[5] During the spring session the locations were changed slightly due to planned felling works

# 6 Conclusion

66. Bat survey work following the latest onshore windfarm guidance (SNH, 2019) was conducted at the Site of the proposed Harestanes South Windfarm Extension, Dumfries and Galloway. Twelve static Wildlife Acoustics Song Meter Mini bat detectors were distributed based on Layout A: Scoping Layout (**EIA Report Figure 3.2: Design Iterations of Turbine Layout A, B and F**) for up to 30 days in Spring, Summer and August 2020.

67. Six species/genera of bats were recorded, including common pipistrelle (the most commonly recorded species), soprano pipistrelle, Nathusius' pipistrelle, *Myotis* species, brown long-eared bat and *Nyctalus* species.

68. Three proposed turbines (SMM04, SMM09 and SMM10) are potentially within the vicinity of bat roosts where a large number of passes were recorded around roost emergence time, with SMM10 potentially being less than 500m from roosts. The overall assessment of potential risk of the Site for high collision risk bat populations has been calculated as **Medium**. Operational curtailment is planned for the Site.

69. Trees with suitability for roosting bats were recorded in the south of the Site to the east of the access track from the A701. Prior to felling, or works within 30m, the trees with suitability for roosting bats are recommended to have further surveys undertaken in the active bat season (May to September, inclusive). These include: activity surveys of trees with PRFs unable to fully inspected or safely inspected through other survey methods; further climb and inspect surveys of features which can be assessed through this method; ladder inspections and ground inspection with an endoscope; and at-height camera inspections with a Polekam.

# 7 References

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Scottish Power (2004a) Harestanes Windfarm Environmental Statement- Part Two (The Assessment). Chapter 7: Ecology.

Scottish Power (2004b) Harestanes Windfarm Environmental Statement: Technical Appendix – Chapter 3 Ecology.

# Appendix A – Figures

300000

N

SMM5
T07
SMM7
T08
T06
T04
SMM12
SMM2
T05
SMM8
T02
T01
SMM6
T03
SMM3
SMM1
SMM10
SMM11
SMM9
SMM4

590000

300000

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

590000

**Key**

- Application Boundary
- Automated Detector Location
- Indicative Turbine Location

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Ordnance Survey Licence 0100031673.

0 0.5 1 Km

| Rev | Date | By | Comment |
|---|---|---|---|
| B | 16/11/2020 | VK | Second Issue. |
| A | 05/11/2020 | PM | First Issue. |

SCOTTISHPOWER RENEWABLES

# Harestanes South Windfarm Extension

Figure 7.5.1: Automated Detector Locations

| | |
|---|---|
| **Drg No** | HARESTANES_WSP_I_206 |
| **Rev** | B |
| **Date** | 16/11/2020 |
| **Scale** | 1:30,000 @ A3 |

300000

590000

300000

N

## Legend

- Application Boundary
- Proposed Turbine

**Tree Suitability - Bat Roost**

- High
- Moderate
- Low
- Negligible

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0 0.5 1 Km

| Rev | Date | By | Comment |
|---|---|---|---|
| | | | |
| B | 23/11/2020 | BG | Second Issue. |
| A | 05/11/2020 | PM | First Issue. |

