ScottishPower Renewables

Hare Hill Windfarm Repowering and Extension

Environmental Impact Assessment Report

Volume 3

Appendix 7.1: Ecology Assessment

November 2025

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Glossary

Term	Description
Application boundary	The red line planning boundary of the proposed Development site as shown on the site location plan. The application boundary encompasses the proposed wind turbines and associated infrastructure as part of the proposed Development.
Baseline	The existing conditions that prevail against which the effects of the proposed Development are compared.
Bat Activity Index	An index of the amount of use bats make of an area. Bat passes provide an index of bat activity rather than a measure of the actual number of individuals in a population.
Environmental Impact Assessment Report	A document reporting the findings of the EIA and produced in accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017.
Habitat	The area or environment where a species naturally occurs.
Hare Hill	The original Hare Hill, consented in 1997, comprising of 20 turbines.
Hare Hill Extension	The extension of Hare Hill, consented in 2015, comprising of 35 turbines.
Hare Hill Windfarm	The current operational Windfarm comprising of Hare Hill and Hare Hill Extension
Previously proposed Developable Area	The application boundary used in the planning of ecological surveys prior to when the current application boundary was confirmed.
Protected Species	Animals or plants protected by European and/or domestic legislation
Proposed Development	The turbines and all associated infrastructure required for Hare Hill Windfarm Repowering and Repowering
Site	Area within the application boundary within which the proposed Development lies.
Study area	The area within which ecological baseline surveys were carried out. This generally refers to the proposed Development plus a surrounding buffer, the size of which is determined by the specific survey being described. Details of the area covered are described in the methodology provided for each field survey (See Section 7.7 in Chapter 7: Ecology, Volume 1)

Abbreviations

Abbreviation	Definition
AICc	Akaike Information Criterion
BAI	Bat Activity Index
EIA	Environmental Impact Assessment
EoA	Evidence of Absence
GPS	Global Positioning System
GWDTE	Ground Water Dependant Terrestrial Ecosystems
HLC	Habitat Loss Calculations
LBAP	Local Biodiversity Action Plan
MMU	Minimum Mapping Unit
MYOsp	Myotis species
NVC	National Vegetation Classification
NYCLEI	Leisler's bat
NYCNOC	Noctule bat
NYCsp	Nyctalus species
PIPNAT	Nathusius' pipistrelle
PIPPIP	Common pipistrelle
PIPPYG	Soprano pipistrelle
PIPsp	Pipistrellus species
PLEAUR	Brown long-eared bat
PRA	Preliminary Roost Assessment
PRF	Potential Roost Features
SBL	Scottish Biodiversity List
QGIS	Geographic Information System
UKHab	UK Habitat Classification

1. Introduction

1. This Technical Appendix presents the following information in support of **Chapter 7: Ecology**, Volume 1 of the Environmental Impact Assessment (EIA) Report for Hare Hill Windfarm Repowering and Extension (the proposed Development):

    - A list of scientific (Latin) and common names of all ecological features that are referred to in the main chapter;
    - details of habitat surveys (UK Habitat Classification (UKHab) and National Vegetation Classification (NVC) surveys);
    - details of protected bat activity surveys, preliminary bat roost assessments, and carcass searching surveys;
    - details of protected mammal surveys; and
    - details of the Habitat Loss Calculations (HLC) methodology.

2. Latin Names

2. Latin names of all animal species referred to in **Chapter 7: Ecology**, Volume 1 of the EIA Report and within this Technical Appendix are given in **Table A7.1.** Latin names of all plant species referred to in **Chapter 7** and this Technical Appendix are given in **Table A7.2.**

Table A7.1 Latin and common names of animal species

Taxon group	Latin name	Common name
Amphibian	*Triturus cristatus*	Great crested newt
Fish	*Anguilla anguilla*	European eel
Fish	*Margaritifera margaritifera*	Freshwater pearl mussel
Fish	*Salmo salar*	Atlantic salmon
Fish	*Salmo trutta*	Brown trout
Terrestrial mammal	*Arvicola amphibius*	Water vole
Terrestrial mammal	*Lutra lutra*	Otter

Taxon group	Latin name	Common name
Terrestrial mammal	*Martes martes*	Pine marten
Terrestrial mammal	*Meles meles*	Badger
Terrestrial mammal	*Sciurus vulgaris*	Red squirrel
Terrestrial mammal - bat	*Myotis brandtii*	Brandt's bat
Terrestrial mammal - bat	*Myotis daubentonii*	Daubenton's bat
Terrestrial mammal - bat	*Myotis mystacinus*	Whiskered bat
Terrestrial mammal - bat	*Myotis nattereri*	Natterer's bat
Terrestrial mammal - bat	*Myotis* spp.	Mouse-eared bat species
Terrestrial mammal - bat	*Nyctalus leisleri*	Leisler's bat
Terrestrial mammal - bat	*Nyctalus noctula*	Noctule bat
Terrestrial mammal - bat	*Nyctalus* spp.	Noctule bat species
Terrestrial mammal - bat	*Pipistrellus nathusii*	Nathusius' pipistrelle
Terrestrial mammal - bat	*Pipistrellus pipistrellus*	Common pipistrelle
Terrestrial mammal - bat	*Pipistrellus pygmaeus*	Soprano pipistrelle
Terrestrial mammal - bat	Pipistrellus spp.	Pipistrelle bat species
Terrestrial mammal - bat	*Plecotus auritus*	Brown long-eared bat
Invertebrate	*Myrmica rubra*	Red ant

Table A7.2 Latin and common names of plant species

Taxon group	Latin name	Common name
Grass	*Cynosurus*	Dog's-tail grass species
Grass	*Deschampsia*	Hair grass species
Grass	*Holcus*	Soft-grass species
Grass	*Lolium*	Rye-grass species
Herb	*Euphrasia spp.*	Eyebright species
Herb	*Pinguicula vulgaris*	Common butterwort
Herb	*Ranunculus flammula*	Lesser spearwort
Herb	*Saxifraga stellaris*	Starry saxifrage
Herb	*Viola palustris*	Marsh violet
Moss	*Blindia acuta*	Sharp-leaved Blindia
Moss	*Scorpidium revolvens*	Rusty hook-moss
Moss	*Scorpidium spp.*	*Scorpidium* species
Moss	*Sphagnum denticulatum*	Cow-horn bog-moss
Moss	*Warnstorfia spp.*	*Warnstorfia* species
Rush	*Juncus*	Rush species
Rush	*Juncus articulatus*	Jointed rush
Sedge	*Carex demissa*	Common-yellow sedge
Sedge	*Carex flacca*	Blue sedge

Sedge	*Carex hostiana*	Tawny sedge
Sedge	*Carex panicea*	Carnation sedge
Sedge	*Carex pulicaris*	Flea sedge
Sedge	*Carex rostrata*	Bottle sedge

3. Survey Methods

3. Baseline surveys were carried out between 2023 and 2024 to assess the habitats present in the proposed Development boundary and to quantify use of the Site and surrounding area by protected species. Surveys were undertaken in a larger area than is now proposed for development, and this is referred to as the 'previously proposed Developable Area'.

4. Baseline ecological surveys comprised:

   - UKHab survey;
   - NVC survey;
   - bat surveys (including preliminary bat roost assessment, bat activity surveys, and carcass searches);
   - protected species surveys;
   - freshwater surveys (including fish habitat, electrofishing and macroinvertebrate surveys).

5. The survey methods are described below.

3.1 UKHab and NVC Surveys

6. UKHab and NVC surveys were undertaken between May and September 2024.

7. A UKHab survey was undertaken to identify and map habitats within the previously proposed Developable Area and a 250 m buffer. Habitats were classified in accordance with standardised methodology which determines the condition and distinctiveness of habitats through the recording of indicative species and/or features (Butcher, 2020). Additionally, an NVC survey (Rodwell, 2006) was undertaken in combination with the UKHab to define the vegetation communities found across the Site.

8. The aim of the UKHab survey was to map habitats and the survey was 'extended' to highlight the presence of any relevant ecological receptors encountered during this process such as protected species signs (including reptiles and potential bat roosts) and invasive non-native species. The survey characterised the habitats present and recorded any encountered signs of protected animals, reptiles and birds. The minimum mapping

unit (MMU) for this survey was a 400 m^2 polygon (20 m in length), which is an appropriate scale for mapping the entire study area. The habitat was digitally mapped using a suitable mobile application. For this survey, the UKHab-P system was adopted, and level 5 Primary Code hierarchy used where possible.

9. The NVC is a detailed phytosociological classification, which assesses the full suite of vascular plant, bryophyte and macro-lichen species within a certain vegetation type. The survey identified any notable or rare plant species present, and the results were used to produce of a detailed habitat map to assess impacts of development. This survey also informed the Groundwater Dependent Terrestrial Ecosystems (GWDTE) assessment (included in **Chapter 9: Hydrology, Geology and Hydrogeology**, Volume 1 of the EIA), which is a requirement under the Water Framework Directive.

10. NVC community and sub-community types were identified in the field (based on extensive surveyor experience) and delineated and mapped using Global Positioning System (GPS) as per Chapter 10 of the NVC Users' Handbook (Rodwell, 2006). Where areas were considered to comprise mosaics or complexes of different habitat communities, the proportion of each was estimated in percentage terms. Target notes were recorded to provide an overview of any additional features of ecological interest or to record areas of habitat too small to map.

11. Weather data summaries can be provided upon request.

3.2 Bat Surveys

12. Surveys were undertaken between May 2023 to September 2024 inclusive. Methods were based on best practice guidance from NatureScot *et al.* (2021) and included a walkover survey for potential bat roosts, bat activity surveys using automated static detectors, and fatality surveys that included searcher efficiency and carcass persistence trials.

3.2.1 Preliminary Roost Assessment (PRA)

13. A daytime walkover of the previously proposed Developable Area was undertaken in 2024 to identify and assess potential bat roosts. Notes were taken where any habitat suitable for roosting was encountered during the survey.

14. Survey of trees and any other structures with potential to support bat roosts within 200 m of each of the proposed turbine locations at the time was undertaken in accordance with NatureScot guidance (NatureScot *et al.*, 2021). Searches for potential roost features (PRFs) included a preliminary assessment of trees for any cracks, holes and crevices which would provide suitable roosting habitat. The inspection was undertaken from ground level with binoculars.

3.2.2 Bat Activity Surveys – Static Detectors

15. A total of 17 Song Meter 4 (SM4) detectors were deployed following the methods outlined by NatureScot *et al.* (2021) at sample locations within the previously proposed Developable Area (see **Figure 7.5** and **Table 7.9** in **Chapter 7: Ecology**) for a minimum of 30 nights per each detector deployment. The deployment periods for each season were as follows:

- spring 01/05/2023-15/06/2023;
- summer 21/07/2023-24/08/2023; and
- autumn 06/09/2023-06/10/2023.

