TA9.2: Bat Survey Report 2019 - 2020

TECHNICAL APPENDIX 9.2

Bat Survey Report

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EXECUTIVE SUMMARY

RPS was commissioned by SSE Generation Ltd. to undertake bat surveys to assess potential impacts to bat species from the Proposed Varied Development. The aim of the surveys undertaken from August to October 2019 was to identify the bat species present on site, assess their activity level, locate roosts at significant risk of disturbance, and assess the potential risk level to each species.

Activity surveys, comprising the deployment of static bat detectors were completed during the peak bat activity season from August to October 2019 covering the activity period of autumn dispersal/mating. An assessment of the habitat suitability for bat roosting, foraging and commuting was conducted, and a desk study was carried out in support of the field surveys.

The desk study returned one sighting of a common pipistrelle bat, and a common pipistrelle roost 4 km northeast of the site boundary within the 10 km search radius. The habitats within the main site of the Proposed Varied Development comprise a mosaic of conifer plantation, open moorland, blanket bog and wet dwarf shrub heath. There are a number of watercourses and small waterbodies within the site and in the surrounding area. The site was considered to have moderate potential for foraging and commuting bats and low potential for roosting bats, due to the limited number of buildings or trees with suitable features to support them.

Static detectors were deployed at twenty locations around the site. Almost 1,000 files with bat passes from five bat species (common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, *Myotis* spp. and *Nyctalus* spp.) were recorded during the total survey effort of 754 days; this survey effort is substantially over and above the requirements of the Guidance. When data from similar sites was compared using the online comparison tool Ecobat[1] (in line with current SNH Guidance (SNH *et al.* 2019)[2]), bat activity levels at this site were assessed as moderate. Further surveys were undertaken in 2020 to meet the requirements of the current SNH Guidance[2] by covering the remainder of the core bat activity periods between April and August 2020.

Two structures within the survey area were assessed for their potential to support roosting bats: Croft House and Strathy River Bridge. The bridge was assessed as having low potential to support roosting bats, however a small number of droppings characteristic of pipistrelle species bats were found within Croft House. DNA analysis of the droppings was carried out which confirmed that they were from common pipistrelles and therefore the building is a confirmed bat roost.

An assessment of risk from the development concerning bat displacement and mortality was made using parameters outlined in the most recent industry standard guidance[1,2]. Overall, prior to suitable mitigation being implemented, the development is considered as presenting moderate risk to bats; albeit there are current limitations with the Ecobat tool which is reliant on third party data and the number of reference records which this is able to provide for the comparison (this was low for the area surrounding the site). Considering the proposed turbine locations, the likely impacts from the development would largely be to pipistrelle species at the south of the site and to *Nyctalus* spp. bats at the north.

Best practice mitigation measures are provided within the report which would minimise potential negative effects on bat species; these were incorporated into the design of the Consented Scheme and continue to be part of the design for the Proposed Varied Development. Where possible these include siting the layout of the turbines to ensure they are at least 85.4 m from key habitat features commonly used by bats, and consideration of suitable buffer distances in the Phased Felling Plan when initial key-holing is completed to ensure that new forest edges would not create additional foraging and commuting routes which would pose a high risk to bat surveys. Where it has been identified that turbines do not meet the requirements of the guidance for the buffer distance, due to the increased turbine height for the Proposed Varied Development, the micro-siting allowance would be used to ensure this is buffer distance is maintained. Six turbines have been identified where this would be required, with the maximum micro-siting of 13 m required. Habitat management as detailed in the Strathy South Wind Farm Outline Habitat Management Plan (EIAR Volume 4: Technical Appendix 9.5) would be implemented following the phased felling of the Strathy South conifer planation as described in EIAR Volume 4: Technical Appendix 9.6 – Strathy South Phased Felling Plan. This would ensure habitats within 85.4 m of wind turbines are unsuitable for foraging and commuting bats. On the basis that the above mitigation is effective, the residual effects for the Proposed Varied Development are predicted to be minor adverse (not significant) and would be unlikely to affect local bat populations.

[1] http://www.ecobat.org.uk/ (accessed 09.04.2020).
[2] SNH (2019) Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation.

REPORT

1 INTRODUCTION

1.1 Background

RPS was commissioned by SSE Generation Ltd. (SSE) to undertake bat surveys to assess potential effects to bats from the Proposed Varied Development. The Proposed Varied Development is located approximately 12 km south of Strathy village, Highland (central Ordnance Survey (OS) grid reference NC 794 512).

The aims of the surveys were to:

- identify the bat species present on site;
- assess their activity level;
- locate roosts at significant risk of disturbance; and
- investigate the potential risk level to each species.

A split season survey effort was completed at the site commencing in August 2019. This approach was agreed with SNH during a pre-submission consultation meeting in September 2019 (Table 9.4, Chapter 9, EIAR Volume 2). The initial survey period (August – October 2019) covered the dispersal period of the bat activity season. A substantial amount of data was collected through this period over and above that required by the relevant SNH Guidance[2]. Further surveys were completed in 2020 covering the first two bat activity periods for spring migration and summer maternity seasons (May – July 2020) to supplement the information collected in 2019 to ensure compliance with the current SNH Guidance[2].

1.2 Relevant Protected Species Legislation

This section describes the legislation pertaining to bat species which may be present on site that informs the requirement for, and nature of, all bat related ecological surveys to be conducted.

1.2.1 The Habitats Directive

The Habitats Directive (European Union Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) requires national governments to specify areas that are expected to ensure the conservation of flora and fauna species (Natura 2000 sites). A number of Annexes accompany the directive which outline the protected habitats and species associated with this legislation. Bat species are listed on Annex II (species requiring designation of Special Conservation Areas) and Annex IV (animals and plant species in need of strict protection) of the directive, and whilst no Natura 2000 sites are specifically designated for bat species within the UK, all bat species are afforded appropriate protection under this legislation.

1.2.2 The Conservation of Habitats and Species Regulations 1994 (as amended)

The Habitats Directive is transposed into law in Scotland through the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

This legislation makes it an offence to deliberately or recklessly disturb European Protected Species (EPS). Their places of shelter are fully protected, and it is an offence to damage, destroy or obstruct access to, or otherwise deny, the animal use of a breeding site or resting site, whether deliberately or not. It is also an offence to disturb in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species, disturb in a manner, or circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young. Any activity which is likely to affect these species requires prior consultation with the relevant statutory nature conservation organisation (i.e. Scottish Natural Heritage (SNH)) and may require a licence to be issued before they can be carried out.

1.3 Terms

The below terms will be used throughout the report:

- **“the site”** - the Proposed Varied Development’s main site; and

- **“survey area”** – the main site plus a 200 m buffer used for the bat scoping survey, this is provided in Figure 9.2.1: Static Bat Recorder Survey Locations (2019-20).

2 METHODOLOGY

2.1 Desk Study

A desk study was undertaken to support the field surveys. The following groups were approached for data:

- Highland Biological Recording Group (HBRG) were contacted for records for all bat species within a 10 km buffer of the site;
- The Bat Conservation Trust were approached to obtain contact details of any local bat groups, but north Highland is under-recorded for bat data and no bat groups cover this area.

Where the data search returned records of bat species, the location of the record in relation to the edge of that species' known range in Scotland was assessed by consulting the 2013 UK Habitats Directive Article 17 Report[3] and Mathews *et al*. (2018)[4].

There are no known statutory designated sites in Scotland with bats as a qualifying feature, as such a search for these was not undertaken for the purpose of this report.

Aerial imagery (Google Earth Pro, May 2019) and Ordnance Survey maps were studied to determine topographic and landscape features which might affect bats' use of the site and surrounding area.

In addition, the location of other existing and proposed wind energy developments (including the number of turbines and their size) within the surrounding 10 km was sought in order to inform an assessment of potential local cumulative pressures; these were:

- Strathy North Wind Farm;
- Armadale Wind Farm;
- Strathy Wood Wind Farm;
- Akron Wind Farm; and
- Bettyhill Wind Farm.

Of the above wind farms, only the Bettyhill and Strathy North Wind Farms are operational. As such, only these developments have been used in the desk study assessment of the potential effects of the operation of the Proposed Varied Development on the local bat populations. The approach to the identification of potential cumulative effects is explained in Section 9.7.46 of Chapter 9: Ecology (non-avian) (EIAR Volume 2).

2.2 Field Surveys

2.2.1 Habitat Assessment

An assessment of the survey area was carried out according to results from a Phase 1 Habitat Survey completed in 2011 (results are reported in EIAR Volume 4: Technical Appendices – Technical Appendix 9.8 – Copy of the 2013 ES Addendum, Volume 4, Technical Appendix A10.2 Habitats, Vegetation and Protected Species), for which the results were ground truthed in 2019 and deemed to be still accurate (see EIAR Volume 4: Technical Appendices - Technical Appendix 9.1 – Habitats and Protected Species Survey Update). The potential value of the habitats and features present for foraging and commuting bats was assessed, using the criteria from the current guidance (Collins, 2016)[5], which are summarised in Table 9.2.1 below. Areas of potential roosting habitat were also identified and where possible assessed for their suitability.

[3] http://archive.jncc.gov.uk/default.aspx?page=63910.

[4] Mathews, F., Kubasiewicz, L.M., Gurnell, J., Harrower, C.A., McDonald, R.A., Shore, R.F. (2018) *A Review of the Population and Conservation Status of British Mammals: Technical Summary*. A report by the Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage. Natural England, Peterborough.

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

Table 9.2.1: Bat Habitat Suitability Criteria

Suitability	Description of Roosting Habitat	Foraging and Commuting Habitat
Negligible	Negligible habitat features on site not likely to be used by roosting bats.	Negligible habitat features on site not likely to be used by commuting or 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 gappy hedgerow or un-vegetated streams, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. 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	A structure or tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with only very limited roosting potential.	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 or tree with one or more potential roost sites that could be used by bats due to its size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	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. Site close to and connected to known roosts.

Table Notes

Table reproduced from Bat Conservation Trust (BCT) Guidance (Collins, 2016)[5]

2.2.2 Preliminary Bat Roost Potential Assessment

A roost assessment was undertaken by an experienced RPS surveyor on 05 September 2019 on the two structures within the survey area with the potential to support roosting bats: Croft House and Strathy River Bridge. The locations of the structures are shown in Figure 9.2.1: Static Bat Recorder Survey Locations (2019).

The assessment followed the methodology detailed in Collins (2016)[5] and comprised an inspection of all accessible areas of the structures to identify features likely to be used by roosting bats.

Bat presence may be indicated by:

- presence of bat droppings;
- staining at regularly used access points;
- corpses; and
- scratches.

The structures were classified for their potential to support roosting bats using criteria detailed in Table 9.2.1 above. The suitability for the habitat to support foraging/commuting bats and connectivity to the wider area was also assessed.

2.2.3 Presence Absence Surveys

Dusk emergence and dawn re-entry surveys were carried out of the Croft House by experienced surveyors on the 28 May, 19 June and 7 July 2020 in accordance with the relevant guidance[5]. Dates, times of surveys and weather conditions for the surveys are detailed in Table 9.2.2 below. Bat calls were recorded using Duet bat detectors recording to a digital recorded for analysis. Recordings were analysed with specialised software Bat Sound by an experienced ecologist to confirm the bat species present.

Dusk emergence surveys started half an hour before sunset and ran until at least 1 ½ hours after sunset. Dawn re-entry surveys ran from at least 1 ½ hours before sunrise until 15 minutes after sunrise.

Table 9.2.2: Summary of Bat Survey Conditions

Date	Sunset / Sunrise	Time		Weather Conditions at Beginning of Survey			
		Start	End	Temp (C)	Wind (m/s)	Cloud (oktas)	Rain*
28.05.20	22:04	09:45	00:00	13	0	1	0
19.06.20	04:08	02:00	04:23	17	3	5	0
07.07.20	22.20	22.00	00.20	14	1.5	8	0

2.2.4 Activity Surveys

Autumn Deployment 2019

Activity surveys, comprising the deployment of static recorders, were completed during the peak bat activity season from August to October 2019 covering the activity period of autumn dispersal/mating. The surveys were designed based on the Consented Scheme's turbine layout (which has not altered for the Proposed Varied Development). In accordance with Guidance, surveys were designed to sample the indicative developable site's habitats which would be present at the time of the Proposed Varied Development's commissioning i.e. open areas that are likely to be currently used and would continue to be used by bat species, and not those within afforested areas. During this period significantly more data than guidance requires was collected for the peak autumn activity period in the site.

Spring/Summer Deployment 2020

Further deployment of static detectors was completed during the spring migration and summer maternity season. The surveys followed the same design as the autumn 2019 deployment and followed the current best practice Guidance[2].

The methodology for the survey technique is detailed below.

Static Recorders

Autumn Deployment 2019

Static bat detectors were deployed in ten locations for eight consecutive nights from 28 August 2019, then at twenty locations from 05 and 06 September 2019 until 14 or 15 October 2019. This split deployment method was employed according to equipment availability across the UK at the time the surveys were commissioned.

Spring/Summer Deployment 2020

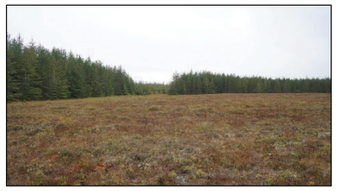
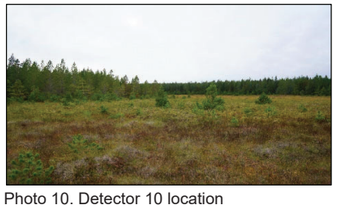
Static detectors were deployed at twenty locations during spring (15 May 2020 to 04 June 2020) and during summer (18 June 2020 to 09 July 2020).

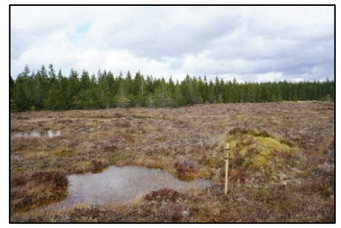
The locations of the twenty static detectors are shown in Figure 9.2.1: Static Bat Recorder Survey Locations (2019-2020) and were selected to cover a representative sample of the habitat variety present on site and areas in proximity to the turbines for the Consented Scheme and Proposed Varied Development (albeit out with the conifer plantation itself). The habitats at each location are detailed in Table 9.2.3.

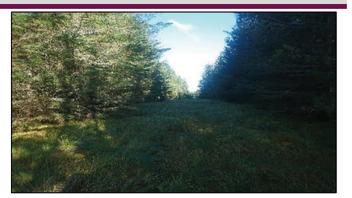
Table 9.2.3: Location of Static Detectors

Location[6]	OS Grid Reference	Habitat Type(s)	Details	Photos
1	NC 80934 52845	Woodland edge, waterbody	Located to the northeast of the site between conifer plantation and the east bank of a lochan.	 Photo 01. Detector 1 location
2	NC 80576 51774	Woodland edge	Located on the northeast of the site on the edge of a forest ride within the conifer plantation.	 Photo 02. Detector 2 location
3	NC 81011 50932	Woodland edge	Located on the east of the site in a forest ride within 100m of Allt Badain Burn.	 Photo 03. Detector 3 location
4	NC 80065 50338	Woodland edge	Located on the southeast of the site in a forest ride along the edge of the conifer plantation.	 Photo 04. Detector 4 location
5	NC 80757 50126	Open moorland	Located on the southeast of the site in a large, open forest ride.	 Photo 05. Detector 5 location

[6] Refer to Figure 9.2.1 for detector locations.

Location[6]	OS Grid Reference	Habitat Type(s)	Details	Photos
6	NC 80373 49222	Woodland edge, open moorland	Located on the south of the site at the edge of the conifer plantation adjacent to an open area of moorland.	 Photo 06. Detector 6 location
7	NC 79677 49753	Woodland edge, open moorland	Located on the south of the site along the conifer plantation edge adjacent to a large open area of moorland.	 Photo 07. Detector 7 location
8	NC 79504 48828	Linear feature, open moorland	Located to the very south of the site close to Croft House and adjacent to an access track and open clearing.	 Photo 08. Detector 8 location
9	NC 78388 49435	Woodland edge, open moorland	Located on the southwest of the site on the edge of the conifer plantation and a large open area of moorland.	 Photo 09. Detector 9 location
10	NC 77827 49735	Watercourse	Located on the southwest of the site in an open area in proximity to Yellowbog Burn.	 Photo 10. Detector 10 location
11	NC 78919 50191	Watercourse	Located on the southwest of the site in an open area in proximity to an unnamed burn.	 Photo 11. Detector 11 location

Location[6]	OS Grid Reference	Habitat Type(s)	Details	Photos
12	NC 78233 50449	Woodland edge	Located to the southwest of the site adjacent to the site boundary and within a forest ride.	 Photo 12. Detector 12 location
13	NC 78730 51012	Woodland edge, open moorland	Located on the west of the site on the edge of the conifer plantation and adjacent to a large open area of moorland.	 Photo 13. Detector 13 location
14	NC 78219 51281	Woodland edge, open moorland	Located on the west of the site on the edge of the conifer plantation and adjacent to a large open area of moorland.	 Photo 14. Detector 8 location
15	NC 78380 52082	Woodland edge, open moorland, waterbody	Located on the northwest of the site on the edge of the conifer plantation and adjacent to open moorland and a group of small lochans.	 Photo 15. Detector 15 location
16	NC 79169 52369	Linear feature	Located on the northwest of the site in a forest ride in proximity to an access track.	 Photo 16. Detector 8 location
17	NC 77820 52428	Open moorland	Located on the northwest of the site in a large, open forest ride.	 Photo 17. Detector 17 location

Location[6]	OS Grid Reference	Habitat Type(s)	Details	Photos
18	NC 78141 52841	Woodland edge, linear feature	Located on the northwest of the site in a forest ride in proximity to an access track.	 Photo 18. Detector 18 location
19	NC 78735 53203	Woodland edge, open moorland	Located on the northwest of the site on the edge of the conifer plantation and adjacent to a large open area of moorland.	 Photo 19. Detector 19 location
20	NC 78973 53998	Woodland edge	Located on the northwest of the site in a forest ride.	 Photo 20. Detector 20 location

Anabat Swift bat detectors, with omnidirectional microphones deployed at ground level, were used and programmed to begin recording an hour before sunset and stop one hour after sunrise. Standard guidance recommends recording within 30 minutes of sunset and sunrise, but an extended recording period allows a buffer for fluctuating sunset or sunrise in each deployment, and collation of bats flying outside the standard times.

The deployment periods are presented in Table 9.2.4 below. The ten detectors deployed in August 2019 were placed at locations 1, 3, 5, 7, 9, 11, 13, 15, 17 and 19. The units were checked at the end of the first deployment and, in some cases, the memory cards were found to be full after four or five nights of recording due to the high volume of noise files collected. The sensitivity of the detectors was adjusted, and twenty units were then deployed throughout the site, with the batteries changed and memory cards checked at the end of the second deployment on 19 and 20 September 2019. The same locations were used for the Spring and Summer 2020 survey.