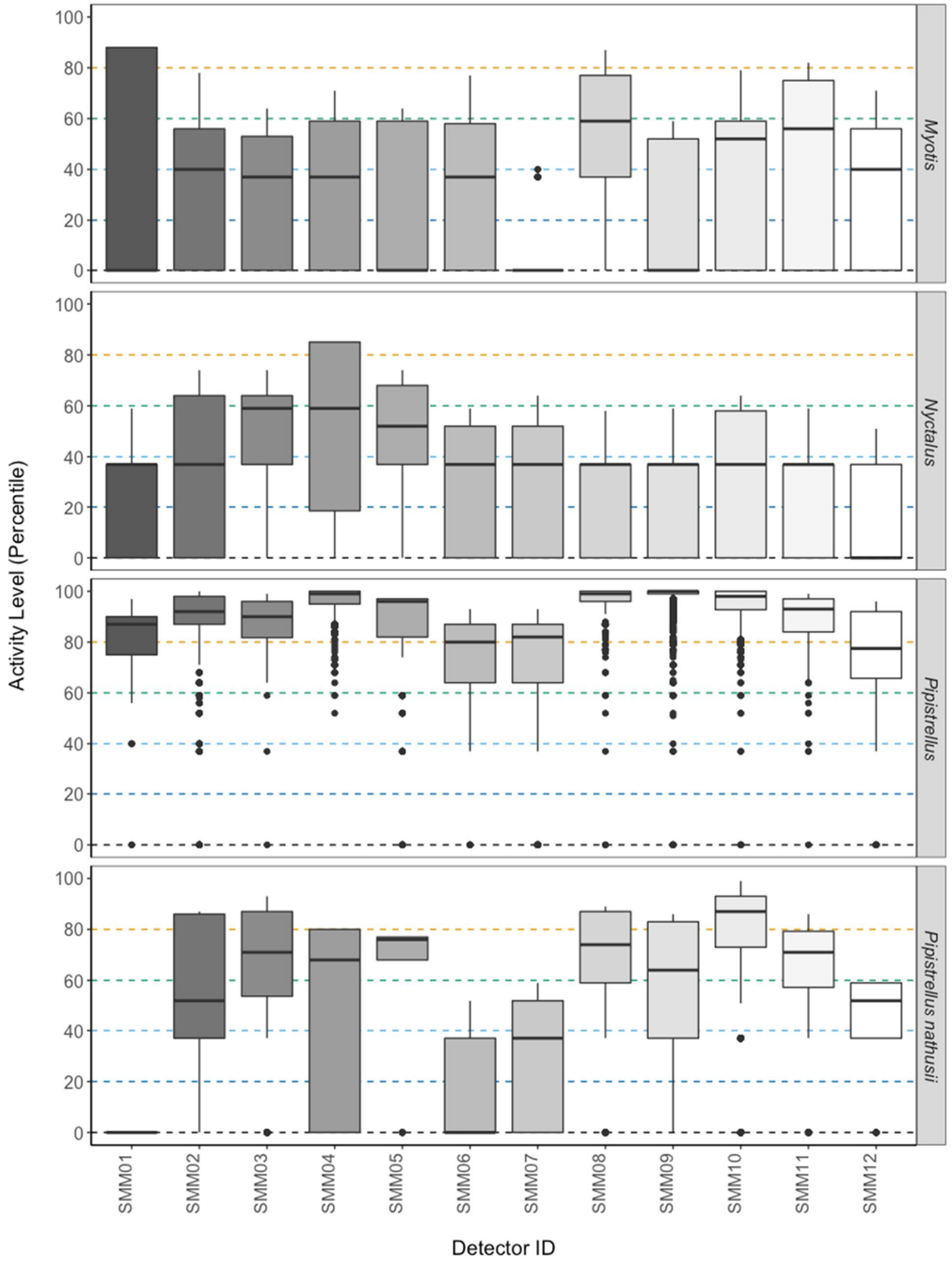
SCOTTISHPOWER RENEWABLES

# Harestanes South Windfarm Extension

Figure 7.5.2: Tree Survey Locations

| | |
|---|---|
| **Drg No** | HARESTANES_WSP_I_207 |
| **Rev** | B |
| **Date** | 23/11/2020 |
| **Scale** | 1:30,000 @ A3 |