16. Only nights on which suitable weather conditions (temperature 5°C or above at dusk; ground wind speed 8 m/s or less; little to no rain) were recorded have been used as "valid survey nights". The total number of valid survey nights per detector for spring, summer and autumn are shown in **Table A7.3.** Throughout the three deployment periods, the start and end dates for deployment varied. In spring, Detectors 1, 2, 4, 5, 6 and 10 started late on 05/05/23, and Detectors 12 and 14 and on 08/05/23. Likewise, some detectors were stopped one night earlier than the rest (Detector 1-4, 9 and 11-16). During the summer deployment, Detectors 1-6 and 10 started late on 22/07/23. During the autumn, Detector 10 was left out past the deployment end date of the rest of the detectors.

17. During the survey deployment periods, some static detectors were believed to have malfunctioned as they did not have any recordings (as shown in **Table A7.3**). On these occasions, the data and nights of effort were removed where appropriate. In spring, Detector 3 did not work until 04/06/23, and Detector 8 for the whole period. Additionally, Detector 5 malfunctioned for the whole of the summer and autumn period, and Detector 15 for the whole summer period.

Table A7.3: Total number of valid survey nights for each detector and deployment period

Detector ID	Spring	Summer	Autumn
1	33	23	16
2	33	23	16
3	10*	23	16
4	33	23	16
5	34	0*	0*
6	34	23	16
7	36	24	16
8	0*	24	16
9	35	24	16
10	34	23	16
11	35	24	16
12	31	24	16
13	35	24	16
14	31	24	16
15	35	0*	16
16	35	24	16
17	36	24	16
Total	**520**	**354**	**256**

** Detector was believed to have malfunctioned and so the survey effort was removed as appropriate.*
Source: Natural Power

18. The bat detectors were programmed to commence recording from 30 minutes before sunset and continue until 30 minutes after sunrise, to cover the active period for all species potentially encountered onsite. Detectors recorded data to a memory card which was downloaded and later analysed to identify species present. Relative bat activity levels have also been assessed for each bat detector following NatureScot *et al.* (2021) guidance by producing bat activity indices (BAI) based on the number of 'bat passes' recorded per night. Bat passes are defined as a fifteen-second recording file which contains at least one bat call. One sound file was counted as one bat pass and different species within the same 15 second sound file were counted as separate bat passes. Bat passes provide an index of bat activity rather than a measure of the actual number of individuals in a population. Bat activity indices are therefore indices of the amount of use bats make of an area. Further details on the static detector parameters and acoustic analysis are included in **Chapter 7: Ecology (in Section 7.7.4).**

19. Weather data summaries can be provided upon request.

3.2.3 Fatality Surveys

20. Surveys undertaken included bat and bird carcass surveys (fatality surveys) and associated searcher efficiency and carcass persistence trials. The surveys were undertaken weekly from July – September 2024 (1 week of clearing searches, plus 12 weeks of carcass searches). Specific survey methodologies are described below.

3.2.4 Carcass Searches

21. Bat and bird carcass searching was undertaken weekly (where possible) at 24 out of the 55 existing turbines throughout the survey period. Due to the number of turbines searched, each survey was undertaken over two days. The first visit was a clearance survey to ensure that there were no carcasses present prior to the start of the first survey, as the date these fatalities may have occurred is unknown. This allows carcass modelling to provide predictions based on a known time period for all carcasses retrieved. The searches were undertaken from sunrise until approximately midday, covering a search area of 25 m^2 centred around each turbine. Each area was systematically searched with the use of specialised and trained sniffer dogs. Photographs were taken of any carcasses found and any bat carcasses were stored appropriately (under the relevant license) for later identification. Bird carcasses were left in place to prevent the spread of avian flu. For each survey, the search rate was also calculated (the number of searched turbines divided by the total number of turbines).

22. The carcass search schedule for the areas surrounding Hare Hill and Hare Hill Extension turbines is presented in **Table A7.4** and **Table A7.5, respectively.** As the same number of turbines were searched on each visit, the calculated survey search rate was 0.4 for all of the surveys.

Table A7.4: Carcass search schedule undertaken at the proposed Development (Hare Hill Turbines). Boxes with crosses represent searched turbines

	Hare Hill Turbines													
Date	**T01**	**T02**	**T03**	**T04**	**T05**	**T06**	**T08**	**T10**	**T11**	**T13**	**T15**	**T17**	**T18**	**T19**
04/07/2024												X		
05/07/2024	X	X	X	X	X		X		X	X	X			X
11/07/2024											X	X		
12/07/2024	X	X	X	X	X		X	X		X				X
16/07/2024												X		
17/07/2024	X	X	X	X	X		X		X	X	X			X
25/07/2024														
26/07/2024	X	X	X	X	X		X		X	X		X		X
01/08/2024														
02/08/2024	X	X	X	X		X	X		X	X	X	X		X

	Hare Hill Turbines													
Date	**T01**	**T02**	**T03**	**T04**	**T05**	**T06**	**T08**	**T10**	**T11**	**T13**	**T15**	**T17**	**T18**	**T19**
08/08/2024														
09/08/2024	X	X	X	X	X		X		X	X	X	X		X
16/08/2024														
17/08/2024	X	X	X	X	X		X		X	X	X	X		X
22/08/2024												X		
23/08/2024	X	X	X	X	X		X		X	X	X			X
29/08/2024														
30/08/2024	X	X	X	X	X		X		X	X	X	X	X	
05/09/2024														
06/09/2024	X	X	X	X	X		X		X	X	X	X		X
11/09/2024														
12/09/2024	X	X	X	X	X		X		X	X	X	X		X
19/09/2024												X		
20/09/2024	X	X	X	X	X		X		X	X	X			X
26/09/2024														
27/09/2024	X	X	X	X	X		X		X	X	X	X		X

Source: Natural Power

Table A7.5: Carcass search schedule undertaken at the proposed Development (Hare Hill Extension Turbines). Boxes with crosses represent searched turbines

		Hare Hill Extension Turbines																
Survey ID	**Date**	**A21**	**A22**	**A29**	**B32**	**B33**	**B35**	**B37**	**B39**	**C40**	**C44**	**C45**	**C47**	**C48**	**C49**	**C52**	**D53**	**D54**	**D55**
1†	04/07/2024				X		X	X	X	X	X		X	X	X		X		X
1‡	05/07/2024		X	X															
2	11/07/2024				X		X	X	X	X			X	X	X		X		X
2	12/07/2024		X	X								X							
3	16/07/2024				X		X	X	X	X	X		X	X	X		X		X
3	17/07/2024		X	X															
4	25/07/2024			X	X		X	X	X	X	X		X	X	X		X		X
4	26/07/2024	X	X																
5	01/08/2024			X	X		X	X	X	X	X		X	X	X		X		X
5	02/08/2024		X																
6	08/08/2024			X	X	X		X	X	X	X		X	X	X		X		X
6	09/08/2024		X																
7	16/08/2024			X	X		X	X	X	X	X		X	X		X	X		X
7	17/08/2024		X																

		Hare Hill Extension Turbines																	
Survey ID	**Date**	**A21**	**A22**	**A29**	**B32**	**B33**	**B35**	**B37**	**B39**	**C40**	**C44**	**C45**	**C47**	**C48**	**C49**	**C52**	**D53**	**D54**	**D55**
8	22/08/2024				X		X	X	X	X	X		X	X	X		X		X
8	23/08/2024		X	X															
9	29/08/2024			X	X		X	X	X	X	X		X	X	X		X		X
9	30/08/2024		X																
10	05/09/2024			X	X		X	X	X	X	X		X	X	X		X		X
10	06/09/2024		X																
11	11/09/2024			X	X		X	X	X	X	X		X	X	X		X		X
11	12/09/2024		X																
12	19/09/2024				X		X	X	X	X	X		X	X	X		X		X
12	20/09/2024		X	X															
13	26/09/2024			X	X		X	X	X	X	X		X	X	X		X	X	
13	27/09/2024		X																

* *Note that this was an initial clearance search*

Source: Natural Power

Observer Efficiency Trials

23. To identify the efficiency of the search dogs, efficiency tests were carried out using a total of ten carcasses throughout the survey period (as shown in **Table A7.6**). Observer efficiency trials were carried out on 4 July, 30 August and 12 September 2024. Unobserved by the search dog, carcasses were positioned by surveyors at randomly selected points within the search radius of the turbines. Care was taken to avoid imparting human scent when handling carcasses by storing in appropriate containers and wearing gloves when placing the carcasses. The handler and dog then searched the locations as part of the standard carcass search process outlined in **Section A7.3.2.4.** Any carcasses not found by the dogs, were collected and taken off Site as soon as practicably possible. All 10 carcasses placed were detected, leading to a search efficiency estimate of 1.

Table A7.6: Dates, carcass condition and location of bats used in observer efficiency trials

ID	Date placed	Condition of carcass	Location	Species
1	04/07/2024	Whole	B32	Mouse
2	04/07/2024	Whole	C48	Mouse
3	04/07/2024	Whole	C49	Mouse
4	04/07/2024	Whole	D55	Mouse
5	30/08/2024	Whole	T04	Pipistrelle
6	30/08/2024	Whole	T08	Pipistrelle
7	30/08/2024	Part (wing only)	T11	Mouse
8	12/09/2024	Whole	T19	Noctule
9	12/09/2024	Whole	T17	Pipistrelle
10	12/09/2024	Whole	A22	Pipistrelle

Source: Natural Power

Predator Removal Rate Trials

24. Predator removal rate trials involved placing a total of ten bat carcasses (or proxies) at different locations within the Site for no more than 30 days. Where bat carcasses were not available, whole mice were used as substitutes. Carcasses were placed, with grid references and photographs taken, and a trail camera positioned to monitor the carcass to determine the length of time it took to be scavenged. Monitoring ceased once the

carcass was no longer present or if presence exceeded 30 days. If at the end of the monitoring period the carcass was still present, it was collected and removed off Site. The camera findings were then analysed to note any predation/movement of the carcass, by what species/date it was removed and time by which the carcass was fully removed. Full details of the carcasses placed for the predator removal rate trials are presented in Table A7.7.

25. The date and time the carcases were placed, date and time they were last observed and the date and time they were first gone were used to calculate relative minimum and maximum persistence times for each carcass placed. These data were then modelled using the carcass persistence module of the Evidence of Absence software (EoA; Dalthorp, 2019). Where possible, curves were fit separately for each species class. Three distributions were trialled to fit the model: exponential, Weibull, log-logistic and lognormal. The final model was selected based on minimising Akaike Information Criterion (AICc), a metric used to assess model fit.

Table A7.7: Carcasses used for predator removal rate trials

ID	Date placed	Bat	White mouse (proxy for bat)	Location
1	04/07/2024	0	1	B37
2	04/07/2024	0	1	T17
3	12/07/2024	0	1	C47
4	12/07/2024	0	1	A29
5	16/07/2024	0	1	D55
6	26/07/2024	0	1	T3
7	22/08/2024	1	0	Array A layby NS 66942 8145
8	22/08/2024	0	1	Array track layby NS 65240 9440
9	30/08/2024	1	0	T11
10	05/09/2024	0	1	T1
Total		**2**	**8**	

Source: Natural Power

3.3 Protected mammals

26. A summary of the survey effort is provided in **Table A7.8**. Protected mammal surveys were undertaken in March – November 2024 to determine the presence of mammal species for which there is legal protection including otter, water vole, red squirrel, pine marten and badger. Protected mammal surveys comprised a walkover of the previously proposed Developable Area.