Table 9.2.4: Static Detector Deployment Dates

Location	Dates Deployed		Nights Deployed	Nights Operative (%)
Autumn First Deployment				
1	28.09.19	05.09.19	8	100
3	28.09.19	05.09.19	8	50
5	28.09.19	05.09.19	8	50
7	28.09.19	05.09.19	8	100
9	28.09.19	05.09.19	8	50
11	28.09.19	05.09.19	8	63
13	28.09.19	05.09.19	8	50
15	28.09.19	05.09.19	8	50
17	28.09.19	05.09.19	8	100
19	28.09.19	05.09.19	8	100

Location	Dates Deployed		Nights Deployed	Nights Operative (%)
Autumn Second Deployment				
1	05.09.19	19.09.19	14	29
2	05.09.19	19.09.19	14	100
3	05.09.19	19.09.19	14	100
4	05.09.19	20.09.19	15	100
5	05.09.19	20.09.19	15	100
6	05.09.19	20.09.19	15	100
7	05.09.19	20.09.19	15	100
8	05.09.19	19.09.19	14	100
9	05.09.19	19.09.19	14	79
10	05.09.19	19.09.19	14	100
11	05.09.19	19.09.19	14	100
12	05.09.19	19.09.19	14	100
13	05.09.19	19.09.19	14	7
14	05.09.19	19.09.19	14	100
15	05.09.19	19.09.19	14	100
16	05.09.19	19.09.19	14	100
17	05.09.19	19.09.19	14	100
18	06.09.19	19.09.19	13	100
19	05.09.19	19.09.19	14	100
20	06.09.19	19.09.19	13	100
Autumn Third Deployment				
1	19.09.19	14.10.19	25	100
2	19.09.19	15.10.19	26	38
3	19.09.19	15.10.19	26	100
4	20.09.19	15.10.19	25	100
5	20.09.19	15.10.19	25	100
6	20.09.19	14.10.19	24	100
7	20.09.19	14.10.19	24	100
8	19.09.19	14.10.19	25	100
9	19.09.19	14.10.19	25	100
10	19.09.19	14.10.19	25	100
11	19.09.19	14.10.19	25	100
12	19.09.19	15.10.19	26	46
13	19.09.19	15.10.19	26	15
14	19.09.19	15.10.19	26	100
15	19.09.19	15.10.19	26	100
16	19.09.19	15.10.19	26	100
17	19.09.19	15.10.19	26	100
18	19.09.19	15.10.19	26	38
19	19.09.19	15.10.19	26	100
20	19.09.19	15.10.19	26	100
Spring Deployment				
1	15.05.20	04.06.20	20	100
2	17.05.20	04.06.20	18	100
3	15.09.19	04.06.20	20	100
4	15.05.20	04.06.20	20	100
5	15.05.20	04.06.20	20	100
6	15.05.20	04.06.20	20	100

Location	Dates Deployed		Nights Deployed	Nights Operative (%)
7	15.05.20	04.06.20	20	100
8	15.05.20	04.06.20	20	100
9	16.05.20	04.06.20	19	100
10	16.05.20	04.06.20	19	100
11	16.05.20	04.06.20	19	100
12	16.05.20	04.06.20	19	100
13	16.05.20	04.06.20	19	100
14	16.05.20	04.06.20	19	100
15	16.05.20	04.06.20	19	100
16	16.05.20	04.06.20	19	0
17	17.05.19	04.06.20	20	100
18	17.05.19	04.06.20	20	65
19	17.05.19	04.06.20	20	100
20	17.05.19	04.06.20	20	100
Summer Deployment				
1	19.06.20	08.07.20	19	100
2	18.06.20	09.07.20	21	100
3	19.06.20	09.07.20	20	100
4	19.06.20	09.07.20	20	100
5	19.06.20	08.07.20	19	100
6	19.06.20	09.07.20	20	100
7	19.06.20	09.07.20	20	100
8	19.06.20	08.07.20	19	37
9	18.06.20	09.07.20	21	100
10	18.06.20	09.07.20	21	100
11	18.06.20	09.07.20	21	100
12	18.06.20	09.07.20	21	100
13	18.06.20	07.07.20	19	100
14	18.06.20	09.07.20	21	100
15	18.06.20	09.07.20	21	100
16	18.06.20	08.07.20	20	0
17	18.06.20	09.07.20	21	100
18	18.06.20	09.07.20	21	100
19	18.06.20	09.07.20	21	100
20	18.06.20	07.07.20	19	100

Weather Data

Weather data for the static recording deployment periods was collated from the nearest weather station to the survey area (Wick Airport)[7]. Weather parameters noted were: hourly temperature from dusk until dawn; and, hourly wind speed (m/s) from dusk until dawn. Daily rainfall was collected from the Scottish Environment Protection Agency (SEPA) rainfall data website[8] (Strathy Bridge station)

For the second and third autumn deployments, an Onset HOBO Rain Gauge Data Logger was installed centrally within the site (OS grid reference NC 79612 52172) to collect hourly rainfall data.

Nightly weather data (between dusk and dawn) is presented within this report in Appendix A, Table A9.2.1. Time of sunset and sunrise were obtained from www.timeanddate.com.

[7] Weather data collated from www.wunderground.com.

[8] https://apps.sepa.org.uk/rainfall.

2.3 Data Analysis

All recordings from the bat activity surveys were analysed with specialised software (Kaleidoscope Pro, Version 5.1.9g) to confirm bat species present. All calls were automatically identified to species by the Kaleidoscope Pro software which compares the echolocation pulses to an integrated library of bat calls. Following this batch analysis, 10% of all *pipistrelle* spp. calls and noise files were manually checked. All calls of *Myotis* spp., *Nyctalus* spp. and calls with no auto-identification or with multiple bats within the same call were checked manually to confirm identification.

During manual analysis, calls were assigned to species according to their key parameters and where relevant call frequency as shown in Table 9.2.5 (Russ, 1999)[9].

Table 9.2.5: Bat Species and their Call Frequency Parameters

Species	Latin Name	Call Frequency
Soprano pipistrelle	*Pipistrellus pygmaeus*	FM/qCF calls above 52 kHz
Pipistrellus spp.	-	FM/qCF calls between 40 and 42 kHz; and, 48 and 52 kHz
Common pipistrelle	*Pipistrellus*	FM/qCF calls between 40 kHz and 48 kHz
Nathusius' pipistrelle	*Pipistrellus nathusii*	FM/qCF calls below 40 kHz
Natterer's bat	*Myotis nattereri*	FM call with wide range between 23 and 107 kHz
Daubenton's bat	*Myotis daubentonii*	FM call with wide range between 30 and 81 kHz
Myotis spp.	-	FM calls greater than 30 kHz
Brown Long-eared bat	*Plecotus auritus*	FM calls greater than 30 kHz with two harmonics
Noctule	*Nyctalus noctula*	FM/qCF calls below 23 kHz
Leisler's bat	*Nyctalus leisleri*	qCF calls between 23 and 28 kHz
Nyctalus spp.	-	Low (less than 30 kHz) qCF or FM calls

Table Notes
FM – Frequency modulated call; CF – constant frequency call; qCF – quasi-constant frequency call. Bats combine variation within their echolocation pulses to create different call 'shapes'. These call shapes can be described in terms of the degree of FM, CF and qCF components they contain.

Not all calls could be positively assigned to species. Call frequencies and shapes can be shared by bat species within the same genus and can change according to the habitat they are flying in, i.e. open areas with no trees or structures such as moorlands, or cluttered environments which contain trees, areas of scrub or linear features such as burns and conifer plantation/woodland edge. Bats adapt their call patterns within their habitats to enable prey detection and navigation and as such, the recordings may differ in parameters. For example, both Leisler's bat and noctules can echolocate at the same frequency and with the same call shape and therefore, where not possible to distinguish species they have been assigned to the *Nyctalus* spp. category and not identified to species level. Similarly, a bat was classified as *Myotis* spp. if differences in call shape and frequency between Daubenton's bats and Natterer's bats (most likely *Myotis* spp. bat to be found in the area) could not be discerned.

2.3.1 Bat Activity Indices

Static detectors record bats as they pass but there is no observer to record whether one bat passes a hundred times, or a hundred bats pass in succession, or the direction of flight. Therefore, in order to standardise the data and enable some comparison of deployment nights, the accepted approach is to use bat 'passes' as a unit of activity.

Numbers of bat 'passes' recorded are used as the standard measure to create a relative index of bat activity. During transects, the number of times a bat was encountered is described as the number of bat passes. A

[9] Russ, J. (1999). *The Bats of Britain and Ireland. Echolocation Calls, Sound Analysis and Species Identification*. Alana Books, Bishop's Castle.

bat pass was defined as a series of ≥ 2 consecutive echolocation calls having <1 second separating each call, and up to 10 seconds long (Hayes, 1997[10]; Cook *et al*., 2008[11]).

For automated detector data, the index of bat activity used was the number of files recorded each night which contained bat calls, taken as the number of bat passes per night (bppn). As one file has been taken to equating to one bat pass, an average nightly activity index was calculated for each detector deployment. The Bat Activity Index (BAI) also removes any bias created by the variation in the duration of the static detector deployment periods.

The relative bat activity within the site has been defined as shown in Table 9.2.6. The BAI levels (number of bat passes per night) has been derived by professional opinion as high, moderate or low and allows a comparison of the results within the site and gives a descriptive parameter for the data generated by this study.

Table 9.2.6: Relative Bat Activity within the Site

BAI (bppn)	Bat Activity
10.1 and above	High
5.1 to 10.0	Moderate
0 to 5.0	Low

2.3.2 Ecobat

The Ecobat[1] tool is an online freely available means of comparing activity levels found on this site with other sites within a given radius at the same time of year and in comparable weather conditions. The tool uses data entered by other ecologists studying areas within the defined search radius. Data is pooled allowing a statistical comparison to be made regarding relative bat activity and the importance of a site in a regional context. The power of the tool is reliant on the number of records present/entered for any given search radius, and as such if limited third party information is present this should be considered when drawing conclusions from the tool's output. However, it does provide a standardised, relatively local comparison for the assessment of the site within the regional context.

The reference range comparison dataset was stratified to include:

- only records from within 30 days of the survey date; and
- only records from within 100 km^2 of the survey area.

Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting the levels of activity recorded at a site across regions in Britain. Percentiles can then be assigned to activity categories (low, moderate, high) to provide a quantifiable measure of bat activity (Table 9.2.7), taken from current SNH Guidance (SNH *et al*., 2019[2]).

Table 9.2.7: Percentile Score and Categorised Level of Bat Activity

Percentile	Bat Activity
81 to 100	High
61 to 80	Moderate to High
41 to 60	Moderate
21 to 40	Low to Moderate
0 to 20	Low

[10] Hayes, J. P. (1997). *Temporal variation in activity of bats and the design of echolocation- monitoring studies*. Journal of Mammalogy 78: 514–524.

[11] Cook J, McCarthy A, Holloway S and Oliver G. (2008). *Survey Guidance for Assessing Bat Activity at Proposed On-shore Wind Farms*. In Practice 62, 24-27.

2.3.3 Risk Assessment

The risk to bats from wind turbines is from death either by direct collision or death through injury (including barotrauma[12]). The impact of a single bat death is unlikely to be significant on any scale, but cumulative losses of individual bats could potentially threaten the viability of local, regional or even national populations. The relevance of the loss of a single bat on local populations depends on the size of a local population, and the online tool Ecobat uses relevant data sets allowing consideration of location within the assessment.

The risk assessment carried out within this report follows that outlined in the current SNH Guidance (SNH *et al*., 2019[2]). Tables 9.2.8 and 9.2.9 below present the factors to consider when assessing potential risk to bats. Table 9.2.8 gives an indication of potential site risk based on a consideration of habitat and development-related features.

Table 9.2.8: Initial Site Risk Assessment

Site Risk Level (1-5)		Project Size		
		Small	Medium	Large
Habitat Risk	Low	1	2	3
	Moderate	2	3	4
	High	3	4	5
Habitat Risk	**Description**			
Low	• Small number of potential roost features, of low quality. • Low quality foraging habitat that could be used by small numbers of foraging bats. • 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. • Habitat could be used extensively by foraging bats. • Site is connected to the wider landscape by linear features such as scrub, tree lines and streams.			
High	• Numerous suitable buildings, trees (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. • Extensive and diverse habitat mosaic of high quality for foraging bats. • Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows. • At/near edge of range and/or on an important flyway. • 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 turbines <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 Notes

Table adapted from SNH *et al*. (2019)[2]. Green (1-2) - low/lowest site risk; Amber (3) - medium site risk; Red (4-5) - high/highest site risk.

An overall assessment of risk can then be made by considering the site assessment in relation to the bat activity output from Ecobat, which considers the relative vulnerability of each species of bat present, at the population level (Table 9.2.9).

[12] Barotrauma is when soft tissues, such as the lungs, are damaged due to the sudden change in air pressure in the wake of rotating turbine blades. It results in fatal internal bleeding (Baerwald *et al*., 2009).

Table 9.2.9: Overall Risk Assessment

Site Risk Level (from Table 9.2.8)	Ecobat Activity Category					
	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
Med (3)	0	3	6	9	12	15
High (4)	0	4	8	12	15	18
Highest (5)	0	5	10	15	20	25

Table Notes

Table adapted from SNH *et al.* (2019)[2]. Overall assessment: Low (green) 0 – 4; Medium (amber) 5 – 12; High (red) 15 – 25.

2.3.4 Mitigation by Design

In line with relevant SNH Guidance[2], the design of the turbine layout for the Consented Scheme took account of the requirement to buffer the rotor swept area of the turbines (blade tip) by 50 m from features which might be used by foraging and commuting bats. Such features include conifer plantation ride and edges, watercourses and waterbodies. The below formula describes how this buffer distance should be calculated:

$$b = \sqrt{(50+bl)^2 - (hh-fh)^2}$$

Where bl = blade length; hh = hub height; fh = feature height (all in metres).

The resulting calculation for the Proposed Varied Development requires all turbines to be located at least 85.4 m from habitats suitable for use by bat species.

2.4 Limitations

2.4.1 Desk Based Assessment

The desk study data is third party controlled data, purchased for the purposes of this report only. RPS cannot vouch for its accuracy and cannot be held liable for any error(s) in these data.

2.4.2 Surveys

Due to equipment availability at the time the surveys were commissioned, only ten static detectors were deployed during the first eight nights of the Autumn 2019 survey period. When the units were checked, it was found that the standard sensitivity settings were too high for some locations and a high volume of noise files were collected. Although it is evident that some bat calls may have been missed during these first eight nights, the presence of different species of bat could still be identified, and this still allowed an assessment of species diversity within the site.

Automated bat detector failure at location 6 during the third deployment of the Autumn 2019 survey periods which meant there was no bat activity data collected at this location. However, it is considered that sufficient data was collected from neighbouring detectors 5, 7 and 8 to represent the level of bat activity in this area. Some detectors were not operative for the entire duration of an Autumn deployment period (for example, location 1 in the first deployment, and location 13 in the second deployment), due to the capture of large amounts of data, either from bat calls or noise files causing the memory cards to become full or batteries quickly drained. It is still considered that across the entire survey period that these detectors captured adequate data to give a representation of the bat activity at these locations.

Automated bat detector failure at Location 16 during both the Spring and Summer survey periods; this meant no bat activity data collected at this location. However, sufficient data was collected throughout the survey period at the surrounding locations to provide representative data of the level of bat activity in the wider area.

Wind exceeded the accepted tolerance limit of 5 m/s for five nights in the second Autumn 2019 deployment period and ten nights during the third Autumn 2019 deployment period. Recorded temperatures were below the minimum considered tolerance limit for Scotland (8°C) during the night for three nights during the Autumn first deployment, four in the second and seven nights within the third deployment. The weather conditions on these dates are outside the parameters given in the SNH Guidance pertaining to suitable survey conditions, but despite the recorded weather conditions bats were still found to be active during a large proportion of these nights. Therefore, it is not considered that these conditions have impacted adversely on the data as a whole. Consequently, it can be assumed that these weather events were not significant enough to change the use of the habitats by bats. Weather conditions during the Spring and Summer survey periods were not deemed to be outwith parameters recommended by the SNH Guidance for the surveys.

Taking the full set of 2019 and 2020 data collected into account, the above limitations are not considered to have significantly impacted the assessment of the bat population use of the site and the data collected is deemed compliant with the requirements of the current SNH guidance (SNH *et al.* (2019)[2]) for this activity period.

2.4.3 Accurate Lifespan of Ecological Data

The majority of ecological data remains valid for only short periods due to the inherently transient nature of the species. The survey results contained in this report are considered accurate for eighteen months, assuming no significant changes to the site conditions during this time.

2.4.4 Ecobat Limitations

There are limitations associated with this assessment in so far as the use of the Ecobat analysis tool as required by SNH (2019)[2] is reliant on third party data, and the accuracy of the results returned using the Ecobat tool requires a substantial amount of records to be present. Due to the novelty of the Ecobat tool, the location of the wind farm and the number of records provided to Ecobat in the surrounding 100 km buffer of the Proposed Varied Development, a substantially smaller reference range of data was used to inform the assessment of the operational effects of the Proposed Varied Development to the local populations of the bat species present. This reduced reference range would increase the importance of bat species in the proximity of the Proposed Varied Development, and as such the assessment of the potential effects would be an over-estimation.

3 RESULTS

3.1 Desk Study

3.1.1 Site and Surrounding Habitat Assessment for Bats

The site comprises conifer plantation interspersed with open, unplanted areas and rides of varying sizes. Unplanted areas within the site often contain lochans, lochs and bog pools, and the site is surrounded by the Caithness and Sutherland Peatland Special Area of Conservation (SAC) which comprises a mosaic of blanket bog and heathland habitats and associated small waterbodies.

The turbine locations are all proposed to be within the conifer plantation. Construction of the Proposed Varied Development would initially involve 'key-holing' of the conifer plantation to allow turbine erection, prior to the remaining conifer plantation being systematically felled over a period of four years. Watercourses connect the site to the numerous surrounding lochans and to further stands of conifer plantation to the north and west. Image 9.2.1 below shows the location of the site within the Strathy South conifer plantation and the surrounding area.

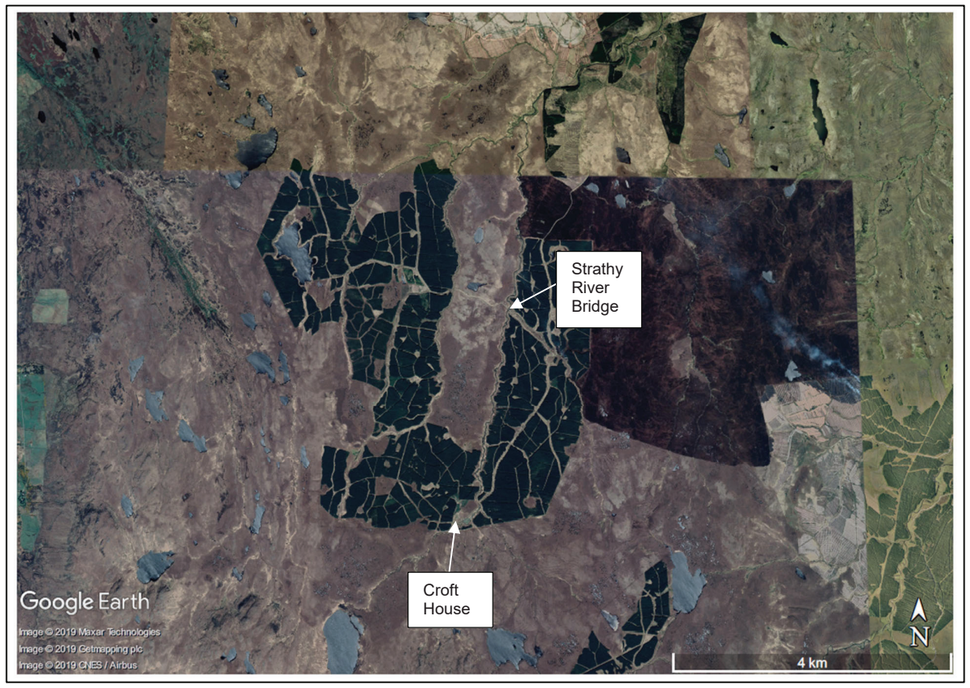


Image 9.2.1. Strathy South conifer plantation – the site of the Proposed Varied Development. Image reproduced from Google Earth 18.11.19.