# Appendix B – Ecobat Data



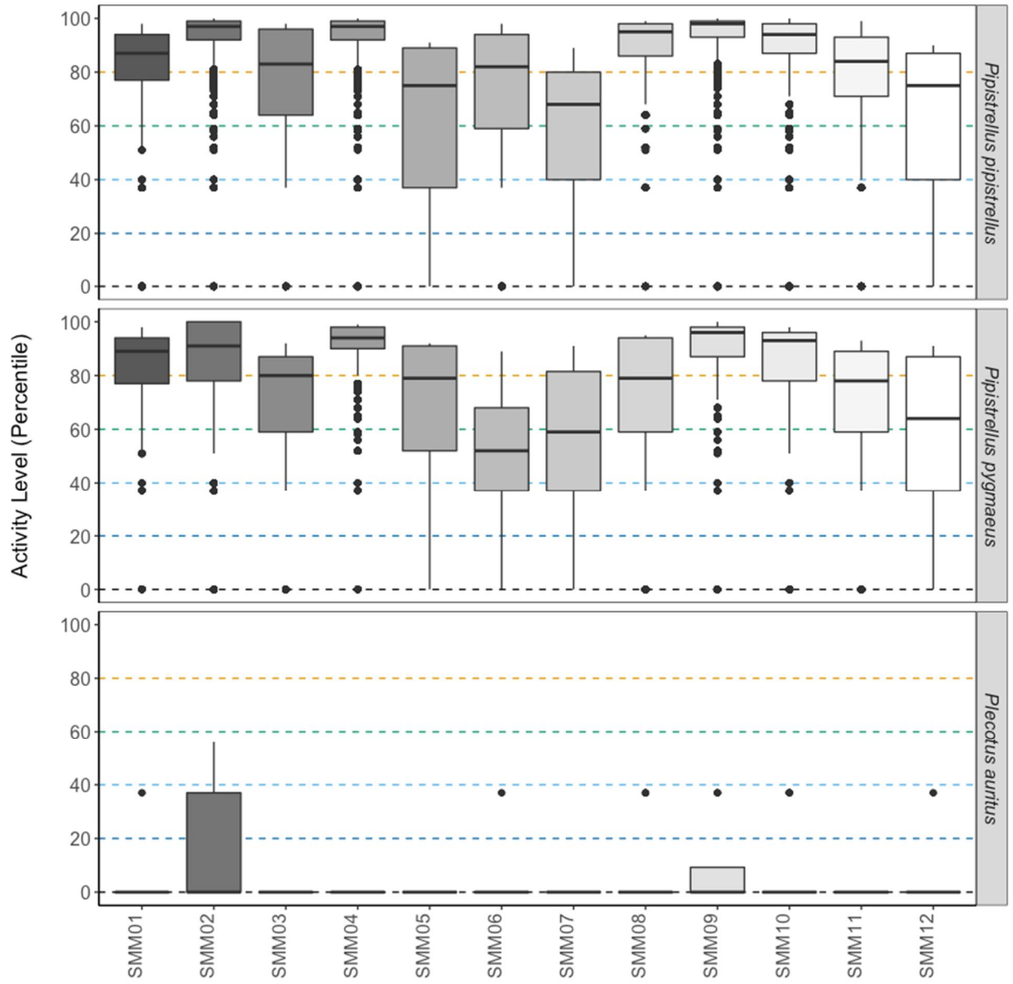




Chart 7.5.1 The recorded activity of bats during the survey. The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity).