27. Surveys for protected mammals were undertaken in suitable habitat within the previously proposed Developable Area and a 150 m buffer. Areas of the buffer that fell outside of the previously proposed Developable Area were surveyed by looking out from the boundary. The survey consisted of searches for field signs and sett/den/drey searches as described in Bang & Dahlstrøm (2001), Sargent *et al.* (2003), Harris *et al*. (1989), and Neal & Cheeseman (1996) amongst other sources.

28. Otter and water vole were surveyed for in suitable habitat (i.e. watercourses and the edges of water bodies) within the previously proposed Developable Area and a 250 m buffer (access permitting). Surveys for otter followed standard methods as described in Chanin (2003) and Sargent & Morris (2003), and surveys for water vole followed methods described by Strachan *et al.* (2011).

29. Weather data summaries can be provided upon request.

Table A7.8: Protected mammal survey effort in 2024

Date	Start time	End time
26/03/2024	10:00	16:00
20/05/2024	09:30	15:30
21/05/2024	09:00	15:00
23/05/2024	17:18	18:18
18/06/2024	11:30	15:30
19/06/2024	09:00	15:00
12/08/2024	10:30	12:00
19/08/2024	09:00	15:45
20/08/2024	09:00	14:00
23/08/2024	09:00	14:00
29/08/2024	09:00	16:30

17/10/2024	10:45	15:30
18/10/2024	10:00	14:00
11/11/2024	10:00	15:30
12/11/2024	10:00	15:30

Source: Natural Power

4. Results

4.1 UKHab and NVC Surveys

30. The results of the UKHab and NVC surveys at the proposed Development are shown in **Table A7.9**, and in **Figure 7.4** in **Chapter 7: Ecology**. NVC communities too small to map are shown in **Table A7.10**

31. Further details of the polygon-specific UKHab secondary codes can be provided upon request.

Table A7.9: Habitats recorded during the UKHab and NVC survey in 2024 within the study area at the proposed Development

UKHab Habitat Type (primary code)	Total area in previously proposed Developable Area (ha)	UKHab Secondary Codes	NVC Community	GWDTE Potential	Conservation Designation
Blanket bog (H7130); (f1a5)	24.3	13 Scattered dwarf shrubs 57 Peat 84 Windfarm 102 Sheep grazed 129 Wet moss lawns 403 Poor fen	M1	-	Annex 1 SBL LBAP
			M4	-	
			M19	-	
			M20	-	
Degraded blanket bog (f1a6)	726.1	13 Scattered dwarf shrubs 14 Scattered rushes 32 Scattered trees 57 Peat 84 Windfarm 102 Sheep grazed 129 Wet moss lawns 423 Grip	M15	Moderate	SBL LBAP
			M17	-	
			M19	-	
			M20	-	
			U4	-	

UKHab Habitat Type (primary code)	Total area in previously proposed Developable Area (ha)	UKHab Secondary Codes	NVC Community	GWDTE Potential	Conservation Designation
Other degraded raised bog (f1b7)	1.1	57 Peat 84 Windfarm 102 Sheep grazed	M19	-	LBAP
			M25	Moderate	LBAP
Fen marsh and swamp (f2)	0.4	14 Scattered rushes	M25	Moderate	LBAP
Purple moor-grass and rush pastures (f2b)	15.3	15 Rushes dominant 84 Windfarm 102 Sheep grazed 403 Poor fen 423 Grip	H12	-	SBL LBAP
			M2	-	
			M6	High	
			U4	-	
			MG9	Moderate	
Upland flushes fens and swamps (f2c)	127.0	10 Scattered scrub 14 Scattered rushes 15 Rushes dominant 32 Scattered trees 57 Peat 84 Windfarm 102 Sheep grazed 129 Wet moss lawns 312 Base-rich water 401 Soligenous 403 Poor fen	H12	-	Annex 1 SBL LBAP
			M4	-	
			M6	High	
			M10	High	
			M15	Moderate	
			M19		
			M20	-	
			M23	High	
			S10	-	
			MG9	Moderate	

UKHab Habitat Type (primary code)	Total area in previously proposed Developable Area (ha)	UKHab Secondary Codes	NVC Community	GWDTE Potential	Conservation Designation
		406 Swamp 408 Small sedge fen 416 Spring fen 423 Grip	CG10	High	
			U2	-	
			U4	-	
			U5	-	
Transition mires and quaking bogs - upland (H7140) (f2c8)	1.7	15 Rushes dominant 57 Peat 84 Windfarm 129 Wet moss lawns 403 Poor fen 411 Transition fen 412 Basin fen	M4	-	Annex 1 SBL LBAP
			M6	High	
			M9	High	
Other wetlands (f2f)	0.7	15 Rushes dominant 420 Valley fen	M23	High	N/A
Upland acid grassland (g1b)	0.4	-	U5	-	LBAP
Other upland acid grassland (g1b6)	463.4	10 Scattered scrub 13 Scattered dwarf shrubs 14 Scattered rushes 32 Scattered trees 57 Peat 84 Windfarm 102 Sheep grazed	H12	-	LBAP
			H18	-	
			M6	High	
			M15	Moderate	
			M19	-	
			M20	-	

UKHab Habitat Type (primary code)	Total area in previously proposed Developable Area (ha)	UKHab Secondary Codes	NVC Community	GWDTE Potential	Conservation Designation
		206 Felled 423 Grip 838 Disused quarry	M23	High	
			MG9	Moderate	
			U2	-	
			U4	-	
			U5	-	
			U6	Moderate	
Bracken (g1c)	10.6	10 Scattered scrub 13 Scattered dwarf shrubs	U20	-	N/A
Other lowland meadows (g3a6)	0.6	10 Scattered scrub 14 Scattered rushes	MG5	-	N/A
Mountain hay meadows (H6520) (g3b5)	0.3	-	MG5	-	Annex 1 SBL
Other neutral grassland (g3c)	1.1	14 Scattered rushes	MG6	-	LBAP
			M23	High	
Lolium-Cynosurus neutral grassland (g3c6)	28.1	14 Scattered rushes 100 Grazed 102 Sheep grazed	M23	High	LBAP
			U4	-	

UKHab Habitat Type (primary code)	Total area in previously proposed Developable Area (ha)	UKHab Secondary Codes	NVC Community	GWDTE Potential	Conservation Designation
			MG6	-	
Deschampsia neutral grassland (g3c7)	9.3	14 Scattered rushes	M23	High	LBAP
			M9	Moderate	
Holcus-Juncus neutral grassland (g3c8)	72.1	14 Scattered rushes 15 Rushes dominant 100 Grazed 102 Sheep grazed	MG10	Moderate	LBAP
Modified grassland (g4)	3.7	-	MG7	-	N/A
Upland Heathland (h1b)	15.6	84 Windfarm 102 Sheep grazed	H18	-	SBL LBAP
			M15	Moderate	
			U2	-	
			U4	-	
Dry heaths - upland (H4030) (h1b5)	62.9	10 Scattered scrub 12 Scattered bracken 13 Scattered dwarf shrubs 14 Scattered rushes	H10	-	Annex 1 SBL LBAP
			H12	-	

UKHab Habitat Type (primary code)	Total area in previously proposed Developable Area (ha)	UKHab Secondary Codes	NVC Community	GWDTE Potential	Conservation Designation
		32 Scattered trees 57 Peat 84 Windfarm 102 Sheep grazed	H18	-	
			M19	-	
			U4	-	
Wet heathland with cross-leaved heath - upland (H4010) (h1b6)	23.5	14 Scattered rushes 57 Peat 84 Windfarm 102 Sheep grazed 423 Grip	M15	Moderate	Annex 1 SBL LBAP
			M19	-	
			U4	-	
Hawthorn scrub (h3f)	1.6	12 Scattered bracken 13 Scattered dwarf shrubs	W21	-	N/A
Willow scrub (h3j)	0.2	14 Scattered rushes 836 Quarry - hard rock	None	-	N/A
Eutrophic standing water (r1a)	0.0	42 Pond 49 Freshwater - artificial	None	-	Annex 1 SBL LBAP

UKHab Habitat Type (primary code)	Total area in previously proposed Developable Area (ha)	UKHab Secondary Codes	NVC Community	GWDTE Potential	Conservation Designation
Mesotrophic lakes (r1b)	0.1	42 Pond	None	-	Annex 1 SBL LBAP
Sparsely vegetated land (s)	0.4	-	None	-	N/A
Suburban mosaic of developed and natural surface (u1d)	0.5	-	None	-	N/A
Upland birchwoods (w1e)	6.3	30 Semi-natural woodland	W11	-	Annex 1 SBL LBAP
Other broadleaved woodland (w1g)	59.8	29 Plantation	None	-	N/A
Other woodland - mixed - mainly broadleaved (w1h5)	2.7	29 Plantation	None	-	N/A
Other coniferous woodland (w2c)	601.9	29 Plantation 102 Sheep grazed 206 Felled	None	-	N/A

Source: Natural Power

Table A7.10: NVC communities too small to map recorded within the previously proposed Developable Area

Point number	Grid reference	NVC code	GWDTE potential	NVC notes
1	NS 72961 10499	MG5	-	South facing steep slope with unimproved neutral grassland. With red anthills.
2	NS 67287 10537	M23	High	-
3	NS 64655 10288	S22	-	Glyceria spp. Bog pool.
4	NS 65125 09912	M3	-	Small M3 bog pool, sparse vegetation, heavily utilised by sheep.
5	NS 66119 09253	M10	High	Small M10 feature.
6	NS 66120 09266	M10	High	Small M10a flush with frequent Pinguicula vulgaris, Carex hostiana, Scorpidium revolvens.
7	NS 66579 10011	M10	High	M10 flushing with Carex pulicaris, Pinguicula vulgaris, Carex panicea, Carex flacca, Sphagnum denticulatum.
8	NS 66577 09932	M10	High	M10 flushing with Carex demissa, Carex panicea, Carex hostiana, Blindia acuta, Scorpidium revolvens.
9	NS 66688 09623	M15	Moderate	Flushed wet heath with Carex pulicaris, Euphrasia spp., Carex flacca.
10	NS 65279 08088	M6	High	M6a flushing with Saxifraga stellaris, Viola palustris, Ranunculus flammula, Warnstorfia spp.

Point number	Grid reference	NVC code	GWDTE potential	NVC notes
11	NS 66279 07522	M10	High	M10a flushes with Carex demissa, Carex pulicaris, Warnstorfia spp., Scorpidium spp. Pinguicula vulgaris.
12	NS 65688 07572	M4	-	Patch of M4 Carex rostrata.
13	NS 66717 07702	M10	High	M10a flushing with Juncus articulatus, Pinguicula vulgaris, Carex demissa, Carex pulicaris, Carex flacca.
14	NS 66622 07657	M10	High	M10a flushing.