Table 9.2.10 below gives details of the structures within the survey area. See Section 3.2.2 for a full assessment of the roosting potential of each structure.

Table 9.2.10: Potential Roosting Structures

Structure	Description	Distance from Site/Location within Site	Grid Reference
Croft House	Single storey bothy of stone and timber construction	Within site, 200 m from southern site boundary	NC 79344 48972
Strathy River Bridge	Bridge that spans Strathy River of steel and timber construction	Within site, on the east side.	NC 80181 52032

3.1.2 Known Bat Records

Table 9.2.11 presents the bat records received from HBRG when a data search was conducted within 10 km of the site boundary. The search returned only one record of common pipistrelle bat. On researching proposed wind farm developments in the area, a small common pipistrelle roost (three bats) was identified 4 km to the northeast of the site boundary within Braerathy Lodge. The roost was found when protected species surveys were conducted in 2011 in relation to the planning application for the proposed Strathy Wood Wind Farm development*.

Table 9.2.11: Known Bat Records

Species	Record Type	Date of Record	Distance and Direction from Site	Grid Reference
Common pipistrelle	Sighting	15 June 2006	7 km, north	NC 82 60
Common pipistrelle	Roost	2011*	Braerathy Lodge, 4 km northeast within Strathy Wood Wind Farm development	NC 82308 56159

Table Notes

*Strathy Wood 2019 Environmental Impact Assessment Report (EIAR), Section A8.4.1

3.1.3 Bat Species Range Relative to the Site

Table 9.2.12 shows the results of the bat species range assessment which shows that the only species (common pipistrelle) with records found within 10 km of the site is within its known range. Four additional species were found within the site during the activity surveys and the results of their species range assessment have also been included in the table below.

Table 9.2.12: Species Range Relative to the Site

Species	Site's Relationship to Known Range	Known Roost within 10 km
Common pipistrelle	Within its known range	One, within Croft House on the south of the site (identified during current surveys)
Soprano pipistrelle	At the edge of its known range	None
Nathusius' pipistrelle	Outside its known range	None
Daubenton's bat	At the edge of its known range	None
Nyctalus spp.	Outside its known range	None

3.1.4 Other Wind Energy Developments in Proximity to the Site

Table 9.2.13 presents the details of other operational wind farms within 10 km of the boundary of the site as collated from the My Grid GB website[13]. There are two operational wind farms within 10 km; Strathy North 2 km to the north, and Bettyhill, 8 km to the northwest of the Proposed Varied Development.

Table 9.2.13: Wind Farms within 10 km of the Site Boundary

Wind Farm Name	Distance and Direction from Site	Grid Reference at Nearest Point	Description	Connecting Habitat
Strathy North	2 km, north	NC 79899 56338	33 turbines in clear-felled conifer plantation with hub height of 69 m	Linked by watercourse flow
Bettyhill	8 km, northwest	NC 73871 60475	2 turbines in open moorland with hub height of 78 m	Linked by watercourse flow

[13] www.mygridgb.co.uk/map/.

3.2 Field Survey Results

3.2.1 Habitat Assessment

Field based assessments corroborated the information gained during the desk based assessment with the majority of the site comprising a mosaic of conifer plantation, transected by rides and open areas of blanket bog and wet dwarf shrub heath. The conifer plantation itself comprises of Sitka spruce (*Picea sitchensis*) and lodgepole pine (*Pinus contorta*) which is widely self-seeding into the open areas across the site. Marshy and unimproved grasslands are also present in smaller areas[14]. The site has a number of watercourses including Strathy River which borders the eastern boundary of Yellow Bog and several smaller burns including; Yellowbog Burn, Allt Badain and Allt Nan Clach Burns. In addition, there are a number of small lochans scattered throughout the site, with Loch Nan Clach located to the northwest.

Yellowbog Burn and the Strathy River and its associated tributaries provide commuting and foraging potential across the site and connectivity to similar waterways throughout the wider area. The habitats in the wider landscape comprise a similar mosaic of open moorland and conifer plantation with a number of small lochans surrounding the site, as assessed from aerial photographs (Google Earth Pro, May 2019, Image 9.2.1 above). The riparian and wetland habitat, clearings and woodland edges on site offer good foraging and commuting potential for bat species in contrast to the open moorland and dense stands of conifer plantation which offer limited foraging potential.

Overall, the site was considered to have moderate potential for foraging and commuting bats with limited potential for roosting bats, due to the limited numbers of structures or trees with suitable features to support them.

3.2.2 Potential Roosting Structures

Two structures were assessed for their potential to support roosting bats. Details of Croft House and Strathy River Bridge are given below.

Strathy River Bridge

Strathy River Bridge is of timber and steel girder construction and spans the Strathy River on the east of the site (Photo 21).

Photo 21. Strathy River Bridge spans Strathy River on the east of the site.

Photo 22. Small gaps exist but the bridge has low bat roost potential.

The bridge is generally in fair condition, but the steel girders show signs of rusting with water seepage along the length of the structure, which has led to rotting of the timber beams (Photo 22). There are a number of small gaps between the girders and timber which have the potential to support a very small number of crevice-dwelling bats, but due to water seepage through the crossbeams it is unlikely that the crevices would

[14]The map of the habitats within the site is presented in Technical Appendix 9.1 Habitats and Protected Species Survey Update, Figure 9.1.3 – NVC Survey Results (2011/2012) (EIAR Volume 4).

provide dry conditions and adequate thermal properties for roosting bats. For this reason, the roosting potential of the bridge has been classified as low.

Croft House

Photo 23. Croft House (north aspect).

Photo 24. Croft House interior.

Potential roosting features that were noted included:

- gaps under roof slates and guttering (Photo 25);
- gaps underneath lead flashing along roof edges and at chimney bases (Photo 26);
- ventilation holes in the stone walls (Photo 2); and
- gaps between stone walls and timber beams (Photo 27).

Photo 25. Potential roosting features are gaps under the roof slates and guttering (east aspect).

Photo 26. Potential roosting features are gaps under lead flashing and ventilation holes (west aspect).

Photo 27. Potential roosting features are gaps between stone walls and timber beams.

Photo 28. Bat droppings were found within a ventilation hole on the north aspect of the building (highlighted in red).

During the inspection, a small number of droppings (less than 10) characteristic of pipistrelle species (*Pipistrellus* spp.) bats were found within one of the ventilation holes on the north aspect of the building (Photo 28). This indicated that the building is being utilised by pipistrelle species bats.

DNA analysis of the droppings was carried out by the industry accredited laboratory ADAS[15] to determine bat species. To identify the species from which the droppings originated, the DNA was first extracted and cleaned before Polymerase Chain Reaction (PCR) amplification and sequencing of a segment of the mitochondrial gene, cytochrome c oxidase I (COI). This information was then compared to a reference database containing DNA sequence information of known species thus enabling the bat species to be determined. The test confirmed that the droppings were from common pipistrelle bats and therefore the building is a confirmed bat roost. The bat speciation results letter is included in Appendix D.

3.2.3 Croft House Presence/Absence Surveys

Due to the confirmation of the presence of bats through eDNA analysis three bat surveys were completed during the main bat activity season in 2020. During the first two visits no bats were observed emerging or re-entering the building. On the third and final visit a single common pipistrelle bat was observed emerging then re-entering the building under a slate, location identified by red arrow in Photo 29.

Photo 29. Croft House (north aspect).

The result of the presence / absence surveys confirmed the building as a transient/occasional non-breeding summer roost. These roosts are generally used by males or non-breeding females.

[15] www.adas.uk8.

Hibernation Potential

Pipistrelle species bats are known to hibernate in the same roosts they utilise in the summer. Croft House is a confirmed roost for a single common pipistrelle bat. Given the low numbers of bats using the building it has been assessed as having low hibernation potential.

3.2.4 Activity Surveys

Overall Activity Levels

Autumn Deployment 2019

From the twenty locations, a total of 754 survey nights were undertaken with a total of 997 files with bat passes collected. Five species of bats were recorded: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, *Myotis* spp. and *Nyctalus* spp.

Spring/Summer Deployment 2020

From the twenty locations, a total of 737 survey nights were undertaken with a total of 676 files with bat passes collected. Three species of bats were recorded: soprano pipistrelle, Nathusius' pipistrelle and Daubenton's Bat. Other calls were identified as *Myotis* spp. and *Pipstrellus* spp.

Table 9.2.14 provides the total number of bat passes at each location during each deployment for each of the three seasons. In addition, it lists the Bat Activity Index (number of bat passes per night whilst detectors were operational) and the relative bat activity levels for each location within the site.

Table 9.2.14: Static Detector Results: Bat Activity Levels

Location	Files with Bat Activity Recorded	Number of Nights Detector Operative	BAI Over Total Deployment Period (bppn)	Nights of Appropriate Weather Conditions*	Relative Bat Activity Level**
Autumn 2019 First Deployment					
1	2	8	0.3	6	Low
3	1	4	0.3	6	Low
5	1	4	1.3	6	Low
7	4	8	1.3	6	Low
9	2	4	0.8	6	Low
11	1	5	0.6	6	Low
13	0	4	0.0	6	-
15	2	4	1.3	6	Low
17	5	8	1.3	6	Low
19	1	8	0.1	6	Low
Autumn 2019 Second Deployment					
1	0	4	0.0	8	-
2	1	14	0.1	8	Low
3	8	14	0.6	8	Low
4	7	15	0.5	8	Low
5	14	15	0.9	8	Low
6	0	15	0.0	8	Low
7	104	15	6.9	8	Moderate
8	26	14	1.9	8	Low
9	0	11	0.0	8	-
10	1	14	0.1	8	Low
11	5	14	0.4	8	Low
12	10	14	0.7	8	Low

Location	Files with Bat Activity Recorded	Number of Nights Detector Operative	BAI Over Total Deployment Period (bppn)	Nights of Appropriate Weather Conditions*	Relative Bat Activity Level**
13	0	1	0.0	8	-
14	0	14	0.0	8	-
15	2	14	0.1	8	Low
16	11	14	0.8	8	Low
17	12	14	0.9	8	Low
18	13	13	1.0	8	Low
19	2	14	0.1	8	Low
20	19	13	1.5	8	Low
Autumn 2019 Third Deployment					
1	1	25	0.0	14	Low
2	0	10	0.0	14	-
3	1	26	0.0	14	Low
4	2	25	0.1	14	Low
5	43	25	1.7	14	Low
6	0	24	0.0	14	-
7	9	24	0.4	14	Low
8	572	25	22.9	14	High
9	0	25	0.0	14	-
10	2	25	0.1	14	Low
11	5	25	0.2	14	Low
12	12	12	1.0	14	Low
13	0	4	0.0	14	-
14	0	26	0.0	14	-
15	4	26	0.2	14	Low
16	3	26	0.1	14	Low
17	4	26	0.2	14	Low
18	20	10	2.0	14	Low
19	0	26	0.0	14	Low
20	44	26	1.7	14	Low
Spring 2020 Deployment					
01	3	20	0.15	13	Low
02	3	18	0.17	13	Low
03	0	20	0.00	13	-
04	1	20	0.05	13	Low
05	2	20	0.10	13	Low
06	1	20	0.05	13	Low
07	7	20	0.35	13	Low
08	537	20	26.85	13	High
09	1	19	0.05	13	Low
10	0	19	0.00	13	-
11	7	19	0.37	13	Low
12	7	19	0.37	13	Low
13	0	19	0.00	13	-
14	1	19	0.05	13	Low
15	3	19	0.16	13	Low
16	-	0	-	-	-
17	3	20	0.15	13	Low

Location	Files with Bat Activity Recorded	Number of Nights Detector Operative	BAI Over Total Deployment Period (bppn)	Nights of Appropriate Weather Conditions*	Relative Bat Activity Level**
18	0	13	0.00	13	-
19	1	20	0.05	13	Low
20	10	20	0.50	13	Low
Summer 2020 Deployment					
01	0	19	0.00	15	-
02	2	21	0.10	15	Low
03	4	20	0.20	15	Low
04	0	20	0.00	15	-
05	25	19	1.32	15	Low
06	4	20	0.20	15	Low
07	1	20	0.05	15	Low
08	10	7	1.43	15	Low
09	2	21	0.10	15	Low
10	7	21	0.33	15	Low
11	1	21	0.05	15	Low
12	0	21	0.00	15	-
13	1	19	0.05	15	Low
14	4	21	0.19	15	Low
15	2	21	0.10	15	Low
16	-	0	-	-	-
17	9	21	0.43	15	Low
18	10	21	0.48	15	Low
19	2	21	0.10	15	Low
20	5	19	0.26	15	Low

Table Notes

*Appropriate weather conditions in accordance with current industry standard guidance for Scotland (Collins, 2016)[5].

**The relative bat activity level as taken from Table 5 in the methods is relative only for the site in question to allow comparison between locations across the site.

Autumn Deployment 2019

Location 7 during the second deployment and location 8 during the third deployment had noticeably more bat passes recorded than the other locations in any of the deployments. Location 7 was on the south of the site along a conifer forest edge adjacent to a large open area of moorland, location 8 was to the very south of the site close to Croft House and adjacent to an access track and an open area. All other locations consistently returned low levels of bat activity throughout the survey period.

Pipistrelle species bats were recorded at all locations (where bat passes were recorded by the detectors) during all three deployments. Only one call from a *Nyctalus* spp. bat was recorded during the entire survey period, at location 1 during the first static detector deployment. *Myotis* spp, (with call structure characteristic of Daubenton's bats) were only recorded at location 17 during the first deployment, locations 7, 15, 16, 17 and 18 during the second deployment and locations 8, 12, 16, 17 and 18 during the third deployment.

It should be noted that the automated detector failed at location 6 in the third deployment period, therefore no data was collected.

Spring/Summer Deployment 2020

Across the site the relative activity level was assessed as low with the exception of location 8 where the activity level was assessed as high with 537 bat passes recorded during the spring dispersal season. These calls were predominately attributed to common pipistrelle species with low numbers of Daubentons' bat recorded.

Pipistrelle species were the most common calls recoded across the site with *Myotis* spp. (including Daubentons' bat) recoded at locations 1, 2, 8 12 17 and 19.

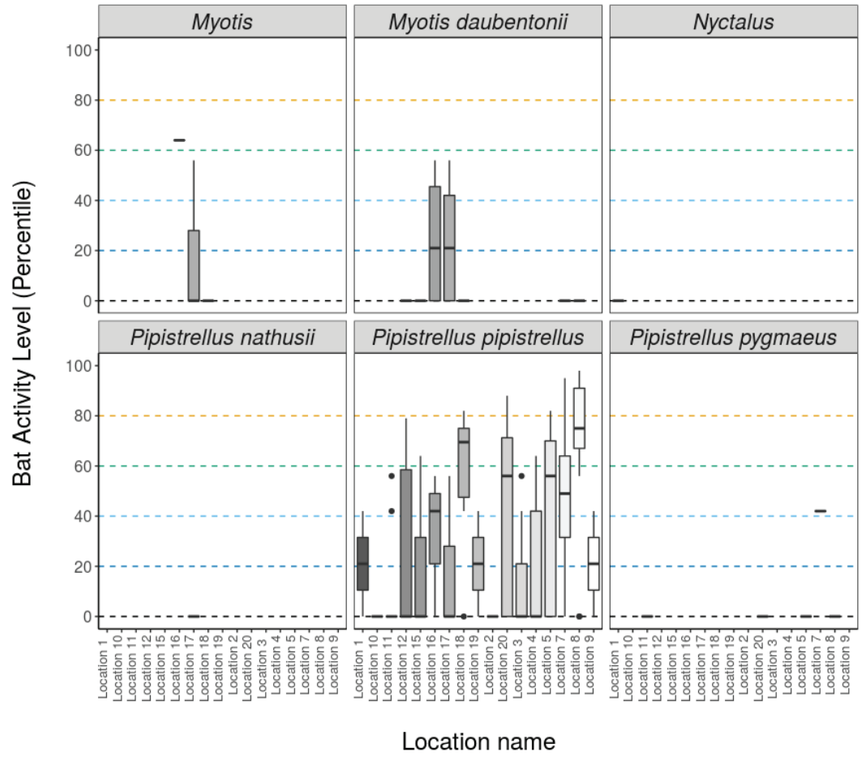
It should be noted that the static detector failed at location 16 in both deployment periods, therefore no data was collected.

3.3 Ecobat Analysis

Autumn Deployment 2019

Bat activity data from the surveys was uploaded and analysed by Ecobat. Pertinent points and interpretation are set out below and additional analysis is presented in Appendix C.

Graph 9.2.1 below is an output from the Ecobat tool and shows the spatial distribution of bat species across the site.



Graph 9.2.1. Bat activity level (percentile) differences between static detector locations.

From Graph 9.2.1, the centre line indicates the median[16] activity level whereas the box represents the interquartile[17] range (the spread of the middle 50% of nights of activity).

[16] The median is a simple measure of central tendency. To find the median, we arrange the observations in order from smallest to largest value. If there is an odd number of observations, the median is the middle value. If there is an even number of observations, the median is the average of the two middle values.

[17] The interquartile range (IQR) is a measure of variability, based on dividing a data set into quartiles.

The key points are:

- Common pipistrelles were recorded at all locations with bat activity, therefore exhibiting the most amount of activity within site, with the greatest median percentile[18] at location 8;
- Soprano pipistrelles were recorded in low numbers at five locations with the greatest activity at location 7;
- Only one call of a *Nyctalus* spp. bat was recorded at location 1;
- One call of a Nathusius' pipistrelle was recorded at location 17;
- *Myotis* spp. bats were recorded at seven locations in low numbers, with the greatest amount of activity at locations 16 and 17.

Table 9.2.15 shows the number of nights recorded bat activity which fell into each activity band for each species as determined by Ecobat.

Table 9.2.15: Nights of Acoustic Monitoring Contained within Each Activity Category for Each Species at all Locations

Location	Species / Species Group	Nights of High Activity	Nights of Moderate / High Activity	Nights of Moderate Activity	Nights of Low / Moderate Activity	Nights of Low Activity
1	*Nyctalus* spp.	0	0	0	0	1
	Common pipistrelle	0	0	1	0	1
2	Common pipistrelle	0	0	0	0	1
3	Common pipistrelle	0	0	2	0	5
4	Common pipistrelle	0	1	1	0	3
5	Common pipistrelle	1	7	3	0	6
	Soprano pipistrelle	0	0	0	0	1
7	Daubenton's bat	0	0	0	0	1
	Common pipistrelle	2	3	7	0	4
	Soprano pipistrelle	0	0	1	0	0
8	Daubenton's bat	0	0	0	0	1
	Common pipistrelle	9	7	1	0	2
	Soprano pipistrelle	0	0	0	0	3
9	Common pipistrelle	0	0	1	0	1
10	Common pipistrelle	0	0	0	0	3
11	Common pipistrelle	0	0	2	0	7
	Soprano pipistrelle	0	0	0	0	1
12	Daubenton's bat	0	0	0	0	1
	Common pipistrelle	0	2	1	0	4
15	Daubenton's bat	0	0	0	0	1
	Common pipistrelle	0	1	1	0	4
16	*Myotis* spp.	0	1	0	0	0
	Daubenton's bat	0	0	2	0	2
	Common pipistrelle	0	0	2	0	1
17	*Myotis* spp.	0	0	1	0	2
	Daubenton's bat	0	0	5	0	5
	Nathusius' pipistrelle	0	0	0	0	1
	Common pipistrelle	0	0	1	0	2
18	*Myotis* spp.	0	0	0	0	1

[18] The median, first quartile, and third quartile can all be stated in terms of percentiles. Since half of the data is less than the median, and one-half is equal to 50 percent, the median marks the 50th percentile. One-fourth is equal to 25 percent, so the first quartile marks the 25th percentile.