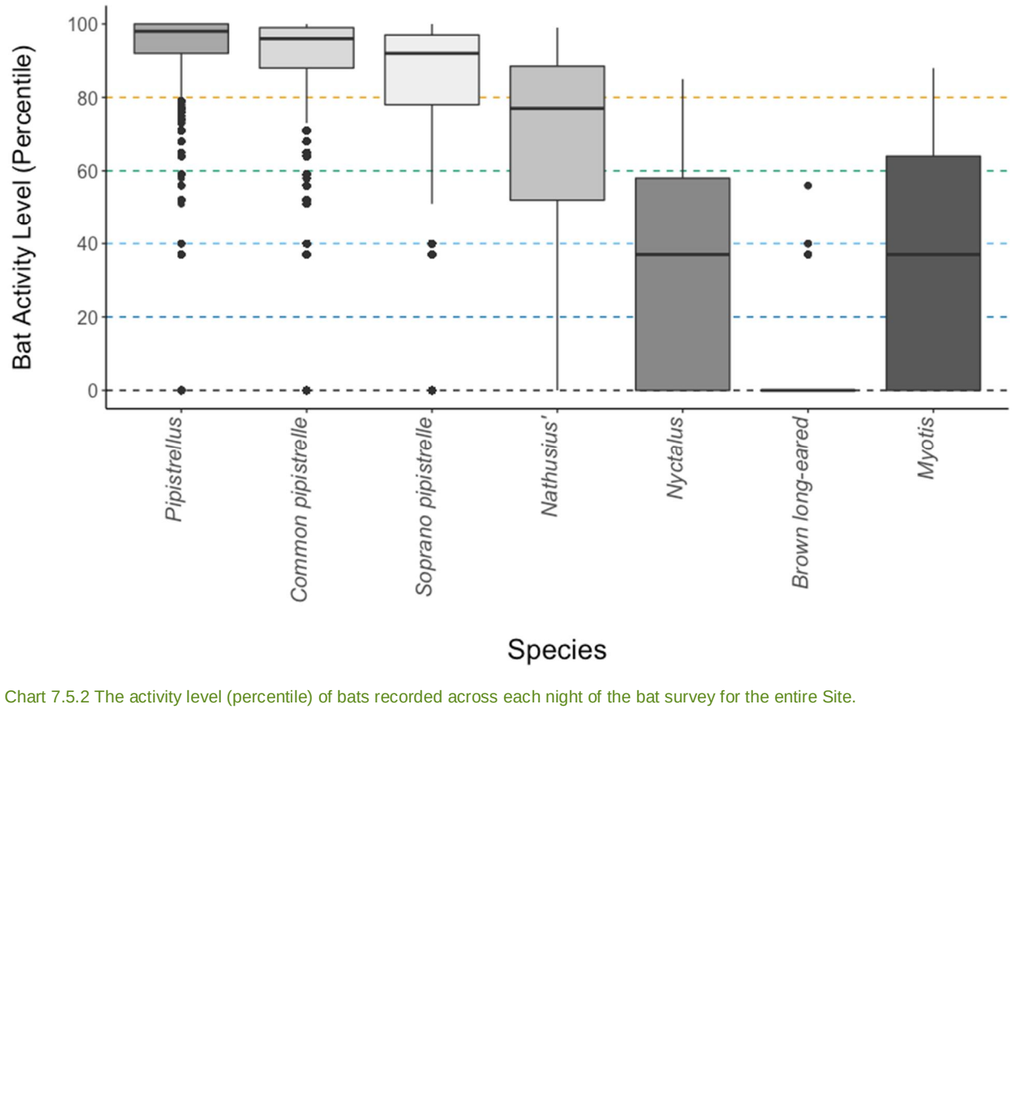



Chart 7.5.2 The activity level (percentile) of bats recorded across each night of the bat survey for the entire Site.