Source: Natural Power

4.2 Habitat Loss Calculations

32. HLC were carried out using a bespoke tool developed in Quantum Geographic Information System (QGIS) version 3.34. This tool imports shapefiles representing the different infrastructure features constituting the proposed Development, as well as a shapefile containing the UKHab primary code classifications across the Site based on the field surveys carried out for the proposed Development. Each infrastructure polygon is intersected with the habitat shapefile to allow calculation of the area of each habitat type that would be lost due to construction of that infrastructure feature. Any overlap in infrastructure features is dealt with in a hierarchical way to avoid inclusion of the same areas of habitat twice. Loss attributed to permanent infrastructure features, such as hardstanding, tracks, and finally turning heads is calculated first, followed by additional loss associated with temporary structures such as temporary construction compounds, cut and fill, laydown area and associated crane pad and borrow pits. Temporary infrastructure relates to features should be fully reinstated and therefore do not reflect permanent habitat loss.

33. Habitat loss was calculated separately for:

- 23 x permanent hardstandings (approx. 7458 – 7467 m^2 each)
- Proposed new track permanent (4.5 m wide track plus 0.5 m shoulders)
- Proposed floating track permanent (4.5 m wide track plus 0.5 m shoulders)
- Proposed existing upgraded track permanent (4.5 m wide track plus 0.5 m shoulders)
- 23 x Turning heads permanent (approx. 750 m^2 each)
- Substation permanent (approx. 80 x 100 m)
- 3 x construction compound temporary (approx. 75 x 75 m each)
- Construction compound with batching plant temporary (approx. 90 x 90 m)
- Cut temporary (various dimensions - 87928 m^2 within the extent used for the calculation)
- Fill temporary (various dimensions - 149857 m^2 within the extent used for the calculation)
- Laydown area temporary (approx. 2251 m^2)
- Cranepad for laydown area temporary (approx. 400 m^2)
- 4 x Borrow pits temporary (approx. 22517 – 26654 m^2)

34. Total habitat loss was calculated by summing the loss associated with each individual feature. Additionally, for each habitat type, the proportion of the total area of that habitat type recorded during surveys within the application boundary to be lost was also calculated.

4.3 Bat Surveys

Preliminary Roost Assessment

35. No potential bat roosting features (PRFs) were identified during the PRA undertaken within the previously proposed Developable Area.

Bat Activity Surveys – Static Detectors

36. A summary of the total recorded bat passes for each species and detector is shown in **Table A7.11** below. **Figure A7.1, Figure A7.2**, and **Figure A7.3** show the total bat passes per species for spring, summer and autumn respectively. **Figure A7.4** shows the overall bat passes per species per detector across the entire deployment period.

37. A comparison of the number of bat passes for each species per night across spring, summer and autumn are shown in **Figure A7.5, Figure A7.6**, and **Figure A7.7,** respectively.

38. The mean nightly weather conditions (temperature and wind speed) for all recorded bat passes across the entire deployment period are shown in **Figure A7.8**.

4.3.1 Bat Passes

Table A7.11: Total number of passes recorded for each bat species across the survey period (May – September 2023) at each detector location

Species	Detector Number																	Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Brown long-eared bat	2	7	1	40	0	0	2	0	0	3	0	1	4	0	0	2	1	63
Common pipistrelle	6,394	5,800	859	5,251	23	84	586	77	49	1,197	473	488	92	40	76	82	67	21,638
Leisler's bat	34	63	60	76	0	8	8	22	5	26	9	35	23	20	5	21	3	418
***Myotis* spp.**	34	363	40	1,019	1	9	145	3	5	70	9	20	13	0	2	13	16	1,762
Nathusius' pipistrelle	6	3	7	3	0	0	0	0	0	2	3	4	0	0	0	4	0	32
Noctule bat	12	17	28	17	0	8	0	21	4	3	7	13	10	1	2	8	1	152
***Nyctalus* spp.**	19	11	14	12	1	2	1	4	0	1	8	11	4	6	1	4	3	102
***Pipistrellus* spp.**	109	65	34	60	0	2	12	0	0	6	2	12	0	0	0	3	2	307
Soprano pipistrelle	403	929	461	1,131	10	41	266	40	29	203	116	349	96	34	27	74	62	4,271

Species	Detector Number																	Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Total	7,031	7,269	1,517	7,622	36	156	1,021	171	92	1,513	635	944	246	107	114	215	158	28,745

Source: Natural Power

Source: Natural Power

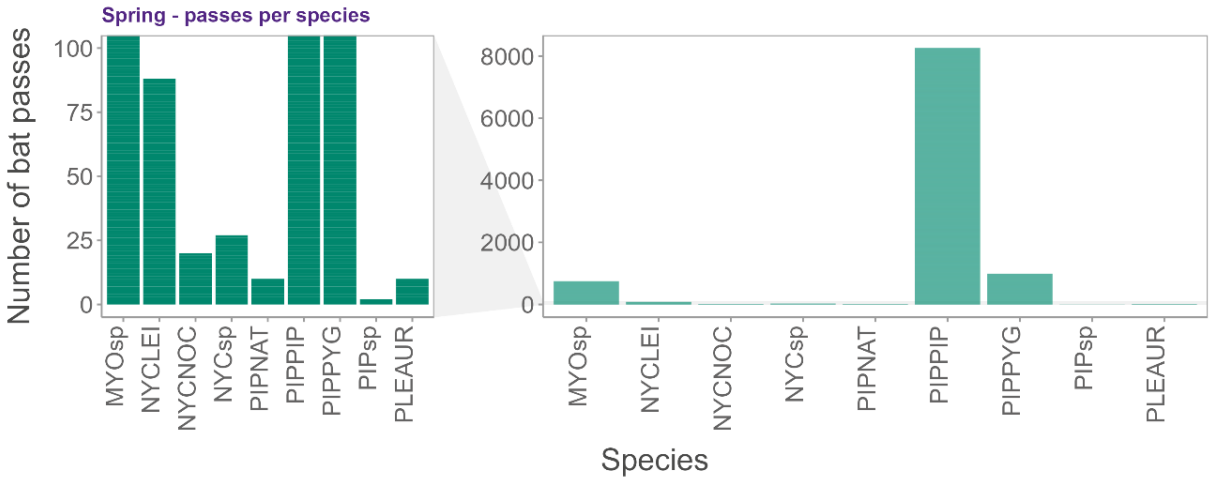

Figure A7.1: Total bat passes per species during spring deployment§

Source: Natural Power

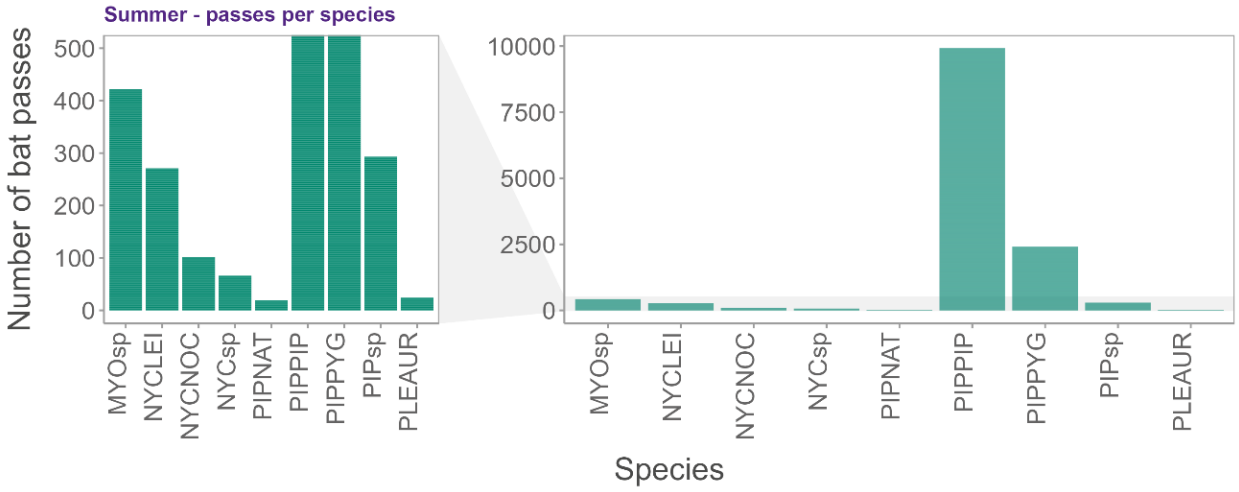

Figure A7.2: Total bat passes per species during summer deployment§

§ Species codes correspond to each species as follows: MYOsp – Myotis sp.; NYCLEI – Leisler's; NYCNOC – noctule; NYCsp – Nyctalus sp.; PIPNAT – Nathusis' pipistrelle; PIPPIP – common pipistrelle; PIPPYG – soprano pipistrelle; PIPsp – Pipistrellus sp.; and PLEAUR – brown long-eared

Source: Natural Power

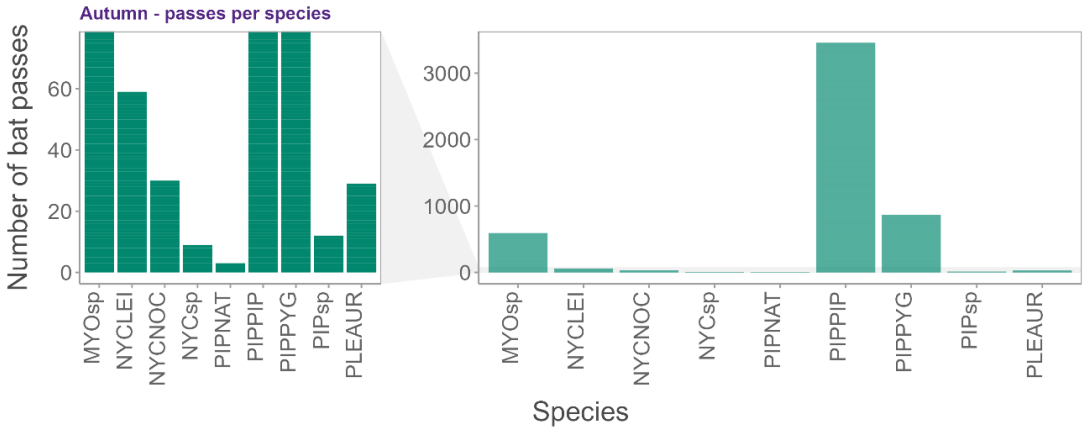

Figure A7.3: Total bat passes per species during autumn deployment§

Source: Natural Power

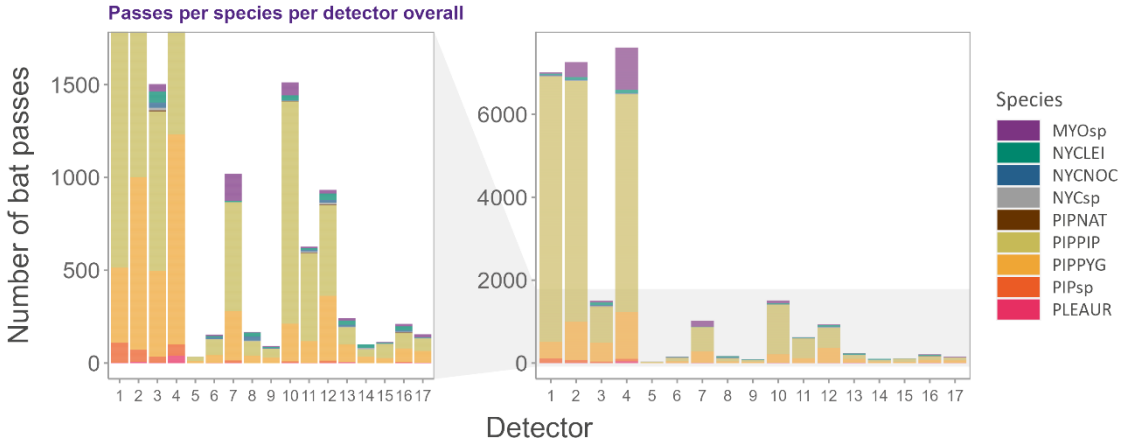

Figure A7.4: Overall bat passes per species per detector throughout the whole deployment period§