Location	Species / Species Group	Nights of High Activity	Nights of Moderate / High Activity	Nights of Moderate Activity	Nights of Low / Moderate Activity	Nights of Low Activity
	Daubenton's bat	0	0	0	0	2
	Common pipistrelle	1	3	1	0	1
19	Common pipistrelle	0	0	1	0	1
20	Common pipistrelle	2	3	3	0	4
	Soprano pipistrelle	0	0	0	0	1

As presented in Table 9.2.15, the activity level of each species at each location has been compared with similar sites by the Ecobat tool.

The key details are:

- Common pipistrelle bats exhibited high levels of activity on fifteen nights at locations 5, 7, 8, 18 and 20;
- Soprano pipistrelle bats exhibited moderate activity levels on one night at location 7 and low levels of activity on six nights at locations 5, 8, 11 and 20;
- *Nyctalus* bats at location 1 exhibited low levels of activity on one night;
- Nathusius' pipistrelle bats at location 17 exhibited low levels of activity on one night;
- Nights with low to moderate/high activity levels of pipistrelle bat species were recorded at all locations where bat activity was recorded;
- *Myotis* spp. were recorded in moderate/high levels for one night only at location 16 and at moderate activity levels for six nights at location 17.

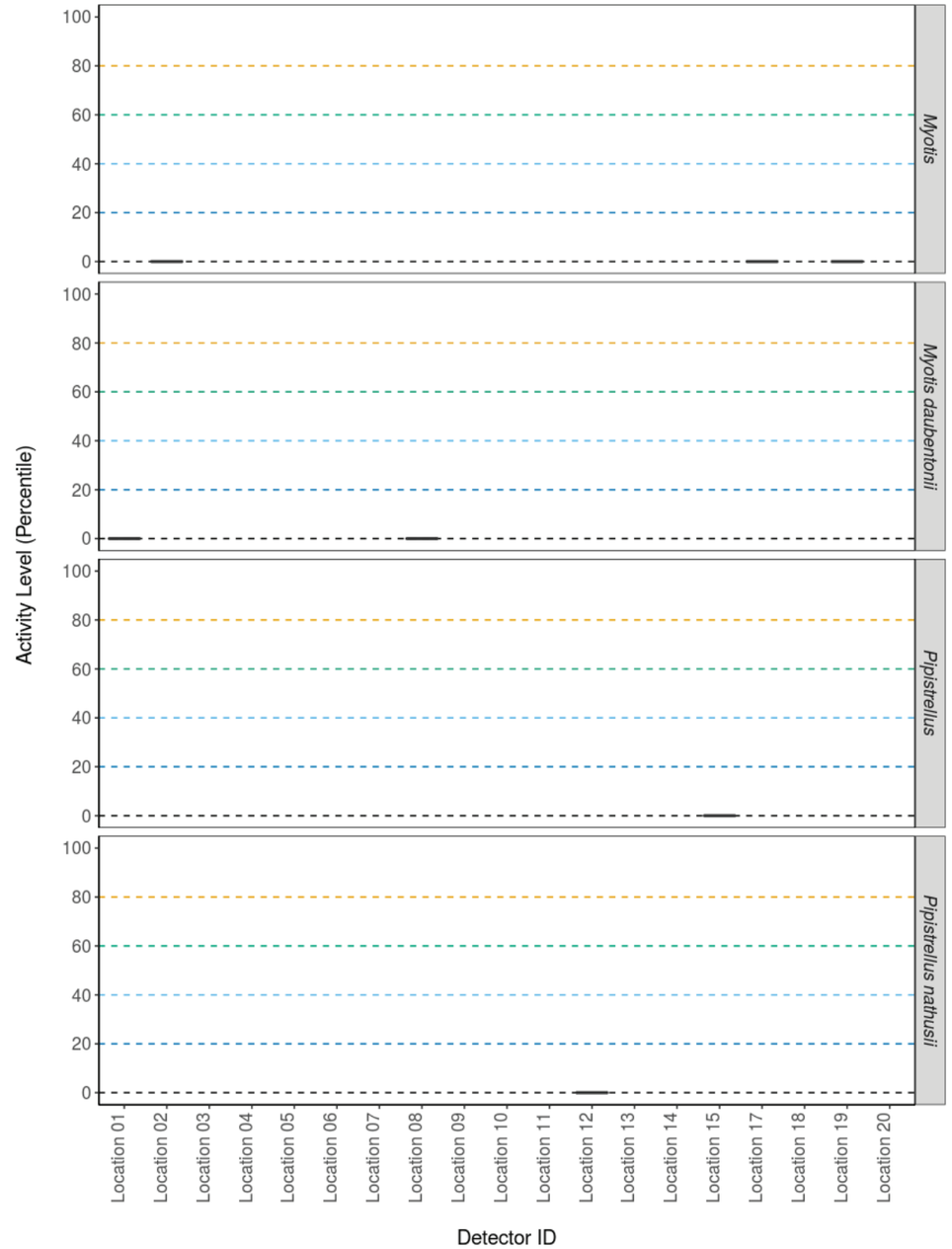
It should be noted that the Reference Range[19] that Ecobat returned to provide the above analysis was extremely small: common pipstrelle 154 records, *Myotis* spp. 33 records, soprano pipistrelle 25 records, Daubenton's bat 20 records, *Nyctalus* spp. four records and Nathusius' pipistrelle one record. There is nothing that can be done regarding the Reference Range provided by Ecobat as this is reliant on third party data, the number of records provided to Ecobat and the abundance of the particular species in the reference area. For example, a number of species identified on-site are at the limit or outside of their known range, and as such the Reference Range is reflective of this. Whilst the Reference Range provided is limited, Ecobat does still provide a comparable assessment of bat activity for the region which should be considered during the assessment of the effects of the Proposed Varied Development to bat species and their populations.

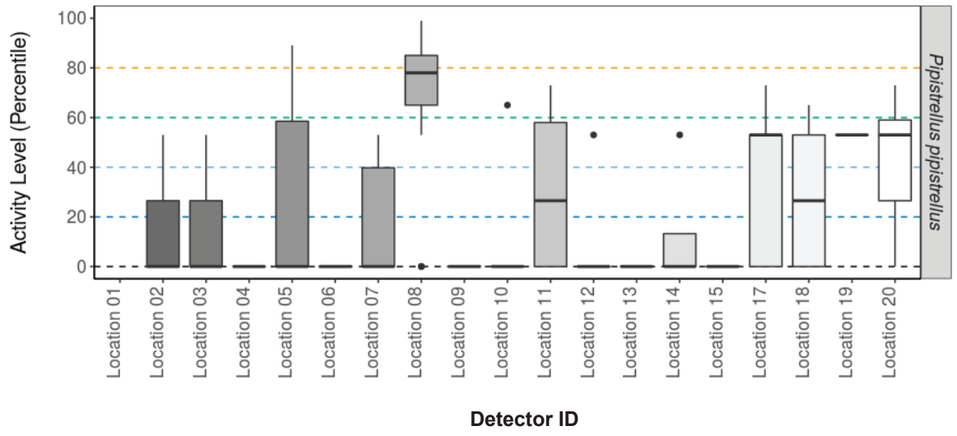
Spring / Summer Deployment 2020

Bat activity data from the surveys was uploaded and analysed by Ecobat. Pertinent points and interpretation are set out below and additional analysis is presented in Appendix C.

Graph 9.2.2 below is an output from the Ecobat tool and shows the spatial distribution of bat species across the site.

[19] The Reference Range is the number of nights for each species within the Ecobat database that the site data is compared to with to provide an estimate of comparable activity levels (low, moderate or high). Ecobat guidance recommends a Reference Range of 2000+ records to be confident in the relative activity level.





Graph 9.2.2[20]. Bat activity level (percentile) differences between static detector locations.

From Graph 9.2.2, the centre line indicates the median[21] activity level whereas the box represents the interquartile[22] range (the spread of the middle 50% of nights of activity).

The key points are:

- Common pipistrelles were recorded at the majority of locations with the exception of Location 01. The species therefore accounts for the majority of bat activity within site, with the greatest median percentile[23] calculated for Location 08;
- One call of a Nathusius' pipistrelle was recorded at Location 12;
- Pipstrelle species (species undetermined) were also recorded at Location 15 in low numbers;
- Daubentons' bats were identified in low numbers at Locations 01 and 08; and
- *Myotis* spp. bats were also in low numbers at Locations 02, 17 and 19.

Table 9.2.16 shows the number of nights for which recorded bat activity for each species fell into defined activity bands as determined by Ecobat.

Table 9.2.16: Nights of Acoustic Monitoring Contained within Each Activity Category for Each Species at all Locations

Location	Species / Species Group	Nights of High Activity	Nights of Moderate / High Activity	Nights of Moderate Activity	Nights of Low / Moderate Activity	Nights of Low Activity
01	*Myotis daubentonii*	0	0	0	0	3
02	*Myotis*	0	0	0	0	1
	Pipistrellus pipistrellus	0	0	0	0	2
	Pipistrellus pipistrellus	0	0	1	0	0
03	*Pipistrellus pipistrellus*	0	0	1	0	2
04	*Pipistrellus pipistrellus*	0	0	0	0	1

[20] Note that Graph 9.2.2 and Graph 9.2.1 differ in format due to updates from Ecobat in their reporting format between periods of analysis. Autumn 2019 data was analysed in November 2019, Spring / Summer 2020 data was analysed in July 2020.

[21] The median is a simple measure of central tendency. To find the median, we arrange the observations in order from smallest to largest value. If there is an odd number of observations, the median is the middle value. If there is an even number of observations, the median is the average of the two middle values.

[22] The interquartile range (IQR) is a measure of variability, based on dividing a data set into quartiles.

[23] The median, first quartile, and third quartile can all be stated in terms of percentiles. Since half of the data is less than the median, and one-half is equal to 50 percent, the median marks the 50th percentile. One-fourth is equal to 25 percent, so the first quartile marks the 25th percentile.

Location	Species / Species Group	Nights of High Activity	Nights of Moderate / High Activity	Nights of Moderate Activity	Nights of Low / Moderate Activity	Nights of Low Activity
05	*Pipistrellus pipistrellus*	0	0	0	0	2
	Pipistrellus pipistrellus	1	1	0	0	2
06	*Pipistrellus pipistrellus*	0	0	0	0	1
	Pipistrellus pipistrellus	0	0	0	0	4
07	*Pipistrellus pipistrellus*	0	0	2	0	3
	Pipistrellus pipistrellus	0	0	0	0	1
08	*Myotis daubentonii*	0	0	0	0	1
	Pipistrellus pipistrellus	5	3	0	0	2
	Pipistrellus pipistrellus	1	1	1	0	0
09	*Pipistrellus pipistrellus*	0	0	0	0	1
	Pipistrellus pipistrellus	0	0	0	0	2
10	*Pipistrellus pipistrellus*	0	1	0	0	2
	Pipistrellus pipistrellus	0	0	0	0	2
11	*Pipistrellus pipistrellus*	0	1	1	0	1
	Pipistrellus pipistrellus	0	0	0	0	1
12	*Pipistrellus nathusii*	0	0	0	0	1
	Pipistrellus pipistrellus	0	0	1	0	4
13	*Pipistrellus pipistrellus*	0	0	0	0	1
14	*Pipistrellus pipistrellus*	0	0	0	0	1
	Pipistrellus pipistrellus	0	0	1	0	2
15	*Pipistrellus*	0	0	0	0	1
	Pipistrellus pipistrellus	0	0	0	0	1
	Pipistrellus pipistrellus	0	0	0	0	3
17	*Myotis*	0	0	0	0	1
	Myotis	0	0	0	0	1
	Pipistrellus pipistrellus	0	1	2	0	1
	Pipistrellus pipistrellus	0	0	0	0	1
18	*Pipistrellus pipistrellus*	0	1	2	0	2
	Pipistrellus pipistrellus	0	0	0	0	1
19	*Myotis*	0	0	0	0	1
	Pipistrellus pipistrellus	0	0	1	0	0
20	*Pipistrellus pipistrellus*	0	2	1	0	1
	Pipistrellus pipistrellus	0	0	2	0	1

As presented in Table 9.2.16, the activity level of each species at each location has been compared with similar sites by the Ecobat tool.

The key details are:

- Common pipistrelle bats exhibited high levels of activity on seven nights; one night at Location 05 and six nights at Location 08;
- At seven locations high/moderate levels of activity were recorded for common pipistrelle bats; Location 05, Location 08, Location 10, Location 11, Location 17, Location 18 and Location 20;
- A single Nathusius' pipistrelle pass at Location 12 provided a result of a low level of activity on one night;
- Daubentons' bats exhibited low levels of activity at Location 01 and Location 08; and
- *Myotis* spp. exhibited low levels of activity at Locations 02, 17 and 19.

It should be noted that the Reference Range[24] that Ecobat returned to provide the above analysis was extremely small: common pipstrelle 186 records, pipistrelle species 194, *Myotis* spp. 44 records, Daubenton's bat 22 records, and Nathusius' pipistrelle one record. There is nothing that can be done regarding the Reference Range provided by Ecobat as this is reliant on third party data, the number of records provided to Ecobat and the abundance of the particular species in the reference area. For example, a number of species identified on-site are at the limit or outside of their known range, and as such the Reference Range is reflective of this. Whilst the Reference Range provided is limited, Ecobat does still provide a comparable assessment of bat activity for the region which should be considered during the assessment of the effects of the Proposed Varied Development to bat species and their populations.

[24] The Reference Range is the number of nights for each species within the Ecobat database that the site data is compared to with to provide an estimate of comparable activity levels (low, moderate or high). Ecobat guidance recommends a Reference Range of 2000+ records to be confident in the relative activity level.

4 DISCUSSION

4.1 Species

The desk study returned one record of common pipistrelle bat. The activity surveys undertaken between August and October 2019 identified five species: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle (the single call recorded at location 17 is included in Appendix E) and bats of genera *Myotis* and *Nyctalus.* The majority of the calls were attributed to common pipistrelles with low numbers of the other species recorded. In addition, eDNA analysis of bat droppings collected from Croft House showed common pipistrelles are utilising the structure for roosting.

The activity surveys undertaken in spring / summer 2020 identified common pipistrelle, Nathusius' pipistrelle and bats of genera *Myotis* and pipistrelle utilising the site. The majority of the calls were attributed to common pipistrelles with low numbers of the other species recorded. In addition, Croft House was confirmed as a transition/occasional non-breeding summer roost for small numbers of common pipistrelles.

Tables B9.2.1 and B9.2.2 in Appendix B outline the collision vulnerability of different bat species when considering the impact of new wind farm developments. The species identified at risk are:

- *Nyctalus* spp. – rare species with high risk of collision;
- Nathusius' pipistrelle - rare species with high risk of collision;
- Common and soprano pipistrelle – widespread species with high collision risk;
- *Myotis* spp including Daubentons' bats. – rare species with low collision risk.

Pipistrelles and *Nyctalus* bats are the most vulnerable species due to their flight activity habits. In particular, they frequently forage and commute high over treetops at potential turbine Rotor Sweep Height (RSH), and therefore may be subject to greater risk from turbines than any other species identified during the activity surveys.

4.2 Use of the Site by Bats

Autumn Deployment 2019

The results of the static detector surveys during the peak autumnal dispersal/mating season show use of the entire site by mainly pipistrelle bat species, with bat activity recorded at 17 locations throughout the deployment period. No bat activity was recorded at locations 6, 13 and 14. However, it should be noted that the detectors at locations 6 and 14 were not installed during the first deployment, and detector 6 failed in the third deployment.

From the spread of activity across the site, it is evident that bats are utilising all habitat types within the survey area (e.g. open moorland, woodland edge, linear features and waterbodies) for foraging and commuting (see Table 9.2.3 for the description of habitats at each detector location) with one structure confirmed as a common pipistrelle bat roost (Croft House) through eDNA analysis of bat droppings.

Key areas exhibiting the highest bat activity within the dispersal/mating period were found to be on the south of the site at Locations 7 and 8. Consequently, according to the results of this study, there is the potential for areas of the site to be important for migratory or mating bats. Locations 7 and 8 are also in proximity to Croft House, which is the only known bat roost within the survey area, albeit surveys in 2020 confirmed this to be used only by a small number of bats. This might suggest that the area is used by a small number of bats but that habitats are abundant in food resources and so are used at a high frequency accounting for the elevated levels of activity recorded.

Spring/Summer Deployment 2020

The results of the static detector surveys during the spring / summer 2020 deployment periods show use of the entire site by mainly common pipistrelle bat species. Bat activity was recorded at all nineteen locations throughout the deployment periods (Location 16 had technical issues and did not record for either deployment).

The key area exhibiting the highest bat activity within the spring / summer 2020 deployment periods is in the south of the site at Location 8. This confirms the findings of the Autumn 2019 survey data which identified that there is the potential for areas of the site to be important for migratory or mating bats, or that they are highly suitable foraging areas potentially used by a small number of bats at a high frequency.

Location 8 (the location of highest bat activity) is in proximity to the Croft House which during presence/absence surveys was confirmed as a common pipistrelle transition/occasional non-breeding bat roost and is the only known bat roost within the survey area. This roost occupied by only small numbers of bats would therefore corroborate that the area surrounding Location 8 is highly utilised for foraging and that high bat activity numbers are likely to be attributed to the small numbers of bats using the Croft House.

4.3 Comparative Activity Levels

When detector data from similar sites were compared using the Ecobat tool it is evident bat activity levels for the Proposed Varied Development are comparable to other sites with similar habitats assessed to have a moderate activity level. This result is based on the interpretation by RPS of all activity survey results and the comparison drawn between these results and data from similar wind farm projects using Ecobat.

It should be noted however, that whilst the reference range for pipistrelle species bats was in excess of one hundred for all survey periods, the sample size for inter-site comparison for Nathusius pipistrelles, *Myotis* spp. and *Nyctalus* spp. was significantly smaller. This highlights the rarity of these species locally.

4.4 Risk Assessment

An assessment of risk from the development can be made using parameters outlined in the most recent SNH Guidance (SNH *et al*., 2019[2]; see Tables 9.2.8 and 9.2.9 in Section 2.3.3 of this report).

The project size is of a large scale, which includes developments comprising turbines over 100 m in height. The value of the habitats and features present for foraging, commuting and roosting bats was assessed, using the criteria from current guidance (Collins, 2016)[5]. The habitat risk is considered to be moderate, as the site contains a building which has been confirmed as a roost albeit it has low potential for use as a hibernation roost, and the surrounding habitat could be used extensively by foraging bats. Therefore, the initial site risk assessment score for the site is high (according to the parameters presented in Table 9.2.8).

Given the site risk level is high, and the Ecobat activity category is moderate, the overall risk assessment for the development is considered as presenting moderate risk to bats (see Table 9.2.9). The scores in the table are a product of multiplying site risk level and the Ecobat activity category.