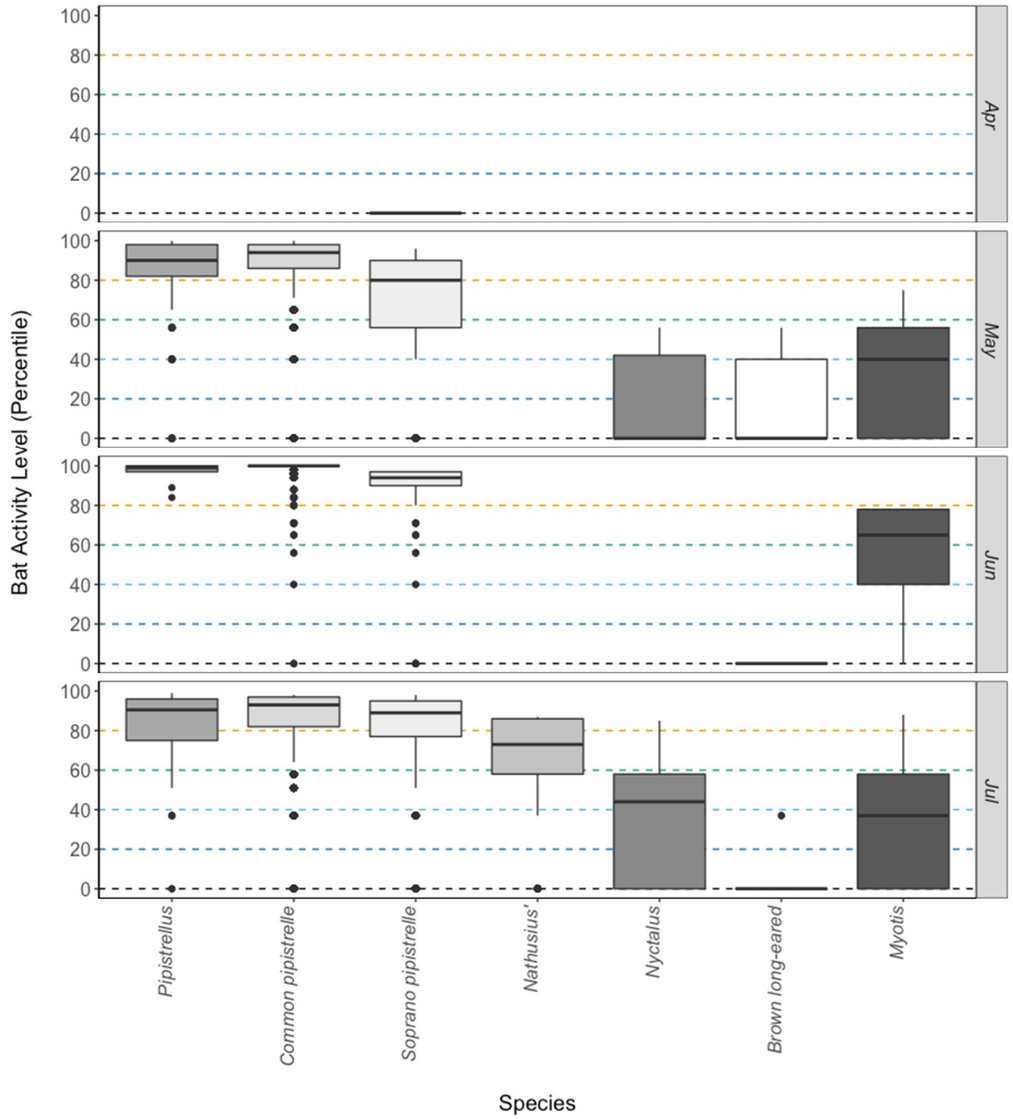



Chart 7.5.3 The activity level (percentile) of bats recorded across each night of the bat survey for the entire Site, split between months.

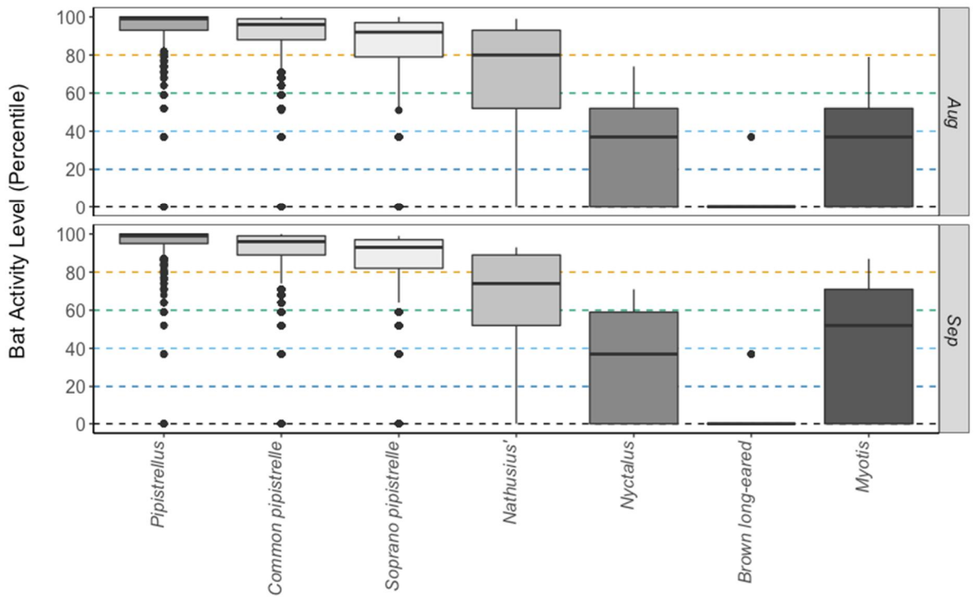



Chart 7.5.3 The activity level (percentile) of bats recorded across each night of the bat survey for the entire Site, split between months (continued).