Source: Natural Power

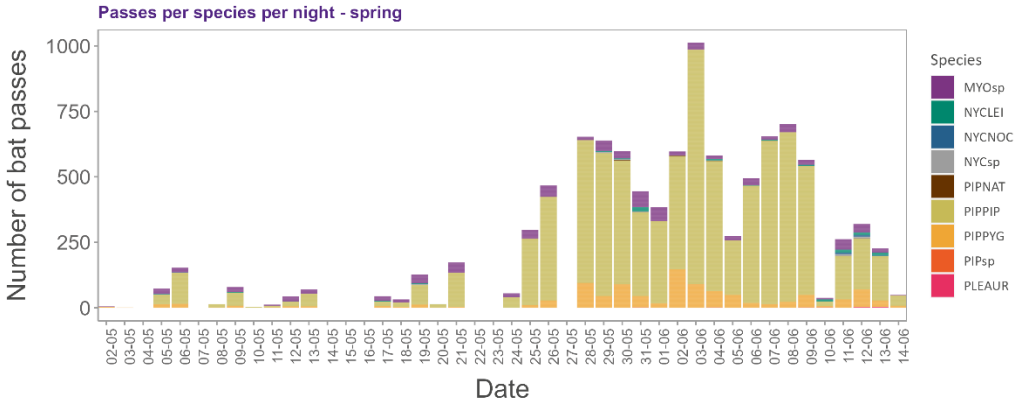

Figure A7.5: Bat passes for each species per night during spring deployment§

Source: Natural Power

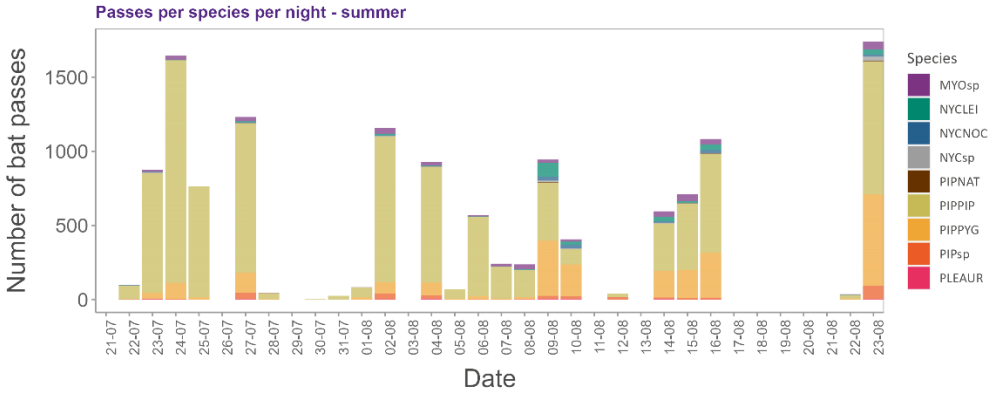

Figure A7.6: Bat passes per species per night during summer deployment§

Source: Natural Power

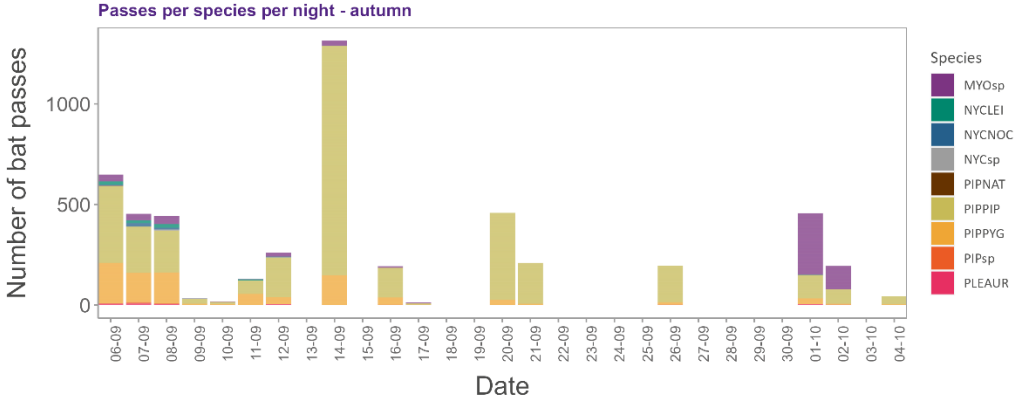

Figure A7.7: Bat passes per species per night during autumn deployment§

Source: Natural Power

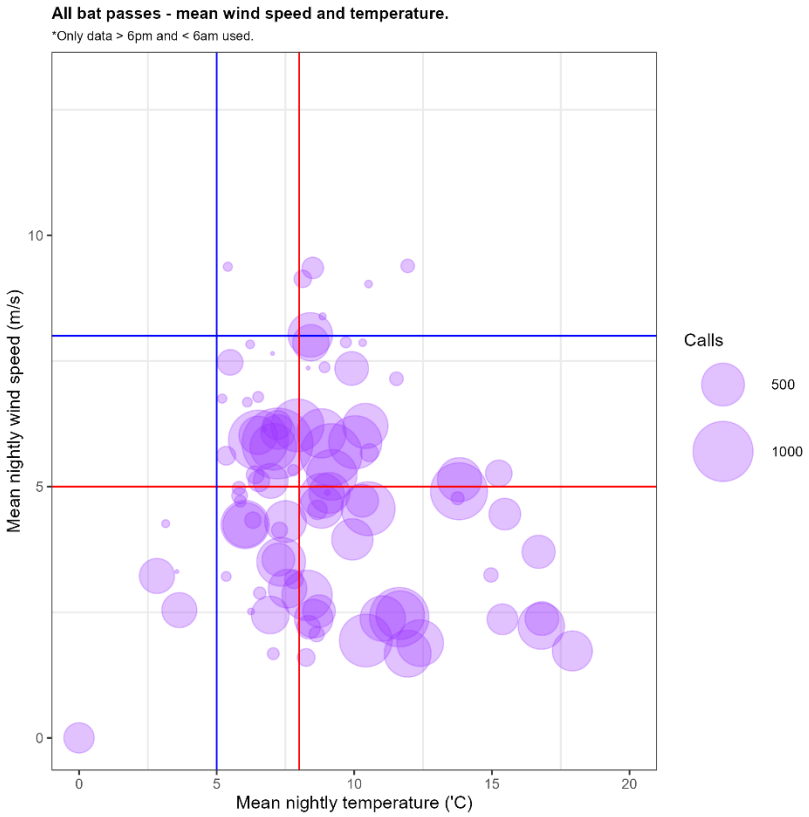

Figure A7.8: The mean nightly wind speed and temperature and all bat passes recorded across the entire deployment period

4.3.2 Bat Activity

39. A comparison of the overall BAI per species across the entire deployment period is shown in **Figure A7.9. Figure A7.10** shows the overall BAI for each species per season. **Figure A7.11** shows the overall BAI per detector.

Source: Natural Power

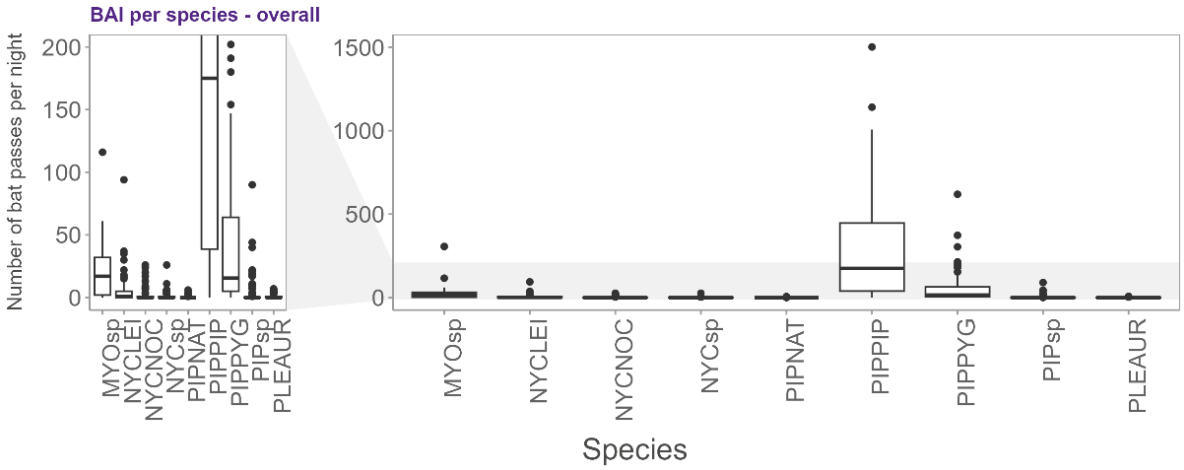

Figure A7.9: Overall BAI per species across the entire deployment. The plot on the left is scaled to enable better visualisation of less common species§

Source: Natural Power

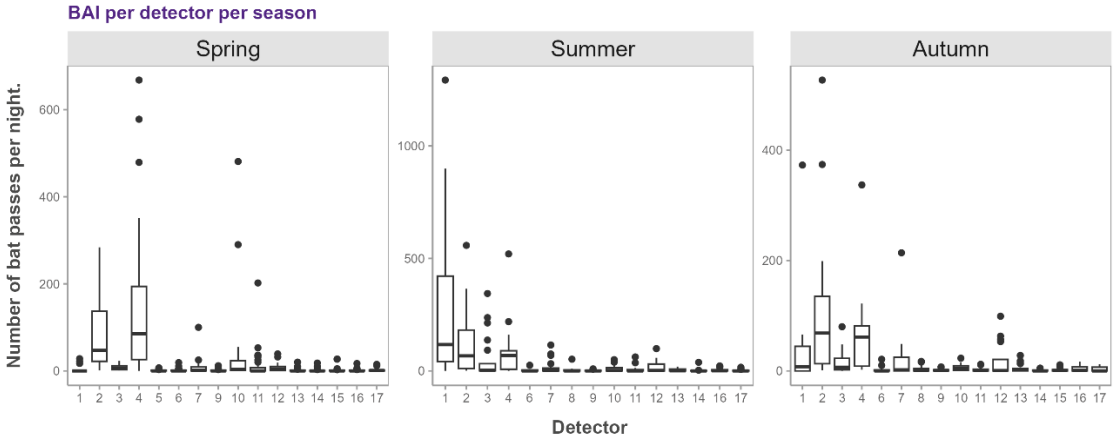

Figure A7.10: Overall BAI per species per season.