4.5 Likely Significant Effects from the Proposed Varied Development

The surveys showed the site has a moderate level of bat activity, with intermittent high species diversity over the entire site from low numbers of species other than common pipistrelle. The highest activity levels during the survey period were at the south of the site around Locations 7 and 8, whereas the areas with highest species diversity were to the north, with the less common bat species more prolific around Locations 1, 16, 17 and 18.

Potential effects to bat species would be via collision or barotrauma to bats which forage or commute at a height similar to the rotor swept area of any turbine. Four species at high risk of turbine collision were identified during the course of the surveys: common, soprano and Nathusius' pipistrelle and *Nyctalus* species (see Table B9.2.2 in Appendix B of this report for species risk in relation to wind farm developments). Similarly, there would be habitat lost beneath the rotor swept area of turbines reducing the available areas of suitable forage for certain bat species. Finally, during the felling of the Strathy South conifer plantation further potential effects should be considered in relation to creating additional forest edge in proximity to turbine locations which might be used by bat species, drawing such species into areas of potential risk not previously available.

Figure 9.2.1: Static Bat Recorder Survey Locations (2019 – 2020) shows the turbine locations. When comparing the results to the turbine locations, the key points from the data collated are as follows:

- Turbine locations 22, 28, 30 and 33 are all located close to higher levels of bat activity at the south of the site;

- The Nathusius' pipistrelle call was recorded in proximity to Turbine 45 on one occasion. This species it at high risk from collision and / or barotrauma due to its flight patterns when foraging;
- Turbine locations 1 and 2 in the north of the site are located close to where *Nyctalus* bat calls were recorded, a species at high risk of turbine collision.

During the spring / summer 2020 deployments, the main area of activity for *Myotis* spp. bats is in the north of the site potentially due to the occurrence of larger bodies of water which are known to be the preferred foraging habitat for Daubentons' bats. Their habitat preference and hunting technique means they are at a lower risk of turbine collision.

It is therefore predicted that any effects from the development would be limited to pipistrelle and *Nyctalus* spp. bats which were noted to be using a variety of habitats including woodland edge, linear features, open moorland and a waterbody, with low numbers of common pipistrelle bats roosting within Croft House. The results of this study have therefore shown that this has potential to be important in relation to the location of turbines 1, 2, 22, 28, 30, 33 and 45 which might affect bats utilising habitats in proximity to these.

As detailed in the Risk Assessment of the development to bat species (Section 4.4 above), the potential effects of the Proposed Varied Development to bats are assessed to be moderate. This highlights a predicted likely significant adverse effects to bat species' populations from the Proposed Varied Development if appropriate mitigation is not implemented to reduce the level of any identified predicted effect.

4.6 Mitigation

The study has shown that a number of the turbines are within areas where some bat species could be adversely affected. To minimise the identified likely significant adverse effects to bat populations from the Proposed Varied Development, a number of best practice mitigation measures would be implemented, these include:

- siting of turbine locations to avoid key habitat features;
- the sensitive management of felling activities;
- appropriate habitat management through implementation of the Strathy South Wind Farm Outline Habitat Management Plan (Technical Appendix 9.5, EIAR Volume 4) during the operational phase to ensure habitats remain of limited value to bat species; and
- ongoing monitoring of bat activity through years 1, 3 and 5 of the operational phase to assess the utilisation of the main site by bat species and the success of the above mitigation measures.

On the basis that the mitigation measures detailed below are considered to be effective, it is expected that the likely significant effects would be reduced to a level which would not significantly affect the local population of pipistrelle and *Nyctalus* spp. bats.

4.6.1 Turbine Location

The risk to bats has been lessened by siting the proposed turbines to avoid parts of the site that have been shown to have high bat activity and where turbines might pose a particular risk of bat collisions. Current SNH Guidance (SNH *et al*., 2019)[2] recommends that wind turbine blade tips should be more than 50 m away from features likely to be used by foraging and commuting bats, such as trees, watercourses and waterbodies.

Buffer distances have been factored into the iterative layout design process to maintain separation of turbines and bat habitat and have similarly been considered during the design for the Phased Felling Plan (see Technical Appendix 9.6: Strathy South Phased Felling Plan (EIAR Volume 4)). Buffer distance have been estimated using the following formula:

$$b = \sqrt{(50+bl)^2 - (hh - fh)^2}$$

Where bl = blade length; hh = hub height; fh = feature height (all in metres).

For the Proposed Varied Development this buffer distance is therefore calculated as 85.4m. The locations of the turbines for the Proposed Varied Development would maintain this buffer distance either by their current locations or with implementation of micrositing from features used by foraging and commuting bats (e.g. watercourses), ensuring that the development remains compliant with SNH Guidance. Six turbines have been identified which would need to be microsited by a maximum of 13 m to achieve compliance with the SNH Guidance.

Similarly, edges of key-holed areas created by forest felling which might be used by bats are greater than the buffer distance for such features. If further micro-siting of turbines is required during the construction phase of the Proposed Varied Development this buffer distance would continue to be maintained. If opportunities arise to increase this buffer distance of turbines from features used by bat species this would continue to be investigated prior to and during the construction stage of the Proposed Varied Development.

4.6.2 Habitat Management

Technical Appendix 9.5: Strathy South Wind Farm Outline Habitat Management Plan (EIAR Volume 4) details the Habitat Management measures, their Objectives, Prescriptions and timescales for the restoration of peatland habitats within the site following felling of the Strathy South conifer plantation. The overarching aim of the Habitat Management Plan is to create peatland habitats similar in nature to those of the surrounding Caithness and Sutherland Peatlands SAC; habitats which are generally deemed as unsuitable or of low value for foraging and commuting bat species. The Objectives of the Habitat Management Plan are therefore well aligned to those required to reduce the suitability of areas surrounding wind turbines to bat species, reducing the attractiveness of these areas during the operational phase of the Proposed Varied Development, directing bats to use habitats of higher value such as watercourses, and therefore reducing the overall risk to bat species.

With the above mitigation taken into account it is likely that the residual effects on bat species from the Proposed Varied Development would be minor adverse (not significant).

Figures

Figure 9.2.1: Static Bat Recorder Survey Locations (2019- 2020)

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- Site Boundary
- Turbine
- Scoping survey area (200m buffer)
- Bat detector locations (1-20)

Structure locations

- Croft House
- Strathy bridge

Scale 1:23,000 @ A3

0 0.5 1 Km

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Figure 9.2.1
Static Bat Recorder Survey Locations (2019-2020)

Strathy South Wind Farm
EIAR 2020

W:\18589\EC - SSE, Strathy South Ecology 2019\Technical\Graphics\GIS\MXDs\Figures\EIAR figures\SEC18589-0004-TA-002 Static Bat Recorder Survey Locations (2019_2020).mxd

Appendix A

Weather Data

Table A9.2.2: Weather Conditions During Automated Detector Surveys Autumn Deployment

Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
29.08.19	20:23	06:05	20:04	15.9	3.4	7 (daily)
			21:04	15.2	3.4	
			22:04	14.1	1.2	
			23:04	13.6	1.7	
			00:04	13.7	1.5	
			01:04	12.8	2.6	
			02:04	12.9	3.3	
			03:04	13.7	3.2	
			04:04	13.2	2.8	
			05:04	12.6	2.7	
			06:04	12.4	1.3	
			07:04	12.4	0.0	
30.08.19	20:20	06:07	20:04	12.8	0.0	13.8 (daily)
			21:04	11.7	0.0	
			22:04	10.4	0.0	
			23:04	10.8	0.1	
			00:04	10.9	0.0	
			01:04	10.8	0.0	
			02:04	11.1	0.0	
			03:04	11.3	0.0	
			04:04	12.2	2.5	
			05:04	11.3	2.7	
			06:04	10.9	3.0	
			07:04	11.0	3.2	
31.08.19	20:17	06:09	20:04	10.8	2.5	15.6 (daily)
			21:04	10.4	4.5	
			22:04	10.1	1.3	
			23:04	10.2	1.1	
			00:04	10.6	3.6	
			01:04	10.9	2.6	
			02:04	11.2	3.2	
			03:04	11.5	5.1	
			04:04	10.9	3.4	
			05:04	10.6	1.3	
			06:04	10.2	2.8	
			07:04	10.2	1.6	
01.09.19	20:15	06:11	19:04	11.2	0.0	1.4 (daily)
			20:04	10.3	0.0	
			21:04	8.8	0.0	
			22:04	7.7	0.4	
			23:04	6.4	0.0	

Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
			00:04	5.7	0.0	
			01:04	5.4	0.0	
			02:04	6.1	0.0	
			03:04	5.8	0.6	
			04:04	7.1	1.3	
			05:04	7.9	2.1	
			06:04	7.7	1.8	
			07:04	8.4	3.2	
02.09.19	20:12	06:13	19:04	12.1	1.7	6.6 (daily)
			20:04	11.4	0.2	
			21:04	10.7	1.8	
			22:04	10.3	0.4	
			23:04	10.3	0.0	
			00:04	9.3	0.0	
			01:04	9.2	0.0	
			02:04	10.4	0.8	
			03:04	9.9	1.3	
			04:04	9.1	0.0	
			05:04	8.2	0.9	
			06:04	7.0	0.1	
			07:04	7.1	0.8	
03.09.19	20:09	06:10	19:04	14.9	3.7	0.8 (daily)
			20:04	14.7	2.1	
			21:04	14.2	4.2	
			22:04	13.7	4.2	
			23:04	11.8	3.3	
			00:04	11.2	0.5	
			01:04	10.9	2.1	
			02:04	9.4	1.4	
			03:04	8.8	1.7	
			04:04	7.9	0.1	
			05:04	7.4	0.0	
			06:04	6.9	0.2	
			07:04	7.2	0.8	
04.09.19	20:06	06:18	19:04	9.2	4.7	2 (daily)
			20:04	9.4	4.8	
			21:04	9.1	3.8	
			22:04	9.3	3.9	
			23:04	9.5	3.8	
			00:04	9.3	3.2	
			01:04	9.4	2.6	
			02:04	9.6	2.1	
			03:04	9.9	2.5	
			04:04	10.3	3.6	
			05:04	10.3	2.8	
			06:04	10.8	3.6	
			07:04	10.0	3.8	
05.09.19	20:03	06:20	19:04	13.3	3.8	6.6 (daily)

Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
			20:04	11.1	3.1	
			21:04	10.2	3.1	
			22:04	10.2	3.8	
			23:04	10.2	3.8	
			00:04	10.7	3.6	
			01:04	12.3	4.0	
			02:04	12.7	6.3	
			03:04	12.3	7.3	
			04:04	11.7	6.7	
			05:04	10.9	5.1	
			06:04	10.8	4.0	
			07:04	11.0	5.4	
06.09.19	20:00	06:22	19:04	11.1	4.0	1.2
			20:04	10.8	1.8	
			21:04	10.4	3.8	
			22:04	10.3	3.0	
			23:04	9.9	1.6	
			00:04	9.6	1.6	
			01:04	9.4	1.3	
			02:04	9.0	0.6	
			03:04	9.2	2.2	
			04:04	10.1	1.7	
			05:04	9.7	1.1	
			06:04	9.6	2.3	
			07:04	9.7	1.6	
07.09.19	19:58	06:24	19:04	12.7	0.0	0.4
			20:04	9.2	0.0	
			21:04	6.9	0.1	
			22:04	6.8	0.1	
			23:04	6.9	0.9	
			00:04	5.6	0.0	
			01:04	4.8	0.0	
			02:04	5.4	0.5	
			03:04	5.3	0.0	
			04:04	5.4	0.5	
			05:04	5.7	0.3	
			06:04	5.8	0.1	
			07:04	5.7	0.0	
08.09.19	19:55	06:27	19:04	14.9	0.0	0.2
			20:04	13.8	3.8	
			21:04	13.4	2.9	
			22:04	13.4	2.9	
			23:04	13.2	3.0	
			00:04	13.2	2.7	
			01:04	13.2	3.5	
			02:04	13.1	2.9	
			03:04	12.9	2.5	
			04:04	12.8	1.7	

Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
			05:04	12.7	0.0	
			06:04	12.8	0.0	
			07:04	12.7	3.1	
09.09.19	19:52	06:29	19:04	13.3	2.0	1
			20:04	12.3	1.8	
			21:04	11.1	4.2	
			22:04	10.9	1.9	
			23:04	10.7	0.1	
			00:04	10.9	0.1	
			01:04	11.1	1.6	
			02:04	10.7	0.9	
			03:04	10.2	1.0	
			04:04	9.2	1.9	
			05:04	7.7	0.6	
			06:04	6.8	0.7	
			07:04	5.9	0.4	
10.09.19	19:49	06:31	19:04	11.8	3.9	4.2
			20:04	11.4	5.0	
			21:04	11.8	6.0	
			22:04	12.3	5.5	
			23:04	13.2	4.9	
			00:04	14.3	2.6	
			01:04	15.1	3.8	
			02:04	15.5	5.9	
			03:04	12.7	6.1	
			04:04	13.0	4.1	
			05:04	12.7	4.7	
			06:04	12.9	5.6	
			07:04	12.4	4.6	
11.09.19	19:46	06:33	19:04	13.3	6.5	0
			20:04	12.7	7.2	
			21:04	12.6	7.3	
			22:04	12.1	7.2	
			23:04	12.6	3.9	
			00:04	12.7	1.7	
			01:04	12.0	2.5	
			02:04	12.4	0.4	
			03:04	11.8	4.9	
			04:04	10.6	2.8	
			05:04	10.9	1.1	
			06:04	9.3	0.0	
			07:04	9.7	0.1	
12.09.19	19:43	06:35	19:04	11.4	4.2	0
			20:04	10.7	2.8	
			21:04	9.9	1.9	
			22:04	9.9	2.8	
			23:04	9.6	2.7	
			00:04	10.3	6.8	

Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
			01:04	10.0	5.4	
			02:04	10.2	5.5	
			03:04	9.9	4.5	
			04:04	9.9	6.1	
			05:04	10.3	5.5	
			06:04	10.7	5.7	
			07:04	11.0	6.1	
13.09.19	19:40	06:38	19:04	12.7	5.3	1.8
			20:04	12.3	2.4	
			21:04	11.8	3.8	
			22:04	11.4	0.5	
			23:04	11.3	0.0	
			00:04	10.3	6.8	
			01:04	10.0	7.7	
			02:04	10.2	5.5	
			03:04	9.9	4.5	
			04:04	9.9	6.1	
			05:04	10.3	5.5	
			06:04	10.7	5.7	
			07:04	11.0	6.1	
14.09.19	19:37	06:40	19:04	12.7	5.3	0
			20:04	12.3	2.4	
			21:04	11.8	3.8	
			22:04	11.4	0.5	
			23:04	11.3	0.0	
			00:04	11.7	8.6	
			01:04	10.9	10.1	
			02:04	10.8	11.4	
			03:04	10.7	11.5	
			04:04	10.8	10.9	
			05:04	10.9	14.3	
			06:04	11.0	14.3	
			07:04	10.9	13.3	
15.09.19	19:34	06:42	19:04	10.4	5.0	0.4
			20:04	9.2	3.1	
			21:04	9.3	4.6	
			22:04	9.2	5.0	
			23:04	10.2	4.2	
			00:04	9.5	1.8	
			01:04	9.1	1.9	
			02:04	9.8	3.7	
			03:04	10.2	3.8	
			04:04	9.3	3.8	
			05:04	9.3	1.7	
			06:04	9.7	5.4	
			07:04	9.7	4.8	
16.09.19	19:32	06:44	19:04	10.1	6.7	0.6
			20:04	10.4	4.2	

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Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
			21:04	9.9	5.9	
			22:04	10.2	6.1	
			23:04	9.2	7.4	
			00:04	9.4	6.4	
			01:04	8.9	7.1	
			02:04	9.3	6.0	
			03:04	9.6	5.9	
			04:04	9.2	3.9	
			05:04	8.9	4.3	
			06:04	9.2	2.5	
			07:04	9.2	3.6	
17.09.19	19:29	06:46	19:04	10.2	0.2	0.6
			20:04	9.4	1.9	
			21:04	9.1	0.3	
			22:04	8.7	0.0	
			23:04	8.1	1.2	
			00:04	8.1	0.0	
			01:04	7.9	0.0	
			02:04	7.9	0.0	
			03:04	7.7	0.0	
			04:04	7.6	0.0	
			05:04	7.3	0.0	
			06:04	12.6	0.3	
			07:04	7.4	2.5	
18.09.19	19:26	06:49	19:04	10.6	2.9	1.2
			20:04	10.3	4.2	
			21:04	10.4	3.9	
			22:04	10.6	2.7	
			23:04	10.8	2.4	
			00:04	11.2	0.0	
			01:04	11.5	0.1	
			02:04	12.1	0.0	
			03:04	12.9	0.6	
			04:04	12.9	0.0	
			05:04	12.8	0.0	
			06:04	12.3	0.0	
			07:04	12.3	0.5	
19.09.19	19:23	06:51	19:04	13.0	2.5	0
			20:04	11.7	0.0	
			21:04	9.2	0.0	
			22:04	8.3	0.0	
			23:04	8.1	0.4	
			00:04	7.8	0.7	
			01:04	7.7	0.4	
			02:04	6.9	0.0	
			03:04	7.4	0.0	
			04:04	7.3	1.3	
			05:04	7.2	1.4	

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Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
			06:04	6.9	2.0	
			07:04	7.3	2.1	
20.09.19	19:17	06:55	19:04	18.1	1.9	0
			20:04	16.1	0.6	
			21:04	14.5	0.2	
			22:04	13.6	1.8	
			23:04	12.9	1.7	
			00:04	12.7	0.6	
			01:04	12.9	1.1	
			02:04	13.7	0.8	
			03:04	13.6	2.4	
			04:04	14.6	3.2	
			05:04	12.3	2.0	
			06:04	13.6	2.6	
			07:04	13.1	1.5	
21.09.19	19:17	06:55	19:04	15.1	6.9	0
			20:04	13.8	6.2	
			21:04	13.1	4.2	
			22:04	13.1	6.5	
			23:04	12.2	3.7	
			00:04	12.1	7.3	
			01:04	11.7	6.8	
			02:04	11.8	7.3	
			03:04	11.7	8.6	
			04:04	11.8	9.0	
			05:04	11.8	6.9	
			06:04	11.4	5.4	
			07:04	12.0	6.6	
22.09.19	19:14	06:57	19:04	15.7	5.0	0
			20:04	14.4	5.4	
			21:04	14.2	6.1	
			22:04	13.9	5.2	
			23:04	13.5	4.3	
			00:04	13.2	5.4	
			01:04	12.9	0.0	
			02:04	13.2	1.3	
			03:04	13.0	1.9	
			04:04	13.2	3.0	
			05:04	13.4	4.6	
			06:04	13.5	3.7	
			07:04	13.6	3.5	
23.09.19	19:11	07:00	19:04	15.8	3.0	0
			20:04	13.7	3.3	
			21:04	12.4	2.0	
			22:04	11.7	1.5	
			23:04	11.8	1.8	
			00:04	12.2	5.7	
			01:04	11.9	1.2	