# Appendix C – Tree Survey Results

| Tree Tag | Species | OS Grid Ref | PRF Location | PRF height (m) | PRF Aspect | PRF Category | PRF Type | Tree Suitability | Further Surveys | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 0100 | Sycamore | NY 03701 90673 | Stem | 6 | West | Damage | Knot hole | moderate | Activity surveys | Tree is dead and unsafe to climb |
| 0099 | Beech | NY 03815 90654 | Limb | 2 | North | Damage | Splits | moderate | Ground inspect | Suitability increased after feature endoscoped |
| 0098 | Sycamore | NY 03721 90685 | Limb | 7 | South east | Damage | Hollow main stem | moderate | Activity surveys | Tree badly damaged, unsafe to climb |
| 0097 | Beech | NY 03694 90707 | Stem and limb | 4 | North | Decay / damage | Basal cavity/knot hole | low | Ground inspect | Suitability decreased after feature endoscoped |
| 0096 | Dead tree | NY 03703 90707 | Stem | 10 | West | Damage | Woodpecker hole | moderate | Activity surveys | Tree is dead and unsafe to climb |
| 0095 | Oak | NY 03768 90696 | Stem | 8 | South | Damage | Hazard beam | high | Climb and inspect | Suitability of features increased after climb and inspect |
| 0094 | Oak | NY 03898 90633 | Stem | 6 | North | Damage | Branch wound | negligible | - | Suitability decreased after torching the feature |
| 0093 | Willow | NY 04123 90249 | Stem | 3 | East | Damage | Hazard beam | moderate | Climb and inspect | Suitability confirmed after climb and inspect |
| 0092 | Beech | NY 04129 90100 | Limb | 5 | East | Damage | Hazard beam | moderate | Climb and inspect | Suitability confirmed after climb and inspect |
| 0091 | Oak | NY 04048 90349 | Limb | 10 | North east | Damage | Hazard beam | high | Activity surveys | No safe anchor point to access feature for climb and inspect |
| 0090 | Ash | NY 04072 90333 | Stem | 0 | Various | Decay | Hollow steam | high | Activity surveys | Suitability increased through climb and inspect. Upper features do not extend far, low feature goes into large cavity |
| 0089 | Ash | NY 04074 90325 | Limb | 13 | East | Decay | Dead limb with woodpecker | moderate | Activity surveys | No safe anchor point to access feature for climb and inspect |
| 0088 | Ash | NY 04082 90308 | Limb | 10 | East | Decay / damage | Broken limbs | moderate | Activity surveys | No safe anchor point to access feature for climb and inspect |
| 0087 | Oak | NY 04147 90123 | Limb | 8 | East | Damage | Snapped limbs | low | Activity surveys | No safe anchor point to access feature for climb and inspect |
| 0086 | Oak | NY 04166 90129 | Limb | 8 | West | Damage | Branch wound / knot hole | moderate | Climb and inspect | Suitability of feature increased after climb and inspect |
| 0085 | Oak | NY 04162 90152 | Limb | 12 | South | Damage | Tearout | moderate | Activity surveys | Active beehives present under feature, not safe to climb and inspect |
| 0084 | Oak | NY 04168 90153 | Limb | 6 | South | Damage | Tearout | moderate | Climb and inspect | Suitability of feature increased after climb and inspect |
| 0083 | Oak | NY 04172 90167 | Stem | 10 | East | Damage | Splits | moderate | PoleKam | No safe anchor point to access feature for climb and inspect |
| 0081 | Oak | NY 04166 90210 | Limb | 6 | West | Damage | Splits | moderate | Climb and inspect | No safe anchor point to access feature for climb and inspect |
| 0080 | Oak | NY 04155 90210 | Limb | 14 | West | Damage | Splits | moderate | Climb and inspect | No safe anchor point to access feature for climb and inspect |
| 0079 | Oak | NY 04132 90253 | Limb | 12 | West | Damage | Branch wound | negligible | - | Suitability of feature decreased after climb and inspect |
| 0078 | Oak | NY 04133 90279 | Stem | 15 | South | Damage | Hazard beam | low | Climb and inspect | Suitability of feature decreased after climb and inspect |
| 0077 | Dead birch | NY 04122 90270 | Stem | 8 | South | Decay | Woodpecker / rot holes | moderate | Activity surveys | Tree is dead and unsafe to climb |
| 0076 | Oak | NY 04125 90298 | Limb | 7 | North west | Damage | Snapped limbs | moderate | Activity surveys | Fallen tree has no safe anchor points to access feature for climb and inspect |
| 0075 | Oak | NY 04113 90301 | Limb | 0 | Various | Damage | Snapped limbs | moderate | Activity surveys | Half the features present can be climb and inspected others can't be accessed due to lack of safe anchor points |
| 0073 | Birch | NY 04113 90325 | Stem | 5 | South | Decay | Rot role | moderate | Activity surveys | No safe anchor point to access feature for climb and inspect |
| 0072 | Birch | NY 04114 90327 | Stem | 8 | West | Decay | Rot roles | moderate | Climb and inspect | Suitability confirmed after climb and inspect, possible signs of roosting bats (droppings, smoother area of bark) |
| 0071 | Oak | NY 04119 90329 | Limb | 4 | East | Damage | Snapped limbs | moderate | - | Outside buffer zone |
| 0007 | Oak | NY 04202 90162 | Stem | 3 | South | Decay | Woodpecker holes | moderate | PoleKam / ladder | Tree is dead and unsafe to climb |

Table 4.7 Tree survey results

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