Source: Natural Power

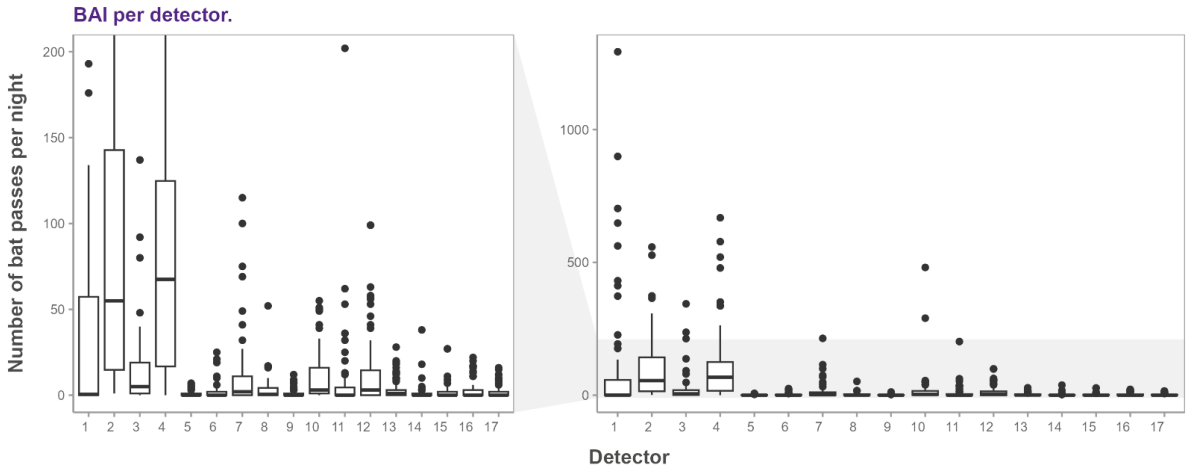

Figure A7.11: Overall BAI per detector. The plot on the left is scaled to enable better visualisation of less busy detectors

4.3.3 Bat Activity in Relation to Sunset (Emergence)

40. Bat species emergence activity in relation to sunset in spring, summer, and autumn respectively is presented for species with high collision risk only. Emergence activity has been presented for the following species: Leisler's bat (**Figure A7.12**, **Figure A7.13, Figure A7.14**); noctule (**Figure A7.15, Figure A7.16, Figure A7.17**); Nathusius' pipistrelle (**Figure A7.18, Figure A7.19, Figure A7.20);** common pipistrelle (**Figure A7.21, Figure A7.22**, **Figure A7.23**); and soprano pipistrelle (**Figure A7.24**, **Figure A7.25**, **Figure A7.26**).