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Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
			02:04	11.5	2.3	
			03:04	11.9	3.1	
			04:04	12.4	4.1	
			05:04	13.1	5.9	
			06:04	13.3	5.3	
			07:04	13.7	6.3	
24.09.19	19:08	07:02	18:04	15.3	4.3	0.2
			19:04	14.8	5.5	
			20:04	14.4	5.2	
			21:04	14.4	2.4	
			22:04	14.6	2.4	
			23:04	14.4	2.3	
			00:04	14.3	5.1	
			01:04	14.1	3.4	
			02:04	13.9	4.2	
			03:04	13.8	3.1	
			04:04	13.8	4.2	
			05:04	13.9	3.9	
			06:04	13.9	3.7	
			07:04	13.8	3.6	
25.09.19	19:05	07:04	18:04	14.8	6.9	1.8
			19:04	14.7	6.6	
			20:04	14.4	6.2	
			21:04	14.2	6.8	
			22:04	14.3	7.4	
			23:04	14.2	7.7	
			00:04	14.2	6.8	
			01:04	13.8	7.5	
			02:04	13.8	6.3	
			03:04	13.9	6.0	
			04:04	13.9	6.7	
			05:04	14.1	6.8	
			06:04	14.2	6.2	
			07:04	14.3	5.1	
26.09.19	19:03	07:06	18:04	13.3	2.9	6.8
			19:04	12.6	1.1	
			20:04	12.5	1.0	
			21:04	11.7	0.0	
			22:04	10.4	0.0	
			23:04	10.8	0.0	
			00:04	14.2	6.8	
			01:04	13.8	7.5	
			02:04	13.8	6.3	
			03:04	13.9	6.0	
			04:04	13.9	6.7	
			05:04	14.1	6.8	
			06:04	14.2	6.2	
			07:04	14.3	5.1	

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Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
27.09.19	19:00	07:08	18:04	13.3	2.9	1.8
			19:04	12.6	1.1	
			20:04	12.5	1.0	
			21:04	11.7	0.0	
			22:04	10.4	0.0	
			23:04	10.8	0.0	
			00:04	9.1	0.0	
			01:04	8.3	0.0	
			02:04	8.2	0.1	
			03:04	7.8	0.1	
			04:04	7.2	0.0	
			05:04	7.7	0.0	
			06:04	7.6	0.0	
			07:04	7.8	0.0	
28.09.19	18:57	07:11	18:04	12.3	0.0	0
			19:04	12.1	0.0	
			20:04	10.9	0.0	
			21:04	10.5	0.0	
			22:04	9.2	0.0	
			23:04	8.2	0.0	
			00:04	8.2	0.0	
			01:04	8.6	0.0	
			02:04	8.4	0.0	
			03:04	8.3	0.0	
			04:04	8.3	0.0	
			05:04	8.8	0.0	
			06:04	8.9	0.0	
			07:04	10.1	0.0	
29.09.19	18:54	07:13	18:04	13.4	0.0	3.2
			19:04	12.7	0.0	
			20:04	11.0	0.0	
			21:04	10.2	0.0	
			22:04	9.6	0.0	
			23:04	9.2	0.0	
			00:04	8.4	0.0	
			01:04	8.7	0.0	
			02:04	8.6	0.0	
			03:04	9.4	0.0	
			04:04	9.7	0.0	
			05:04	9.7	0.0	
			06:04	9.7	0.0	
			07:04	9.8	0.0	
30.09.19	18:51	07:15	18:04	11.6	1.3	1.6
			19:04	11.3	0.6	
			20:04	11.5	0.0	
			21:04	11.3	0.3	
			22:04	11.4	3.2	
			23:04	11.2	0.8	

Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
			00:04	10.5	1.3	
			01:04	10.4	1.9	
			02:04	10.5	1.9	
			03:04	10.1	1.5	
			04:04	9.8	2.3	
			05:04	9.7	3.4	
			06:04	9.2	0.9	
			07:04	8.7	1.3	
01.10.19	18:48	07:17	18:04	8.9	1.7	3.4
			19:04	8.2	2.8	
			20:04	7.8	1.1	
			21:04	7.1	0.0	
			22:04	6.3	0.0	
			23:04	5.3	0.9	
			00:04	5.4	0.1	
			01:04	6.4	0.2	
			02:04	6.3	0.0	
			03:04	5.3	0.5	
			04:04	5.1	0.3	
			05:04	7.4	0.1	
			06:04	7.4	0.4	
			07:04	7.9	0.5	
02.10.19	18:45	07:20	18:04	7.9	4.2	1
			19:04	7.1	3.0	
			20:04	7.2	2.8	
			21:04	7.7	3.6	
			22:04	7.8	3.6	
			23:04	7.7	1.7	
			00:04	7.8	2.5	
			01:04	8.7	4.3	
			02:04	8.7	4.5	
			03:04	8.4	4.2	
			04:04	8.2	2.8	
			05:04	8.7	4.2	
			06:04	8.8	3.5	
			07:04	9.3	3.9	
03.10.19	18:42	07:22	18:04	9.3	2.4	0.2
			19:04	9.3	1.6	
			20:04	9.3	2.0	
			21:04	9.3	1.2	
			22:04	9.2	1.0	
			23:04	9.4	1.5	
			00:04	9.2	0.0	
			01:04	9.5	0.4	
			02:04	9.2	0.0	
			03:04	8.3	1.0	
			04:04	8.1	1.0	
			05:04	7.9	1.2	

Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
			06:04	7.6	0.4	
			07:04	6.8	0.2	
04.10.19	18:40	07:24	18:04	9.8	5.5	0
			19:04	9.7	5.4	
			20:04	9.6	5.1	
			21:04	9.6	4.3	
			22:04	9.7	3.4	
			23:04	9.3	4.5	
			00:04	9.8	4.6	
			01:04	9.6	4.2	
			02:04	9.3	4.2	
			03:04	9.3	4.6	
			04:04	9.3	4.3	
			05:04	8.7	4.0	
			06:04	8.4	4.1	
			07:04	7.9	1.0	
05.10.19	18:37	07:26	18:04	9.5	0.0	2.4
			19:04	6.6	0.0	
			20:04	5.6	1.2	
			21:04	5.1	0.0	
			22:04	4.8	0.0	
			23:04	4.7	1.9	
			00:04	5.1	0.9	
			01:04	4.9	1.4	
			02:04	5.8	1.7	
			03:04	4.9	0.3	
			04:04	5.1	2.5	
			05:04	6.1	2.5	
			06:04	6.8	2.4	
			07:04	7.8	2.8	
06.10.19	18:34	07:29	18:04	11.7	5.6	0
			19:04	11.4	5.5	
			20:04	11.6	5.4	
			21:04	11.7	5.4	
			22:04	11.6	5.0	
			23:04	11.8	5.0	
			00:04	11.7	5.5	
			01:04	11.4	6.2	
			02:04	11.5	5.4	
			03:04	11.6	6.0	
			04:04	11.6	6.3	
			05:04	11.4	5.4	
			06:04	11.6	5.5	
			07:04	11.3	7.9	
07.10.19	18:31	07:31	18:04	12.0	4.2	0.6
			19:04	10.4	3.2	
			20:04	10.4	3.8	
			21:04	10.7	4.3	

Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
			22:04	10.8	6.0	
			23:04	11.1	5.9	
			00:04	9.4	2.9	
			01:04	8.6	0.3	
			02:04	8.0	0.5	
			03:04	8.3	2.9	
			04:04	8.7	2.7	
			05:04	8.4	2.9	
			06:04	9.4	3.9	
			07:04	9.3	3.8	
08.10.19	18:28	07:33	18:04	11.4	2.8	0.4
			19:04	10.4	2.1	
			20:04	9.7	2.1	
			21:04	9.8	2.7	
			22:04	9.8	2.2	
			23:04	10.3	1.7	
			00:04	10.4	2.9	
			01:04	10.7	2.9	
			02:04	10.4	2.2	
			03:04	10.3	2.8	
			04:04	10.4	3.0	
			05:04	10.3	2.4	
			06:04	10.2	3.3	
			07:04	10.2	3.0	
09.10.19	18:25	07:35	18:04	11.7	4.0	1.8
			19:04	11.0	2.7	
			20:04	11.1	2.3	
			21:04	11.3	4.0	
			22:04	11.3	4.7	
			23:04	11.1	5.0	
			00:04	10.9	5.5	
			01:04	10.7	6.0	
			02:04	10.7	6.8	
			03:04	10.6	7.4	
			04:04	10.7	7.3	
			05:04	10.3	9.7	
			06:04	10.0	5.9	
			07:04	10.1	7.4	
10.10.19	18:23	07:38	17:04	10.9	0.0	1.8
			18:04	10.4	1.2	
			19:04	10.1	0.6	
			20:04	9.7	1.5	
			21:04	9.7	1.2	
			22:04	9.7	2.2	
			23:04	9.5	1.2	
			00:04	9.9	2.8	
			01:04	9.7	0.0	
			02:04	9.6	2.2	

Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
			03:04	9.4	2.0	
			04:04	8.8	0.1	
			05:04	8.7	2.0	
			06:04	7.8	1.7	
			07:04	7.7	0.7	
11.10.19	18:20	07:40	17:04	10.4	1.1	2.2
			18:04	10.3	1.3	
			19:04	10.2	0.0	
			20:04	10.4	2.4	
			21:04	10.2	2.4	
			22:04	9.7	0.6	
			23:04	9.8	2.2	
			00:04	9.1	3.3	
			01:04	8.8	2.4	
			02:04	8.7	2.9	
			03:04	9.3	3.4	
			04:04	9.1	3.3	
			05:04	8.6	2.7	
			06:04	8.7	2.8	
			07:04	8.4	1.9	
12.10.19	18:17	07:42	17:04	9.3	0.2	0.8
			18:04	9.3	0.0	
			19:04	9.2	0.8	
			20:04	8.6	1.7	
			21:04	7.9	1.2	
			22:04	7.0	1.0	
			23:04	7.1	1.0	
			00:04	7.5	0.8	
			01:04	6.9	0.4	
			02:04	5.7	0.9	
			03:04	5.6	0.9	
			04:04	4.9	1.4	
			05:04	5.1	0.9	
			06:04	5.0	1.3	
			07:04	3.7	0.3	
13.10.19	18:14	07:44	17:04	10.7	2.7	0
			18:04	8.9	2.0	
			19:04	7.5	1.5	
			20:04	7.4	1.6	
			21:04	6.2	0.0	
			22:04	5.8	0.0	
			23:04	4.2	0.6	
			00:04	7.5	0.8	
			01:04	6.9	0.4	
			02:04	5.7	0.9	
			03:04	5.6	0.9	
			04:04	4.9	1.4	
			05:04	5.1	0.9	

Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Nightly Rain (mm)
			06:04	5.0	1.3	
			07:04	3.7	0.3	
			08:04	3.3	0.6	
14.10.19	18:11	07:47	17:04	11.2	0.1	0
			18:04	10.3	1.3	
			19:04	9.7	0.0	
			20:04	9.2	0.3	
			21:04	8.4	0.0	
			22:04	8.3	0.2	
			23:04	8.5	0.3	
			00:04	8.6	1.5	
			01:04	6.8	0.0	
			02:04	8.2	1.0	
			03:04	7.9	0.0	
			04:04	8.5	1.7	
			05:04	7.4	3.4	
			06:04	7.6	4.0	
			07:04	8.3	4.6	
			08:04	8.6	4.4	

The data was collected from the nearest weather station to the survey area (Wick Airport) and shows that precipitation was consistently low during the survey period, and only one date within the second deployment with high winds and four dates within the third deployment where temperatures were consistently below 8°C for the whole night. The weather conditions on these dates are outside the parameters given in the guidance pertaining to suitable survey conditions.

It should be noted that, during the first deployment, daily rain data was collected from the SEPA rainfall data website[25] (Strathy Bridge station). For the second and third deployments, a rain gauge data logger was installed to collect hourly rainfall data. Therefore, nightly (from dusk till dawn) rainfall data has been presented for the remainder of the survey period.

Table A9.2.2: Weather Conditions During Automated Detector Surveys Spring/Summer Deployment

Date	Sunset	Sunrise	Time	Weather Conditions		
				Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
15.05.20	04:47	21:38	20:20	8.9	7.2	0.0
			20:50	8.9	6.7	0.0
			21:20	8.9	7.2	0.0
			21:50	8.9	7.2	0.0
			22:20	7.8	7.2	0.0
			22:50	7.8	7.2	0.0
			23:20	7.8	7.2	0.0
			23:50	7.8	7.6	0.0
			00:20	7.8	7.2	0.0
			00:50	7.8	6.7	2.6
			01:20	7.8	10.3	2.6
			01:50	7.2	5.8	1.2
			02:20	6.1	4.0	1.2

[25] https://apps.sepa.org.uk/rainfall.

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			02:50	6.1	2.7	1.0
			03:20	6.1	3.1	1.0
			03:50	6.1	2.7	0.6
			04:20	6.1	2.7	0.6
			04:50	6.1	2.7	0.8
			05:20	6.1	3.6	0.8
			05:50	6.1	3.1	2.2
			06:20	6.1	3.1	2.2
16.05.20	04:45	21:41	20:20	10.0	6.7	0.0
			20:50	10.0	6.7	0.0
			21:20	8.9	5.4	0.0
			21:50	8.9	4.0	0.0
			22:20	8.9	4.5	0.0
			22:50	8.9	5.8	0.0
			23:20	8.9	7.2	0.0
			23:50	8.9	6.7	0.0
			02:20	7.8	6.7	0.0
			00:50	7.8	6.7	0.0
			01:20	7.8	5.8	0.0
			01:50	7.8	5.4	0.0
			02:20	7.8	4.0	0.0
			02:50	7.8	6.3	0.0
			03:20	7.8	5.4	0.0
			03:50	7.8	4.5	0.4
			04:20	7.8	4.0	0.4
			04:50	7.8	4.5	1.0
			05:20	8.9	4.0	1.0
			05:50	8.9	4.0	0.6
			06:20	8.9	3.6	0.6
17.05.20	04:43	21:43	20:20	6.1	4.0	0.0
			20:50	6.1	3.6	0.2
			21:20	6.1	4.0	0.2
			21:50	6.1	4.0	0.2
			22:20	6.1	4.5	0.2
			22:50	6.1	4.0	0.0
			23:20	6.1	4.5	0.0
			23:50	6.1	5.4	0.4
			00:20	7.2	4.5	0.4
			00:50	7.2	5.8	0.8
			01:20	7.2	5.4	0.8
			01:50	7.2	5.8	1.2
			02:20	7.2	6.3	1.2
			02:50	7.2	5.8	0.2
			03:20	7.2	6.3	0.2

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			03:50	7.2	6.3	0.2
			04:20	7.2	7.2	0.2
			04:50	7.2	7.6	0.0
			05:20	7.2	7.6	0.0
			05:50	7.2	8.9	0.4
			06:20	7.8	8.0	0.4
18.05.20	04:41	21:45	20:20	12.2	3.1	0.0
			20:50	12.2	3.1	0.0
			21:20	11.1	0.9	0.0
			21:50	10.0	1.3	0.0
			22:20	10.0	4.5	0.0
			22:50	8.9	2.7	0.0
			23:20	7.8	2.2	0.0
			23:50	7.8	3.1	0.0
			00:20	7.2	3.6	0.0
			00:50	7.2	0.9	0.0
			01:20	6.1	1.3	0.0
			01:50	7.2	1.3	0.0
			02:20	6.1	1.3	0.0
			02:50	7.2	1.3	0.0
			03:20	7.2	1.3	0.0
			03:50	6.1	0.9	0.0
			04:20	6.1	1.3	0.0
			04:50	5.0	0.4	0.0
			05:20	6.1	0.0	0.0
			05:50	6.1	0.4	0.0
			06:20	7.8	0.4	0.0
19.05.20	04:39	21:47	20:20	10.0	0.4	0.0
			20:50	10.0	0.0	0.0
			21:20	10.0	0.9	0.0
			21:50	8.9	0.0	0.0
			22:20	8.9	0.4	0.0
			22:50	8.9	0.9	0.0
			23:20	10.0	0.4	0.0
			23:50	10.0	0.4	0.0
			00:20	10.0	0.4	0.0
			00:50	8.9	1.3	0.0
			01:20	10.0	1.3	0.0
			01:50	10.0	1.3	0.0
			02:20	10.0	1.3	0.0
			02:50	10.0	1.3	0.0
			03:20	10.0	2.2	0.0
			03:50	10.0	2.2	0.0
			04:20	10.0	2.7	0.0

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			04:50	10.0	2.2	0.0
			5:20	8.9	0.9	0.0
			5:50	8.9	1.3	0.0
			6:20	10.0	3.1	0.0
20.05.20	04:37	21:49	20:20	11.1	4.5	0.0
			20:50	11.1	4.0	0.0
			21:20	11.1	1.3	0.0
			21:50	10.0	3.6	0.0
			22:20	11.1	3.6	0.0
			22:50	12.2	2.7	0.0
			23:20	12.8	3.6	0.0
			23:50	12.2	2.7	0.0
			00:20	11.1	0.9	0.0
			00:50	11.1	1.3	0.0
			01:20	10.0	0.4	0.0
			01:50	11.1	0.0	0.0
			02:20	11.1	1.3	0.0
			02:50	11.1	1.3	0.0
			03:20	8.9	0.4	0.0
			03:50	8.9	0.4	0.0
			04:20	8.9	0.9	0.0
			04:50	8.9	0.9	0.0
			05:20	8.9	1.3	0.0
			05:50	8.9	0.9	0.0
			06:20	10.0	0.4	0.0
21.05.20	04:35	21:51	20:20	10.0	5.4	0.0
			20:50	10.0	3.6	0.0
			21:20	8.9	2.7	0.0
			21:50	8.9	1.3	0.0
			22:20	8.9	0.4	0.0
			22:50	8.9	0.4	0.0
			23:20	8.9	2.2	0.0
			23:50	8.9	2.7	0.0
			00:20	8.9	3.1	0.0
			00:50	8.9	3.6	0.0
			01:20	8.9	4.0	0.0
			01:50	8.9	5.4	0.0
			02:20	8.9	5.4	0.0
			02:50	7.8	5.4	0.0
			03:20	7.8	5.4	0.0
			03:50	7.8	5.4	0.0
			04:20	7.8	6.3	0.0
			04:50	8.9	6.3	0.0
			05:20	8.9	5.8	0.0

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			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			05:50	8.9	7.6	1.4
			06:20	8.9	8.0	1.4
22.05.20	04:33	21:53	20:20	11.1	11.6	0.0
			20:50	11.1	11.2	0.2
			21:20	11.1	10.7	0.2
			21:50	11.1	9.8	0.0
			22:20	11.1	9.8	0.0
			22:50	10.0	9.4	0.0
			23:20	11.1	11.2	0.0
			23:50	11.1	9.8	0.4
			00:20	10.0	10.3	0.4
			00:50	10.0	10.7	0.8
			01:20	10.0	11.6	0.8
			01:50	10.0	10.7	0.2
			02:20	10.0	10.7	0.2
			02:50	10.0	10.3	0.2
			03:20	10.0	9.8	0.2
			03:50	10.0	11.2	0.0
			04:20	10.0	9.8	0.0
			04:50	10.0	10.3	0.0
			05:20	10.0	10.3	0.0
			05:50	10.0	9.8	0.2
			06:20	8.9	9.8	0.2
23.05.20	04:31	21:55	20:20	10.0	11.6	0.4
			20:50	8.9	11.2	0.4
			21:20	8.9	10.3	0.6
			21:50	8.9	12.5	0.6
			22:20	10.0	14.3	0.2
			22:50	10.0	14.3	0.2
			23:20	10.0	13.9	0.6
			23:50	10.0	13.0	0.6
			00:20	10.0	12.5	0.8
			00:50	10.0	12.5	0.8
			01:20	10.0	13.4	0.2
			01:50	8.9	14.3	0.2
			02:20	8.9	13.4	0.2
			02:50	8.9	14.3	0.2
			03:20	8.9	14.3	0.0
			03:50	8.9	15.6	0.0
			04:20	8.9	14.3	0.0
			04:50	8.9	13.0	0.0
			05:20	10.0	12.5	0.0
			05:50	10.0	12.5	0.0
			06:20	10.0	12.5	0.0