Source: Natural Power

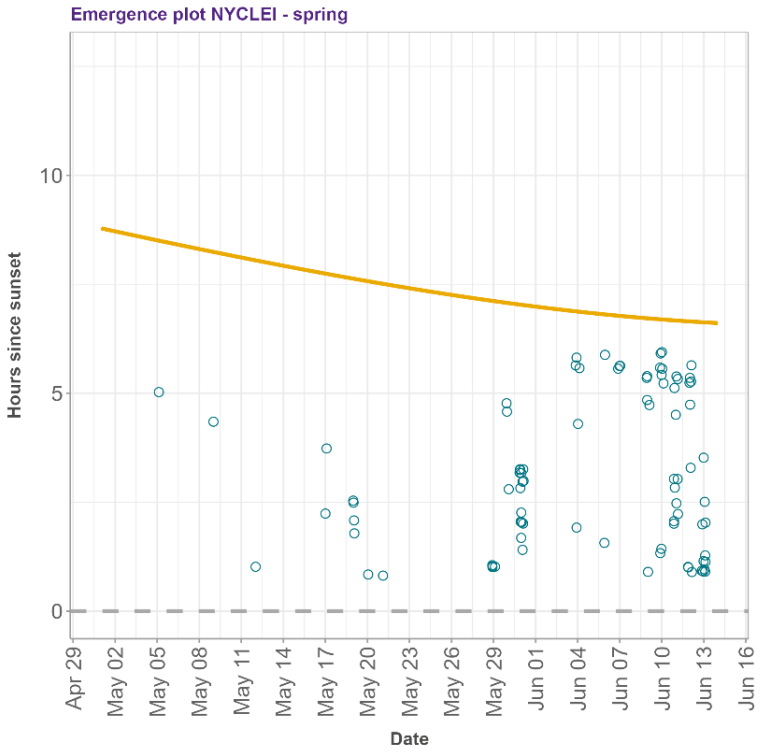

Figure A7.12: Leisler's bat activity in relation to sunset in spring

Source: Natural Power

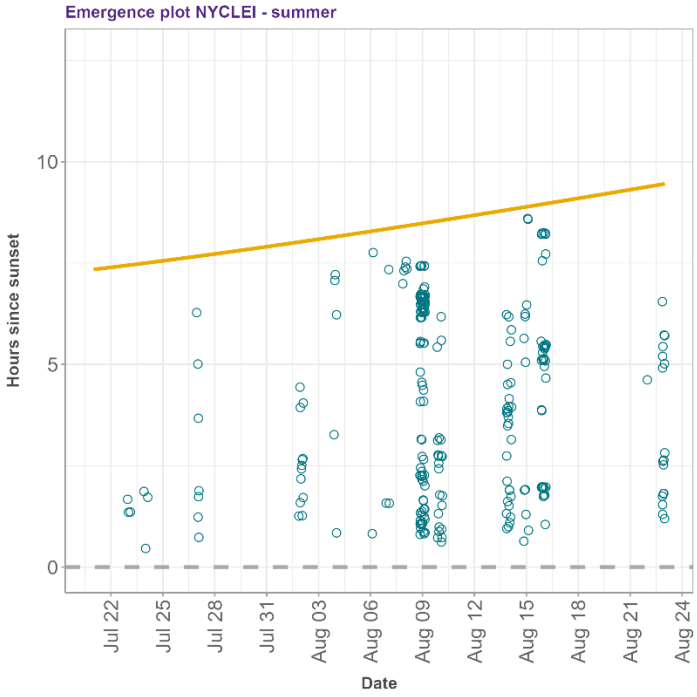

Figure A7.13 Leisler's bat activity in relation to sunset in summer

Source: Natural Power

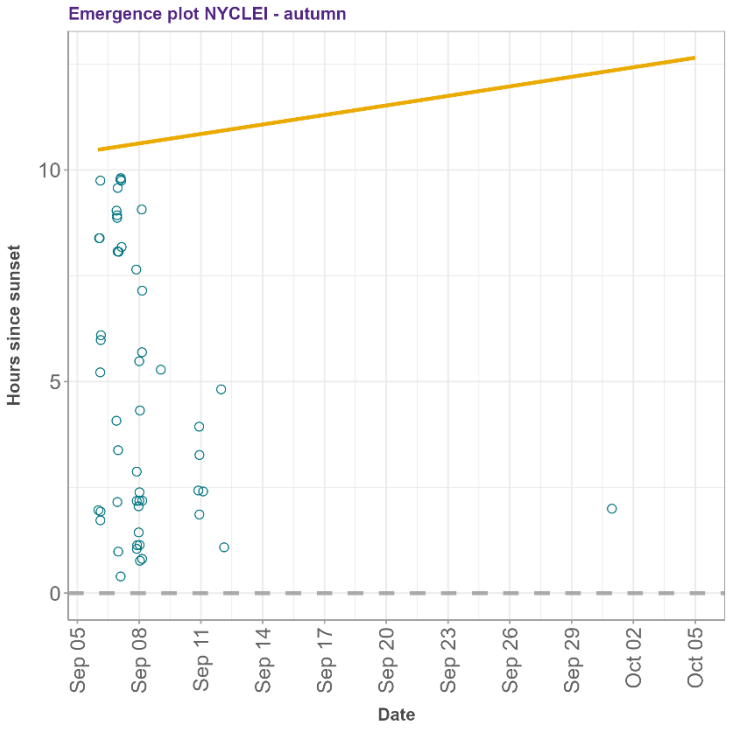

Figure A7.14: Leisler's bat activity in relation to sunset in autumn

Source: Natural Power

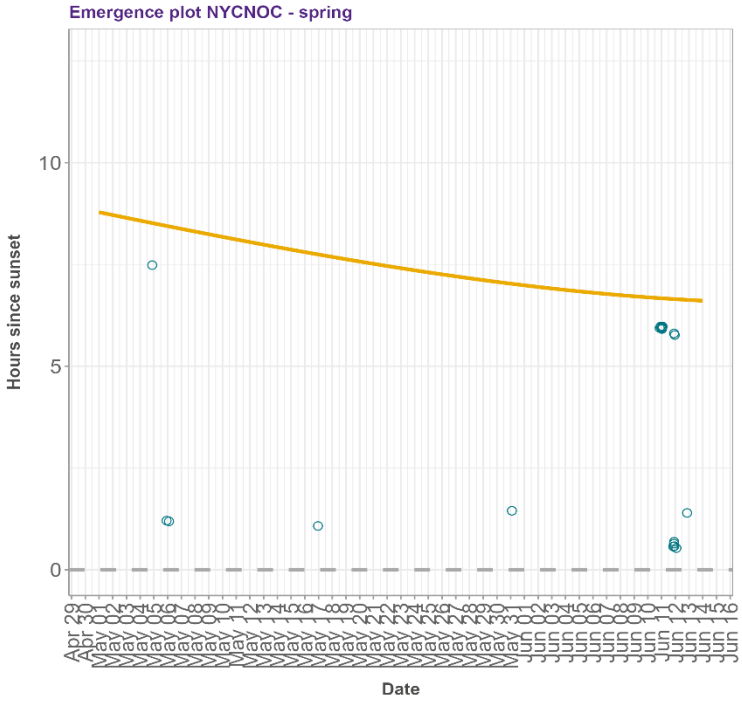

Figure A7.15: Noctule bat activity in relation to sunset in spring

Source: Natural Power

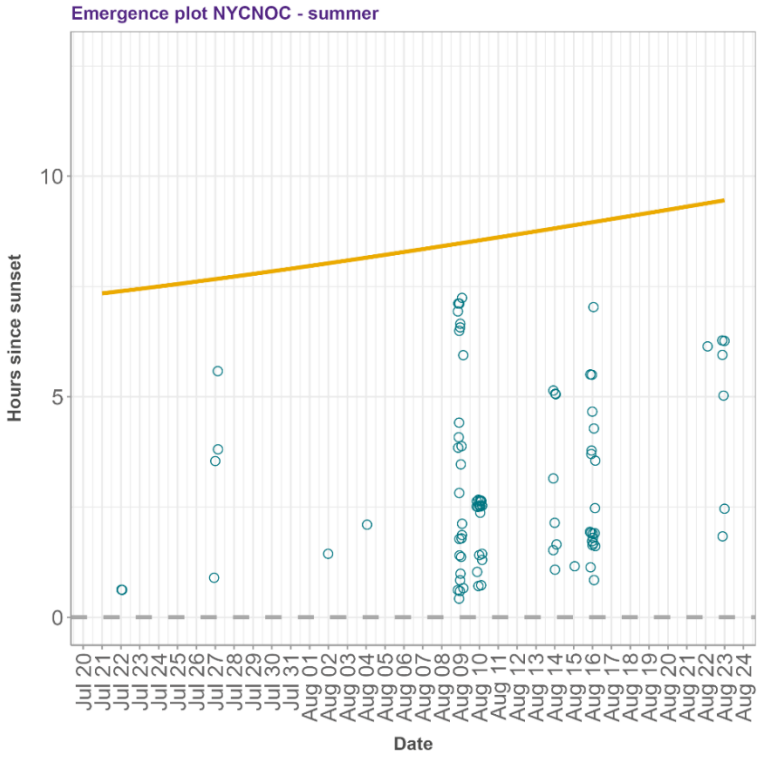

Figure A7.16: Noctule bat activity in relation to sunset in summer

Source: Natural Power

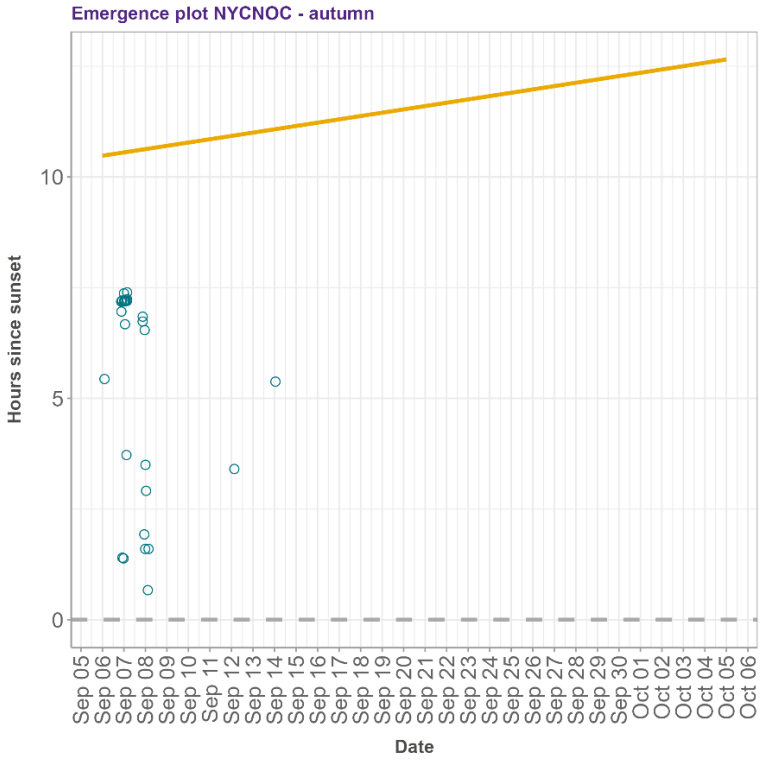

Figure A7.17: Noctule bat activity in relation to sunset in autumn

Source: Natural Power

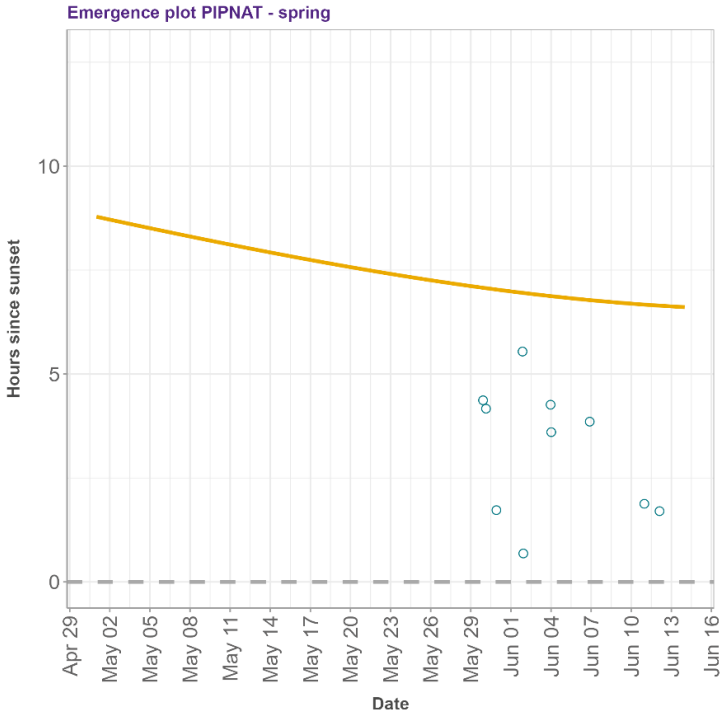

Figure A7.18: Nathusius' pipistrelle activity in relation to sunset in spring

Source: Natural Power

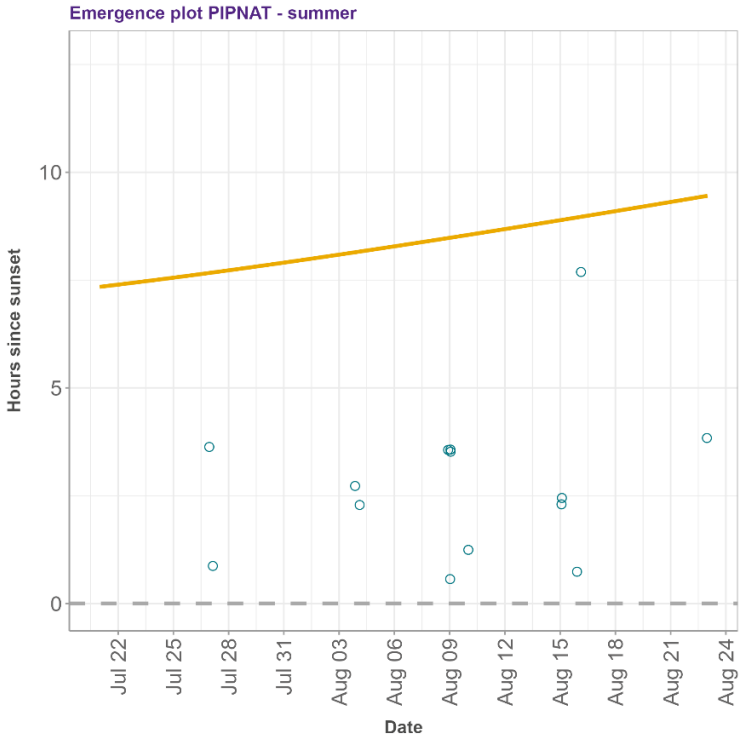

Figure A7.19: Nathusius' pipistrelle activity in relation to sunset in summer

Source: Natural Power

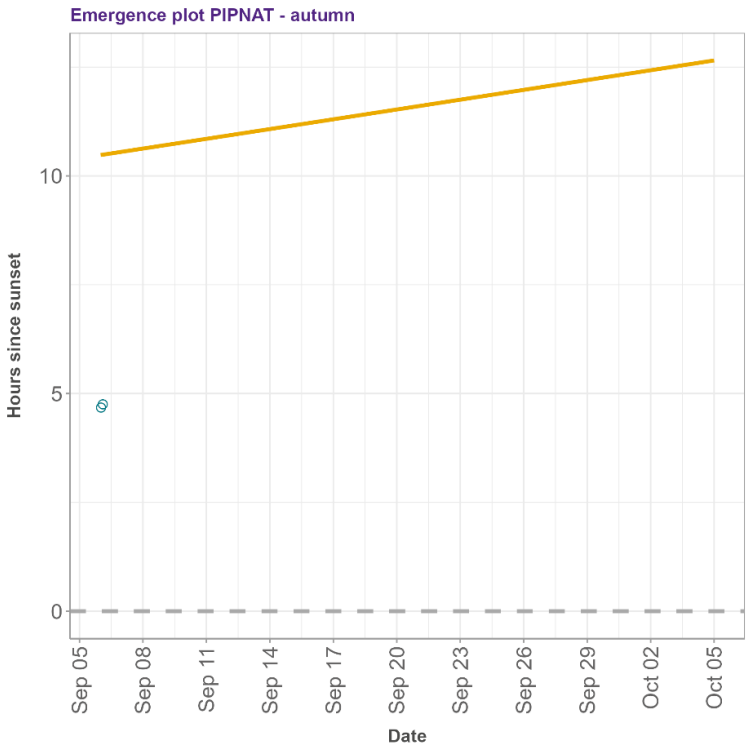

Figure A7.20: Nathusius' pipistrelle activity in relation to sunset in autumn

Source: Natural Power

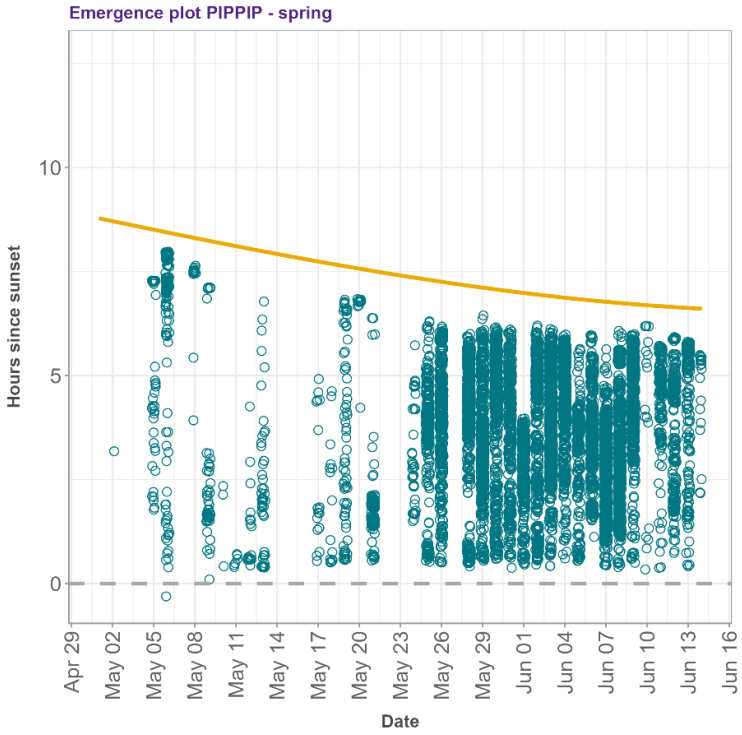

Figure A7.21 Common pipistrelle activity in relation to sunset in spring

Source: Natural Power

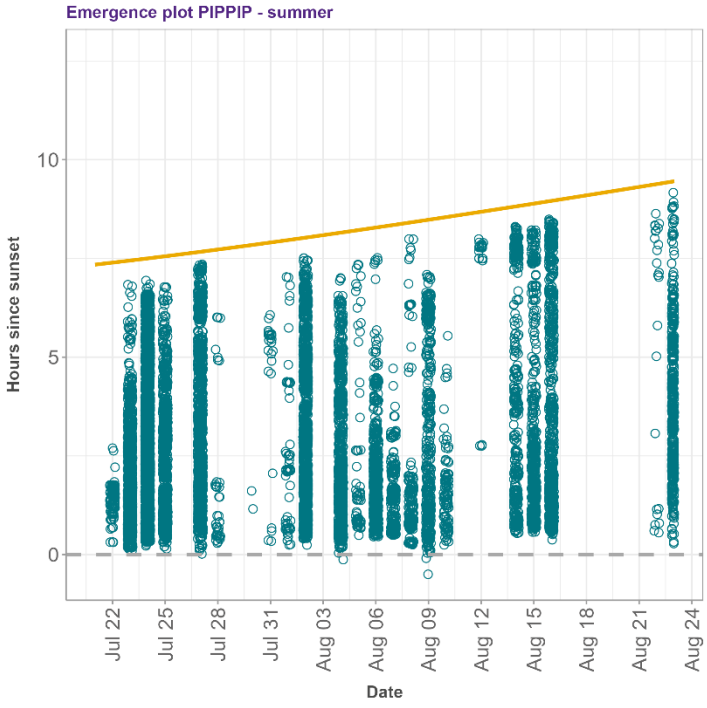

Figure A7.22: Common pipistrelle activity in relation to sunset in summer

Source: Natural Power

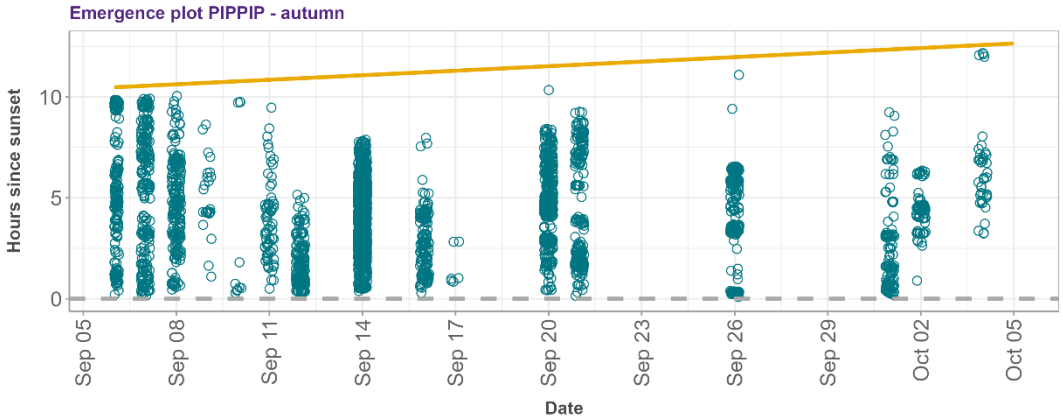

Figure A7.23: Common pipistrelle activity in relation to sunset in autumn

Source: Natural Power

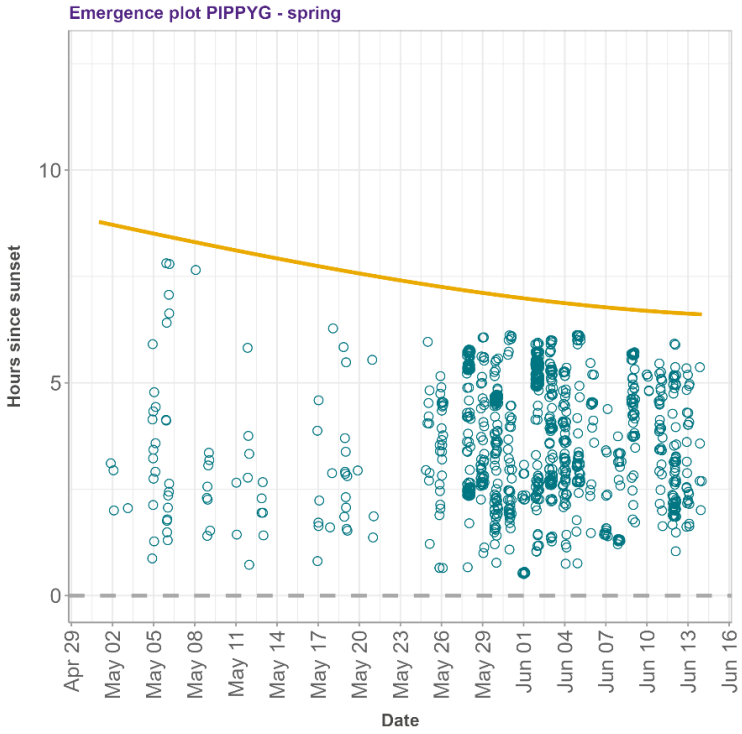

Figure A7.24: Soprano pipistrelle activity in relation to sunset in spring

Source: Natural Power

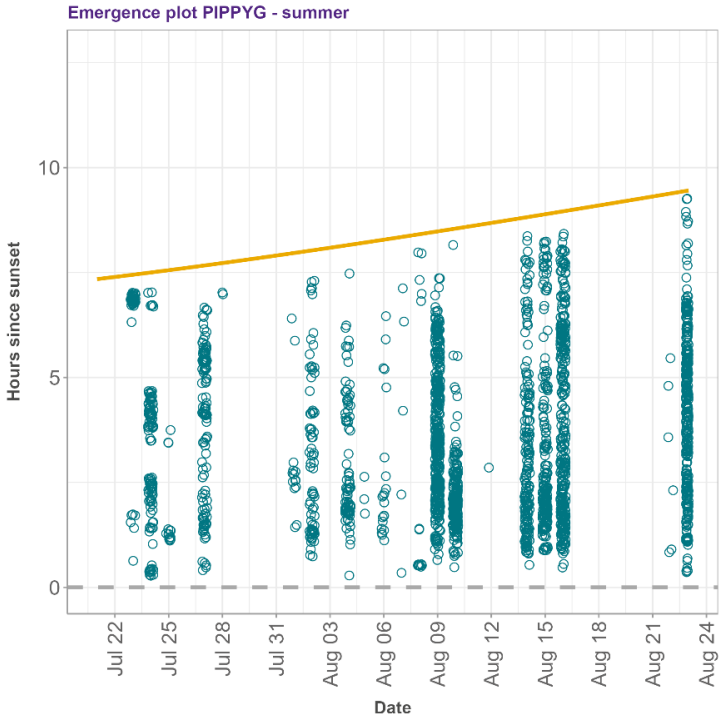

Figure A7.25: Soprano pipistrelle activity in relation to sunset in summer

Source: Natural Power

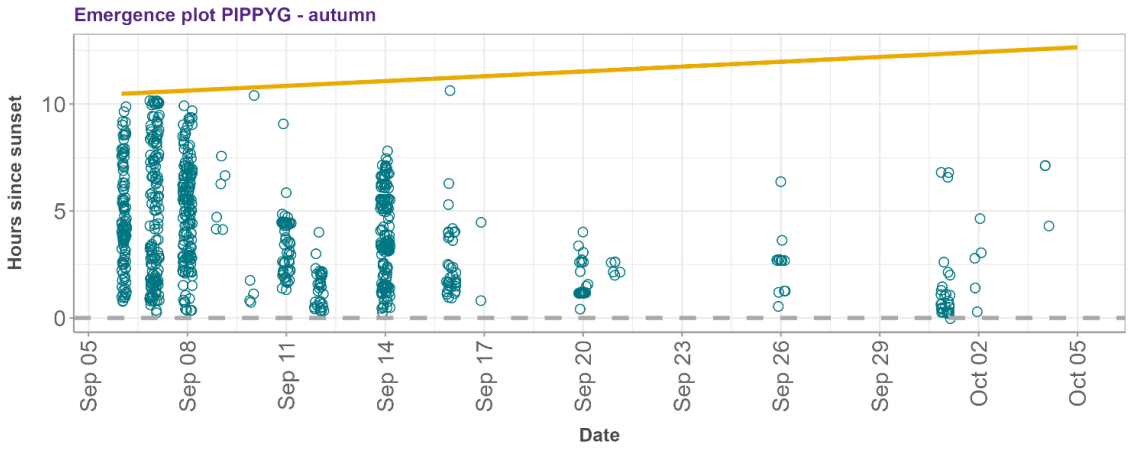

Figure A7.26: Soprano pipistrelle activity in relation to sunset in autumn

4.3.4 Ecobat Relative Activity Reference Ranges

41. The Ecobat reference ranges for calculating bat relative activity per survey deployment period for each bat species are listed in **Table A7.12**