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			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
24.05.20	04:30	21:57	20:20	12.8	2.2	0.0
			20:50	12.8	2.7	0.0
			21:20	12.8	5.4	0.0
			21:50	12.2	5.4	0.0
			22:20	11.1	1.3	0.0
			22:50	10.0	0.9	0.0
			23:20	11.1	3.1	0.0
			23:50	11.1	2.7	0.0
			00:20	11.1	1.3	0.0
			00:50	11.1	3.6	0.0
			01:20	10.0	2.2	0.0
			01:50	8.9	0.9	0.0
			02:20	8.9	2.2	0.0
			02:50	10.0	2.7	0.0
			03:20	10.0	3.6	0.0
			03:50	8.9	3.1	0.0
			04:20	8.9	2.2	0.0
			04:50	8.9	4.5	0.0
			05:20	8.9	4.0	0.0
			05:50	8.9	4.0	0.0
			06:20	10.0	5.4	0.0
25.05.20	04:28	21:59	20:20	16.1	6.3	0.0
			20:50	16.1	4.5	0.0
			21:20	15.0	6.3	0.0
			21:50	15.0	6.3	0.0
			22:20	13.9	6.3	0.0
			22:50	13.9	5.8	0.0
			23:20	13.9	6.7	0.0
			23:50	12.8	3.1	0.0
			00:20	12.2	4.0	0.0
			00:50	11.1	0.9	0.0
			01:20	11.1	3.1	0.0
			01:50	11.1	3.6	0.0
			02:20	8.9	1.3	0.0
			02:50	10.0	2.7	0.0
			03:20	10.0	2.7	0.0
			03:50	10.0	3.6	0.0
			04:20	10.0	4.0	0.0
			04:50	8.9	2.7	0.0
			05:20	8.9	1.3	0.0
			05:50	8.9	1.3	0.0
			06:20	8.9	3.6	0.0
26.05.20	04:26	22:00	20:20	12.8	6.3	0.0
			20:50	12.2	6.3	0.0

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			21:20	11.1	2.2	0.0
			21:50	10.0	0.4	0.0
			22:20	10.0	2.2	0.0
			22:50	10.0	0.9	0.0
			23:20	8.9	3.1	0.0
			23:50	8.9	3.1	0.0
			00:20	8.9	3.6	0.0
			00:50	8.9	4.5	0.0
			01:20	8.9	3.1	0.0
			01:50	10.0	3.6	0.0
			02:20	10.0	1.3	0.0
			02:50	10.0	1.3	0.0
			03:20	8.9	2.2	0.0
			03:50	8.9	3.1	0.0
			04:20	10.0	2.2	0.0
			04:50	8.9	2.2	0.0
			05:20	8.9	2.2	0.0
			05:50	8.9	2.7	0.0
			06:20	10.0	4.0	0.0
27.05.20	04:25	22:02	20:20	10.0	3.6	0.0
			20:50	10.0	3.1	0.0
			21:20	8.9	3.1	0.0
			21:50	8.9	3.6	0.0
			22:20	10.0	4.0	0.0
			22:50	10.0	4.5	0.0
			23:20	8.9	4.5	0.0
			23:50	8.9	4.5	0.8
			00:20	8.9	3.6	0.8
			00:50	8.9	3.6	0.8
			01:20	8.9	4.0	0.8
			01:50	8.9	3.1	0.2
			02:20	10.0	4.0	0.2
			02:50	10.0	4.0	0.0
			03:20	8.9	5.4	0.0
			03:50	8.9	4.5	0.2
			04:20	8.9	5.4	0.2
			04:50	8.9	6.3	0.0
			05:20	8.9	5.8	0.0
			05:50	8.9	5.8	0.0
			06:20	8.9	5.8	0.0
28.05.20	04:23	22:04	20:20	11.1	1.3	0.0
			20:50	11.1	0.9	0.0
			21:20	11.1	0.9	0.0
			21:50	10.0	2.2	0.0

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			22:20	10.0	2.2	0.0
			22:50	8.9	2.2	0.0
			23:20	10.0	2.2	0.0
			23:50	10.0	1.3	0.0
			00:20	10.0	2.2	0.0
			00:50	10.0	1.3	0.0
			01:20	10.0	2.2	0.0
			01:50	10.0	3.1	0.0
			02:20	10.0	2.7	0.0
			02:50	10.0	3.6	0.0
			03:20	8.9	3.6	0.0
			03:50	8.9	3.6	0.0
			04:20	8.9	3.1	0.0
			04:50	8.9	2.7	0.0
			05:20	8.9	2.7	0.0
			05:50	8.9	2.7	0.0
			06:20	10.0	3.1	0.0
29.05.20	04:22	22:06	20:20	12.2	3.6	0.0
			20:50	12.2	4.5	0.0
			21:20	11.1	5.4	0.0
			21:50	11.1	4.5	0.0
			22:20	12.2	4.0	0.0
			22:50	12.2	3.1	0.0
			23:20	12.2	3.6	0.0
			23:50	12.2	3.6	0.0
			00:20	-	2.7	0.0
			00:50	12.2	3.6	0.0
			01:20	12.2	3.1	0.0
			01:50	12.2	3.1	0.0
			02:20	12.2	4.0	0.0
			02:50	12.2	2.2	0.0
			03:20	12.2	2.7	0.0
			03:50	12.2	1.3	0.0
			04:20	11.1	2.7	0.0
			04:50	11.1	3.1	0.0
			05:20	11.1	4.0	0.0
			05:50	12.2	3.1	0.0
			06:20	12.2	4.5	0.0
30.05.20	04:20	22:07	20:20	11.1	6.7	0.0
			20:50	11.1	6.7	0.0
			21:20	10.0	5.8	0.0
			21:50	10.0	6.7	0.0
			22:20	10.0	6.3	0.0
			22:50	10.0	6.7	0.0

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			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			23:20	10.0	7.6	0.0
			23:50	10.0	7.2	0.0
			00:20	10.0	7.6	0.0
			00:50	10.0	7.2	0.0
			01:20	10.0	7.2	0.0
			01:50	10.0	6.3	0.0
			02:20	10.0	5.4	0.0
			02:50	8.9	5.4	0.0
			03:20	8.9	5.4	0.0
			03:50	8.9	4.5	0.0
			04:20	8.9	4.0	0.0
			04:50	8.9	5.4	0.0
			05:20	8.9	3.6	0.0
			05:50	10.0	4.0	0.0
			06:20	10.0	4.5	0.0
31.05.20	04:19	22:09	20:20	11.1	4.5	0.0
			20:50	11.1	4.0	0.0
			21:20	11.1	4.5	0.0
			21:50	10.0	4.0	0.0
			22:20	10.0	4.0	0.0
			22:50	10.0	3.1	0.0
			23:20	10.0	4.0	0.0
			23:50	10.0	3.6	0.0
			00:20	10.0	3.1	0.0
			00:50	10.0	3.1	0.0
			01:20	10.0	2.7	0.0
			01:50	10.0	3.1	0.0
			02:20	10.0	2.7	0.0
			02:50	10.0	2.7	0.0
			03:20	10.0	4.0	0.0
			03:50	11.1	3.6	0.0
			04:20	11.1	2.2	0.0
			04:50	8.9	0.9	0.0
			05:20	8.9	0.0	0.0
			05:50	10.0	1.3	0.0
			06:20	10.0	2.2	0.0
01.06.20	04:18	22:10	20:20	15.0	0.4	0.0
			20:50	13.9	0.4	0.0
			21:20	12.2	0.9	0.0
			21:50	12.2	1.3	0.0
			22:20	11.1	2.7	0.0
			22:50	10.0	2.7	0.0
			23:20	10.0	2.2	0.0
			23:50	11.1	1.3	0.0

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			00:20	11.1	0.9	0.0
			00:50	10.0	0.9	0.0
			01:20	10.0	1.3	0.0
			01:50	10.0	2.2	0.0
			02:20	10.0	3.1	0.0
			02:50	10.0	5.4	0.0
			03:20	10.0	3.1	0.0
			03:50	10.0	4.0	0.0
			04:20	10.0	2.7	0.0
			04:50	10.0	2.7	0.0
			05:20	10.0	2.7	0.0
			05:50	10.0	3.1	0.0
			06:20	10.0	2.7	0.0
02.06.20	04:16	22:12	20:20	8.9	6.7	0.0
			20:50	8.9	6.7	0.0
			21:20	8.9	7.2	0.0
			21:50	7.8	6.7	0.0
			22:20	7.8	5.8	0.0
			22:50	7.8	5.4	0.0
			23:20	7.8	6.3	0.0
			23:50	7.8	6.3	0.0
			00:20	8.9	6.7	0.0
			00:50	7.8	5.8	0.0
			01:20	7.8	5.4	0.0
			01:50	7.8	4.5	0.0
			02:20	7.8	5.4	0.0
			02:50	7.8	6.7	0.0
			03:20	7.8	6.3	0.0
			03:50	7.8	5.8	0.0
			04:20	7.8	5.4	0.0
			04:50	7.8	5.8	0.0
			05:20	7.8	6.3	0.0
			05:50	7.8	5.8	0.0
			06:20	7.8	5.8	0.0
03.06.20	04:15	22:13	20:20	8.9	4.0	0.0
			20:50	7.8	5.4	0.0
			21:20	7.8	4.0	0.0
			21:50	7.8	3.1	0.0
			22:20	7.2	2.7	0.0
			22:50	7.2	3.1	0.0
			23:20	7.2	2.2	0.0
			23:50	7.2	2.2	0.0
			00:20	7.2	2.2	0.0
			00:50	6.1	1.3	0.0

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			01:20	6.1	1.3	0.0
			01:50	6.1	2.2	0.0
			02:20	6.1	1.3	0.0
			02:50	6.1	1.3	0.0
			03:20	6.1	0.9	0.0
			03:50	6.1	0.9	0.0
			04:20	6.1	0.9	0.0
			04:50	6.1	1.3	0.0
			05:20	6.1	0.9	0.0
			05:50	6.1	0.9	0.0
			06:20	7.2	0.9	0.0
04.06.20	04:14	22:15	20:20	7.8	6.7	0.0
			20:50	7.8	4.5	0.0
			21:20	7.2	6.7	0.0
			21:50	7.2	4.5	0.0
			22:20	6.1	3.6	0.0
			22:50	6.1	4.5	0.0
			23:20	6.1	4.5	0.0
			23:50	5.0	3.6	0.2
			00:20	5.0	3.1	0.2
			00:50	6.1	5.4	0.0
			01:20	6.1	4.0	0.0
			01:50	5.0	3.6	0.0
			02:20	6.1	6.3	0.0
			02:50	5.0	3.6	0.0
			03:20	5.0	4.5	0.0
			03:50	5.0	5.4	0.0
			04:20	5.0	4.0	0.0
			04:50	6.1	5.4	0.2
			05:20	6.1	7.2	0.2
			05:50	6.1	7.6	0.0
			06:20	6.1	7.6	0.0
05.06.20	04:13	22:16	20:20	10.0	9.4	0.2
			20:50	10.0	8.0	0.2
			21:20	10.0	7.6	0.8
			21:50	10.0	7.6	0.8
			22:20	10.0	6.3	0.6
			22:50	10.0	6.3	0.6
			23:20	8.9	7.2	0.4
			23:50	8.9	6.7	0.4
			00:20	8.9	6.3	1.2
			00:50	8.9	5.8	1.2
			01:20	8.9	5.8	1.0
			01:50	8.9	5.4	0.4

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			02:20	8.9	5.4	0.4
			02:50	8.9	5.4	0.6
			03:20	8.9	4.0	0.6
			03:50	8.9	3.6	0.8
			04:20	7.8	3.6	0.8
			04:50	7.8	3.6	0.6
			05:20	8.9	4.0	0.6
			05:50	8.9	3.6	0.8
			06:20	8.9	4.0	0.8
18.06.20	04:04	22:26	21:20	12.2	4.0	0.0
			21:50	12.2	4.0	0.0
			22:20	12.2	4.0	0.0
			22:50	12.2	4.5	0.0
			23:20	12.2	4.5	0.0
			23:50	12.2	4.0	0.0
			00:20	11.1	0.9	0.0
			00:50	11.1	1.3	0.0
			01:20	11.1	2.2	0.0
			01:50	11.1	2.7	0.0
			02:20	10.0	2.7	0.0
			02:50	10.0	2.2	0.0
			03:20	10.0	0.4	0.0
			03:50	10.0	0.4	0.0
			04:20	10.0	0.9	0.0
			04:50	10.0	2.7	0.0
			05:20	11.1	3.1	0.0
			05:50	10.0	1.3	0.0
19.06.20	04:04	22:26	21:20	12.8	3.6	0.0
			21:50	12.8	5.4	0.0
			22:20	12.2	4.0	0.0
			22:50	12.2	3.6	0.0
			23:20	11.1	5.8	0.0
			23:50	11.1	6.7	0.0
			00:20	12.2	4.5	0.0
			00:50	11.1	4.5	0.0
			01:20	11.1	4.5	0.0
			01:50	11.1	4.5	0.0
			02:20	11.1	4.5	0.0
			02:50	11.1	4.0	0.0
			03:20	11.1	4.0	0.0
			03:50	11.1	4.0	0.0
			04:20	11.1	4.0	0.0
			04:50	11.1	4.0	0.0
			05:20	11.1	3.6	0.0

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			05:50	11.1	3.6	0.0
20.06.20	04:04	22:26	21:20	12.8	0.9	0.0
			21:50	12.8	2.7	0.0
			22:20	12.8	5.4	0.0
			22:50	12.8	5.8	0.0
			23:20	12.8	6.3	0.0
			23:50	12.8	5.8	0.0
			00:20	11.1	6.3	0.0
			00:50	11.1	6.7	0.0
			01:20	11.1	4.5	0.0
			01:50	11.1	2.7	0.0
			02:20	11.1	5.8	0.0
			02:50	11.1	6.7	0.0
			03:20	11.1	2.2	0.0
			03:50	11.1	3.1	0.0
			04:20	12.2	4.0	0.0
			04:50	12.2	3.1	0.0
			05:20	12.2	3.6	0.0
			05:50	12.2	3.1	0.0
21.06.20	04:04	22:27	20:50	13.9	1.3	0.0
			21:20	13.9	0.4	0.0
			21:50	13.9	0.4	0.0
			22:20	13.9	1.3	0.0
			22:50	13.9	4.5	0.0
			23:20	12.8	2.2	0.0
			23:50	12.2	3.6	0.0
			00:20	12.2	5.4	0.0
			00:50	12.2	4.5	0.0
			07:50	12.2	5.8	0.0
22.06.20	04:05	22:27	21:20	12.8	3.6	0.0
			21:50	12.8	8.9	0.0
			22:20	12.8	6.3	0.0
			22:50	12.8	6.3	0.0
			23:20	12.8	6.3	0.0
			23:50	12.8	9.8	0.0
			00:20	11.1	3.6	0.0
			00:50	12.2	2.7	0.0
			01:20	12.2	2.2	0.0
			01:50	11.1	2.7	0.0
			02:20	12.2	2.2	0.0
			02:50	11.1	1.3	0.0
			03:20	11.1	0.9	0.0
			03:50	11.1	1.3	0.0
			04:20	11.1	2.2	0.0

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			04:50	10.0	2.7	0.0
			05:20	10.0	2.2	0.0
23.06.20	04:05	22:27	21:20	12.8	0.9	0.0
			21:50	13.9	0.4	0.0
			22:20	15.0	2.7	0.0
			22:50	15.0	1.3	0.0
			23:20	15.0	1.3	0.0
			23:50	15.0	2.2	0.2
			00:20	13.9	8.0	0.2
			00:50	12.8	8.0	0.0
			01:20	12.8	9.4	0.0
			01:50	11.1	4.5	0.0
			02:20	11.1	1.3	0.0
			02:50	11.1	2.2	0.0
			03:20	11.1	3.1	0.0
			03:50	11.1	0.9	0.0
			04:20	11.1	1.3	0.0
			04:50	12.2	3.1	0.0
			05:20	11.1	3.1	0.0
24.06.20	04:06	22:27	21:20	12.2	3.1	0.0
			21:50	11.1	3.6	0.0
			22:20	12.2	4.0	0.0
			22:50	12.2	3.6	0.0
			23:20	12.2	3.1	0.0
			23:50	11.1	2.7	0.0
			00:20	15.0	2.7	0.0
			00:50	15.0	5.8	0.0
			01:20	13.9	4.5	0.0
			01:50	13.9	3.1	0.0
			02:20	13.9	2.2	0.0
			02:50	12.2	0.9	0.0
			03:20	12.2	3.1	0.0
			03:50	12.2	4.5	0.0
			04:20	12.8	4.0	0.0
			04:50	12.8	3.6	0.0
			05:20	13.9	6.7	0.0
25.06.20	04:06	22:26	18:20	16.1	7.2	0.0
			00:20	11.1	2.7	0.0
			00:50	12.2	2.2	0.0
			01:20	12.2	2.7	0.0
			01:50	12.2	3.1	0.0
			02:20	12.2	3.6	0.0
			02:50	12.2	3.6	0.0
			03:20	12.2	3.6	0.0

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			03:50	11.1	3.1	0.0
			04:20	11.1	3.6	0.0
			04:50	12.2	2.7	0.0
			05:20	12.2	3.6	0.0
			05:50	12.2	3.1	0.0
26.06.20	04:07	22:26	21:20	12.8	3.6	0.0
			21:50	13.9	4.0	0.0
			22:20	12.8	2.7	0.0
			22:50	12.8	4.0	0.0
			23:20	12.8	4.5	0.0
			23:50	12.8	4.0	0.0
			07:20	12.8	4.0	0.0
27.06.20	04:07	22:26	20:50	12.8	8.9	0.0
			21:20	12.8	8.9	0.0
			21:50	12.8	9.4	0.0
			22:20	12.8	8.0	0.0
			22:50	12.8	8.0	0.0
			23:20	12.8	7.6	0.0
			23:50	12.8	8.0	0.0
			00:20	12.8	3.1	0.0
			00:50	12.8	2.2	0.0
			01:20	12.2	3.1	0.0
			01:50	12.8	2.2	0.0
			02:20	12.2	2.7	0.0
			02:50	12.2	2.7	0.0
			03:20	12.2	2.2	0.0
			03:50	12.2	3.1	0.0
			04:20	12.2	2.2	0.0
			04:50	12.2	2.7	0.0
			05:20	12.2	3.1	0.0
			05:50	12.2	3.1	0.0
28.06.20	04:08	22:26	21:20	12.8	4.5	0.0
			21:50	12.8	5.4	0.0
			22:20	12.8	4.0	0.0
			22:50	12.8	3.1	0.0
			23:20	12.8	3.6	0.0
			23:50	12.8	4.0	0.0
			00:20	12.8	7.6	0.0
			00:50	12.8	7.2	0.0
			01:20	12.8	5.8	0.0
			01:50	12.8	6.3	0.0
			02:20	12.8	5.8	0.0
			02:50	12.2	6.3	0.0
			03:20	12.2	5.8	0.0