Table A7.12: Ecobat reference ranges per survey deployment period per species. Reference ranges lower than 200 have been highlighted in bold (values must be greater than 200 to be confident in the associated species relative activity level).

	Bat species								
Season	***Myotis* spp.**	**Leisler's bat**	**Noctule**	***Nyctalus* spp.**	**Nathusius' pipistrelle**	**Common pipistrelle**	**Soprano pipistrelle**	***Pipistrellus* spp.**	**Brown long-eared bat**
Spring	2400	91	30	2566	16	42455	37953	76	163
Summer	4124	274	123	4237	44	93579	73290	1687	497
Autumn	2927	60	41	2164	24	57095	38385	1334	359

Source: Ecobat

4.3.5 Fatality Searches

42. The results of the carcass searches, observer efficiency trials and predator removal rate trials are included in **Chapter 7: Ecology**.

4.4 Protected mammals

43. A summary of non-confidential protected mammal signs recorded at the proposed Development is shown in **Table A7.13.** Confidential badger and otter records are detailed in **Technical Appendix 7.2: Confidential Ecology.**

Table A7.13: Protected mammal survey results at the proposed Development 2024

Species	Location	Confidence of record	Nature of record	No. of signs	Freshness of sign	Status	Comments
Badger	Confidential	Definite	Snuffle holes	1	Confidential	Confidential	Outlined in **Technical Appendix 7.2: Confidential Ecology**
Badger	NS 71559 11002	Definite	Latrine and snuffle holes	2	Recent	n/a	Single latrine on eastern edge of plantation approx. 5 m from open hillside. Latrine contains scat that is recent but not fresh, strong odour present. Foraging signs and snuffle holes within the general vicinity of latrine and mammal path.
Otter	NS 67284 09111	Definite	Spraint	1	Old	n/a	Old spraint remnants on grassy section of south bank of Polstacher Burn close to where burns intersect. Bones visible but minimal, no odour, slightly brown still but mostly bony remains.
Otter	NS 66402 08503	Definite	Spraint	1	Old	n/a	Old otter spraint found on large mossy rock nestling slightly into the south bank of Polhigh Burn. Spraint is very old with only loose bones and some staining still present, very weathered.
Pine marten	NS 68241 09034	Possible	Scat	1	Old	Potential	Potential pine marten/mustelid scat on mossy mound at the southern edge of plantation. Dark coloured, twisted/coiled. ~10 cm in length, no odour, considered old.

Source: Natural Power

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