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			03:50	12.2	6.3	1.4
			04:20	12.2	4.5	1.4
			04:50	12.2	5.4	3.8
			05:20	12.2	5.4	3.8
			05:50	12.2	5.4	2.0
29.06.20	04:09	22:25	20:50	12.2	5.8	0.0
			21:20	12.2	5.4	0.0
			21:50	12.2	4.5	0.0
			22:20	12.2	4.5	0.0
			22:50	12.2	4.0	0.0
			23:20	12.2	4.5	0.0
			23:50	12.2	4.5	0.0
			02:20	12.8	4.5	0.0
			00:50	12.2	4.0	0.0
			01:20	12.2	4.5	0.0
			01:50	12.2	5.4	0.0
			02:20	12.2	4.0	0.0
			02:50	12.2	3.6	0.0
			03:20	12.2	3.6	0.0
			03:50	12.2	3.1	0.0
			04:20	12.2	2.7	0.0
			04:50	12.2	3.1	0.0
			05:20	12.2	3.1	0.0
30.06.20	04:10	22:25	20:50	11.1	5.8	0.0
			21:20	11.1	6.7	0.0
			21:50	11.1	6.7	0.0
			22:20	11.1	6.3	0.0
			22:50	11.1	5.4	0.2
			23:20	11.1	5.8	0.2
			23:50	11.1	5.8	0.0
			00:20	12.2	4.5	0.0
			00:50	12.2	5.4	0.2
			01:20	12.2	4.5	0.2
			01:50	12.2	5.4	0.2
			02:20	12.2	4.5	0.2
			02:50	12.2	5.4	0.0
			03:20	12.2	5.4	0.0
			03:50	12.2	4.5	0.0
			04:20	12.2	5.4	0.0
			04:50	12.2	5.4	0.0
			05:20	12.2	4.5	0.0
			05:50	12.2	5.4	0.0
01.07.20	04:11	22:24	20:50	8.9	3.6	0.0
			21:20	8.9	3.6	0.0

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			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			21:50	7.8	4.0	0.0
			22:20	7.2	3.6	0.0
			22:50	6.1	3.1	0.0
			23:20	6.1	3.1	0.0
			23:50	6.1	2.7	0.0
			00:20	11.1	6.3	0.0
			00:50	11.1	5.4	0.0
			01:20	10.0	5.4	0.0
			01:50	10.0	6.3	0.0
			02:20	10.0	6.7	0.0
			02:50	10.0	6.3	0.0
			03:20	10.0	7.2	0.0
			03:50	10.0	7.2	0.0
			04:20	10.0	7.6	0.0
			04:50	10.0	6.7	0.0
			05:20	10.0	6.3	0.0
			05:50	10.0	5.8	0.0
02.07.20	04:12	22:23	21:20	10.0	1.3	0.0
			21:50	10.0	1.3	0.0
			22:20	10.0	1.3	0.0
			22:50	10.0	2.2	0.0
			23:20	10.0	1.3	0.0
			23:50	10.0	0.9	0.0
			00:20	7.2	2.7	0.0
			00:50	7.2	2.7	0.0
			01:20	7.2	2.7	0.0
			01:50	6.1	3.1	0.0
			02:20	7.2	2.7	0.0
			02:50	6.1	1.3	0.0
			03:20	6.1	1.3	0.0
			03:50	6.1	2.2	0.0
			04:20	6.1	2.2	0.0
			04:50	6.1	2.2	0.0
			05:20	7.2	2.2	0.0
			05:50	7.2	2.2	0.0
03.07.20	04:13	22:22	21:20	12.2	2.7	0.0
			21:50	11.1	2.7	0.0
			22:20	11.1	0.4	0.0
			22:50	10.0	0.0	0.0
			23:20	10.0	0.4	0.0
			23:50	8.9	1.3	0.0
			00:20	10.0	0.9	0.0
			00:50	10.0	0.4	0.0
			01:20	8.9	0.9	0.0

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			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			01:50	8.9	0.9	0.0
			02:20	8.9	1.3	0.0
			02:50	8.9	0.9	0.0
			03:20	7.8	1.3	0.0
			03:50	7.8	1.3	0.0
			04:20	7.8	1.3	0.0
			04:50	7.8	0.9	0.0
			05:20	8.9	0.4	0.0
04.07.20	04:14	22:22	20:50	11.1	1.3	0.0
			21:20	11.1	2.2	0.0
			21:50	11.1	1.3	1.8
			22:20	11.1	1.3	1.8
			22:50	11.1	3.1	2.2
			23:20	11.1	2.2	2.2
			23:50	11.1	2.7	2..4
			00:20	8.9	0.4	2.4
			00:50	8.9	0.9	1.8
			01:20	10.0	0.4	1.8
			01:50	8.9	1.3	1.4
			02:20	7.8	0.9	1.4
			02:50	8.9	2.2	0.2
			03:20	8.9	2.2	0.2
			03:50	10.0	2.2	0.2
			04:20	10.0	1.3	0.2
			04:50	8.9	0.9	0.0
			05:20	8.9	2.7	0.0
			05:50	10.0	2.2	0.0
			06:20	10.0	1.3	0.0
05.07.20	04:15	22:21	21:20	11.1	6.3	0.0
			21:50	10.0	5.8	0.0
			22:20	10.0	6.3	0.0
			22:50	10.0	4.5	0.0
			23:20	10.0	5.8	0.0
			23:50	10.0	7.6	0.2
			00:20	11.1	2.7	0.2
			00:50	11.1	2.7	0.2
			01:20	11.1	2.7	0.2
			01:50	10.0	3.1	1.4
			02:20	10.0	3.1	1.4
			02:50	10.0	3.6	0.8
			03:20	10.0	4.5	0.8
			03:50	10.0	4.0	0.4
			04:20	10.0	4.5	0.4
			04:50	10.0	5.4	0.0

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			05:20	10.0	4.5	0.0
06.07.20	04:16	22:20	20:50	11.1	7.2	1.8
			21:20	8.9	8.9	1.8
			21:50	8.9	6.3	0.0
			22:20	8.9	5.8	0.0
			22:50	8.9	4.0	0.0
			23:20	8.9	3.6	0.0
			23:50	8.9	3.6	0.0
			00:20	10.0	6.7	0.0
			00:50	10.0	5.8	0.0
			01:20	10.0	6.3	0.0
			01:50	10.0	8.9	0.0
			02:20	10.0	6.7	0.0
			02:50	11.1	7.6	0.0
			03:20	11.1	7.6	0.0
			03:50	11.1	7.6	0.0
			04:20	10.0	7.2	0.0
			04:50	10.0	5.8	0.0
			05:20	10.0	6.3	0.0
			05:50	10.0	6.3	0.0
07.07.20	04:18	22:19	20:50	10.0	5.4	0.0
			21:20	8.9	3.1	0.0
			21:50	7.8	2.2	0.0
			22:20	7.2	2.7	0.0
			22:50	7.2	1.3	0.0
			23:20	7.2	1.3	0.0
			23:50	7.2	1.3	0.0
			00:20	8.9	4.5	0.0
			00:50	7.8	3.6	0.0
			01:20	7.2	3.1	0.0
			01:50	7.2	3.6	0.0
			02:20	6.1	4.0	0.0
			02:50	6.1	3.6	0.0
			03:20	6.1	4.0	0.0
			03:50	6.1	4.0	0.0
			04:20	7.2	4.0	0.0
			04:50	6.1	4.0	0.0
			05:20	7.2	4.0	0.0
			05:50	7.2	4.0	0.0
			06:20	7.8	4.0	0.0
08.07.20	04:19	22:17	20:50	10.0	2.7	0.0
			21:20	10.0	2.2	0.0
			21:50	8.9	2.2	0.0
			22:20	8.9	1.3	0.0

			Weather Conditions			
Date	Sunset	Sunrise	Time	Temperature (°C)	Wind Speed (m/s)	Daily Rainfall (mm)
			22:50	8.9	1.3	0.0
			23:20	8.9	0.9	0.0
			23:50	8.9	0.4	0.0
			00:20	7.2	2.2	0.0
			00:50	6.1	2.2	0.0
			01:20	6.1	2.2	0.0
			01:50	6.1	2.2	0.0
			02:20	7.2	2.2	0.0
			02:50	7.2	2.2	0.0
			03:20	6.1	2.2	0.0
			03:50	6.1	2.7	0.0
			04:20	5.0	2.7	0.0
			04:50	5.0	2.7	0.0
			05:20	5.0	2.7	0.0
			05:50	5.0	2.2	0.0

Appendix B

Wind Farms and Bats

Bats are at risk of mortality not only by direct collision with wind turbines, but also by barotrauma due to the very low air pressure in the wake of rotating turbine blades (Baerwald *et al*., 2009)[26]. Barotrauma causes damage to soft tissues such as the lungs resulting in fatal internal bleeding. Bats will travel long distances to and from roosting sites, often via preferential commuting routes. The potential mortality risk from wind turbines can be significant if these intersect preferential commuting routes or include areas of high foraging activity. In order to assess the potential impact of a proposed wind energy development on bats, the new guidance concerning bats and onshore wind turbines published in 2019 (SNH *et al*., 2019)[2] recommends study and assessment of bat activity within the proposed wind energy development site and the surrounding landscape.

British bat species have slow reproduction cycles, mostly with only one young being born per year. Therefore, populations are vulnerable to even small losses of individual adult bats. Female bats spend the summer in maternity roosts, in which they give birth and rear their young. The same individual bats may return to the same maternity roost sites every year. Cumulative losses of individual bats from a particular roost site could potentially threaten the viability of a local breeding population.

Studies in the United States and mainland Europe have identified the autumn migration period (commuting to hibernating sites) as the peak risk period for bat mortality at wind turbines in these countries, accounting for about three-quarters of all bat deaths. The species affected make mass migrations on narrow routes, which have resulted in high mortality where these intersect with wind energy sites. The remaining quarter of deaths are of local resident species. High mortality rates have also been found throughout the year where wind turbines are positioned close to bat roosts, commuting or foraging routes.

In the UK there is a lack of data regarding the behaviour of bats during the migratory season and UK bats are believed to migrate to a lesser degree than individuals of the same species in mainland Europe. In the UK, there is no evidence of the narrow-front mass migrations mentioned above. However, there is growing evidence of short distance migrations even up to 100 km (between summer sites, autumn swarming or mating sites, and winter sites) for some UK species. There is also a lack of data on bat activity or bat mortality at operational UK wind farm sites. Therefore, any assessment of the potential impacts on bats must take regard of the potential similarities with foreign observations and can only be approximate.

During the main bat activity season, from approximately April to October (although the duration of the activity period at any location is dependent on the climate conditions) bats commute from their roosts to their feeding sites. Flight activity habits vary between species with some making regular flights at ‘rotor swept height’ (RSH); noctules usually commute along distinct routes, high over treetops and also feed high, often within RSH. Most species stay low during commuting and make use of landscape features such as hedges or trees but may still forage at higher altitudes and reach the RSH. European studies have shown the highest number of deaths in the following species; noctules, common pipistrelles and Nathusius’ pipistrelles. The very few UK records that have been collated show deaths of common pipistrelle, soprano pipistrelle, Natterer’s bat, and noctule. These records are mostly incidental observations during other studies.

Different species have different flight patterns, flight heights, foraging strategies and echolocation calls and therefore have different risk of collision with wind turbines. Table B.1 categorises which bat species are potentially most vulnerable to collision based on physical and behavioural characteristics.

[26] Baerwald, E.F., Edworthy, J. Holder, M. Barclay R.M.R. (2009). *A large-scale mitigation experiment to reduce bat fatalities at wind energy facilities.* Journal of Wildlife Management 73: 1077-1081.

Table B9.2.1: Collision Vulnerability of Different Bat Species

Factor	Risk of Turbine Impact		
	Low Risk	Medium Risk	High Risk
Habitat preference	Bats preferring cluttered habitat	Bats able to exploit background cluttered space	Bats preferring to use open habitat
Echolocation characteristics	• Short range • High frequency • Low intensity • Detection distance ~15m	Intermediate – more plastic in their echolocation	• Long range • Low frequency • High intensity • Detection distance ~80m
Wing shape	• Low wing loading • Low aspect ratio • Broadest wings	Intermediate	• High wing loading • High aspect ratio • Narrow wings
Flight speed	Slow	Intermediate	Fast
Flight behaviour and use of landscape	• Manoeuvre well • Will travel in cluttered habitat • Keeps close to vegetation Gaps may be avoided	Some flexibility	• Less able to manoeuvre • May avoid cluttered habitat • Can get away from unsuitable habitat quickly • Commute across open landscape
Hunting techniques	• Hunt close to vegetation • Exploit richer food sources in cluttered habitat • Gleaners	• Hunt in edge and gap habitat • Aerial hawkers	• Less able to exploit insect abundance in cluttered habitat • Aerial hawker • Feed in open
Migration	Local or regional movements.	Regional migrant in some parts of range	Long-range migrant in some parts of range
Conclusion	**Myotis spp.** **Long eared-bats** **Horseshoe bats**	**Serotine** **Barbastelle**	**Common pipistrelle** **Soprano pipistrelle** **Noctule** **Leisler's bat** **Nathusius' pipistrelle**

Table Notes

Table adapted from SNH *et al*. (2019).

When assessing the impact of a proposed wind farm on bat mortality, it is important to consider not only the bat activity recorded on site and the collision vulnerability of different bat species but also the level of potential vulnerability of populations of British bat species. In this way, negative impacts on the Favourable Conservation Status (FCS) at both the local and national level of rare or vulnerable species can be avoided. This comprehensive assessment can help to inform the assessment of potential risk and guide the decision-making process in relation to the mitigation options considered for the wind farm development. Table B.2 presents the level of potential vulnerability of populations of Scottish bat species.

Table B9.2.2: Potential Vulnerability of Scottish Bat Populations

Relative Abundance	Collision Risk		
	Low Collision Risk	Medium Collision Risk	High Collision Risk
Widespread species			Common pipistrelle Soprano pipistrelle
Rarer species	Brown long-eared bat Daubenton's bat Natterer's bat		
Rarest species	Whiskered bat Brandt's bat		Nathusius' pipistrelle Noctule bat Leisler's bat

Table Notes

Table adapted from Wray *et al.* (2010). Yellow – low population vulnerability; Orange – medium population vulnerability; Red – high population vulnerability.

Appendix C

Additional Ecobat Analysis Results

The additional pertinent information from the analysis is set out below in Table C9.2.1, which includes the key metrics for each species recorded at the detector locations.

Table C9.2.1: Median and Maximum Percentiles for Each Species at Each Detector Location During the Autumn Deployment

Location	Species / Species Group	Median Percentile (±CI*)	Maximum number of passes per night	Maximum Percentile	Number of records in comparison dataset
1	*Nyctalus* spp.	0 (0,0)	1	0	1
1	Common pipistrelle	21 (21, 21)	2	42	2
2	Common pipistrelle	0 (0,0)	1	0	1
3	Common pipistrelle	0 (49, 49)	3	56	7
4	Common pipistrelle	(53,53)	4	64	5
5	Common pipistrelle	56 (56.74.5)	9	82	17
5	Soprano pipistrelle	0 (0,0)	1	0	1
7	Daubenton's bat	0 (0,0)	1	0	1
7	Common pipistrelle	49 (49,71.5)	72	95	16
7	Soprano pipistrelle	42 (0,0)	2	42	1
8	Daubenton's bat	0 (0,0)	1	0	1
8	Common pipistrelle	75 (73,89.5)	222	98	19
8	Soprano pipistrelle	0 (0,0)	1	0	3
9	Common pipistrelle	21 (21,21)	2	42	2
10	Common pipistrelle	0 (0,0)	1	0	3
11	Common pipistrelle	0 (49,49)	3	56	9
11	Soprano pipistrelle	0 (0,0)	1	0	1
12	Daubenton's bat	0 (0,0)	1	0	1
12	Common pipistrelle	0 (42,79)	8	79	7
15	Daubenton's bat	0 (0,0)	1	0	1
15	Common pipistrelle	0 (53,53)	4	64	6
16	*Myotis* spp.	64 (0,0)	1	64	1
16	Daubenton's bat	21 (49,49)	3	56	4
16	Common pipistrelle	42 (49,49)	3	56	3
17	*Myotis* spp.	0 (0,0)	1	56	3
17	Daubenton's bat	21 (42,42)	3	56	10
17	Nathusius' pipistrelle	0 (0,0)	1	0	1
17	Common pipistrelle	0 (0,0)	3	56	3
18	*Myotis* spp.	0 (0,0)	1	0	1
18	Daubenton's bat	0 (0,0)	1	0	2
18	Common pipistrelle	70 (42,82)	9	82	6
19	Common pipistrelle	21 (21,21)	2	42	2
20	Common pipistrelle	56 (56,79)	17	88	12
20	Soprano pipistrelle	0 (0,0)	1	0	1

Table Notes

*A 95% confidence interval (CI) is a range of values which we can be 95% certain contains the true mean of the population.

Table C9.2.2: Median and Maximum Percentiles for Each Species at Each Detector Location During the Spring / Summer Deployment

Location	Species/Species Group	Median Percentile (±CI*)	Maximum number of passes per night	Max Percentile	Number of records in comparison dataset
01	Daubenton's bat	0 (0,0)	1	0	22
02	*Myotis* spp.	0(0)	1	0	44
02	Common pipistrelle	0(0,0)	2	53	186
03	Common pipistrelle	0(0,0)	2	53	186
04	Common pipistrelle	0(0)	1	0	186
05	Common pipistrelle	0(83.5,83.5)	20	89	186
06	Common pipistrelle	0(0,0)	2	0	186
07	Common pipistrelle	0(0,0)	2	53	186
08	Daubenton's bat	0(0)	1	0	22
08	Common pipistrelle	78(69,90.5)	288	99	186
09	Common pipistrelle	0(0,0)	1	0	186
10	Common pipistrelle	0(0,0)	3	65	186
11	Common pipistrelle	27(63,63)	4	73	186
12	Nathusius' pipistrelle	0(0)	1	0	1
12	Common pipistrelle	0(0,0)	2	53	186
13	Common pipistrelle	0(0)	1	0	186
14	Common pipistrelle	0(0,0)	2	53	186
15	*Pipistrellus* spp.	0(0)	1	0	194
15	Common pipistrelle	0(0,0)	1	0	186
17	*Myotis* spp.	0(0,0)	1	0	44
17	Common pipistrelle	53(53,53)	4	73	186
18	Common pipistrelle	27(53,53)	3	65	186
19	*Myotis* spp	0(0)	1	0	44
19	Common pipistrelle	53(0)	2	53	186
20	Common pipistrelle	53(53,63)	6	73	186

Table Notes

*A 95% confidence interval (CI) is a range of values which we can be 95% certain contains the true mean of the population.

Appendix D

DNA Analysis Results

The results of the DNA analysis carried out by ADAS on the bat droppings found at Croft House confirming the building as a common pipistrelle roost.

Sample ID: 454590801

Client Identifier: Strathy South Bothy, SEC8589

Sample Description: Bag of crushed droppings

Date of Receipt: 08/11/2019

Material Tested: Single dropping chosen for analysis

Determinant	Result	Method	Date of DNA Sequence Analysis
Cytochrome oxidase subunit 1 (COI) DNA sequence	*Pipistrellus pipistrellus*	DNA extraction from a single dropping followed by PCR amplification of a short fragment of the COI gene, DNA sequencing and comparison to a database of known DNA sequences for species identification	12/11/2019

Appendix E

Nathusius' Pipistrelle Call

A call from a Nathusius' pipistrelle with peak frequency of 38.95 kHz recorded on 23 September at 04:53 at location 17.