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Over Hill Wind Farm Environmental Statement

Appendix 9.3

Bat Survey Technical Report

Prepared by LUC
January 2015

Project Title: Over Hill Wind Farm Environmental Statement

Client: Energiekontor UK Ltd.

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January 2015

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1 Introduction

Remit

1.1 LUC was commissioned by Energiekontor UK Ltd to undertake Bat Surveys at the proposed Over Hill site, in East Ayrshire. This report sets out methods employed and presents and discusses the findings of the surveys.

1.2 The surveys were undertaken to inform an Ecological Impact Assessment (EcIA) and the reader is referred to the Environmental Statement for further information relating to the development, the design process and consultation with relevant consultees.

Aim and objectives

1.3 The aim of the work reported here was to describe and characterise habitat suitability for, and field evidence of, bats within the site of the proposed Over Hill Wind Farm. The objectives were to:

- Undertake a desk study to identify records of extant bat populations at or near the site;
- Undertake a site visit to identify potential habitat for roosting bats;
- Undertake a suite of bat activity surveys, including:
    - Static detector surveys;
    - Manual transect surveys.
- Produce a series of maps detailing the extent and type of bat activity identified in the field;
- Identify and discuss any bat populations or activity that could be affected by the proposed development and may therefore require assessment and mitigation.

Site location

1.4 The Over Hill site is located in East Ayrshire, 4.5km north east of Dalmellington, to the north of the B741. It occupies a low plateau, partially defined to the west and east by the shallow valleys of an unnamed watercourse (in the west) and the Beoch Lane (a small river) in the east. A number of other watercourses drain the plateau and lead to those at the boundary.

1.5 The topography across and beyond the site is subdued. Across the site, which measures 4.2 km (north to south) by up to 2.5km wide, the altitudinal range is 270m to 330m. As such, the character of the semi-natural habitats within and around the site is upland but they are widely over-planted with coniferous plantation and/or improved for pastoral, agricultural purposes where drainage is possible.

1.6 The site boundary is shown in Figure 1, Annex 1.

Legislation, policy and initiatives

1.7 While legislative and policy issues are discussed in the EcIA, the following key elements of the legal, policy and initiative framework underpin the types of data collected during the survey:

- The Conservation (Natural Habitats etc.) Regulations 1994 as amended;
- Scottish Planning Policy;
- Scottish Biodiversity List;
- Ayrshire Local Biodiversity Action Plan; and the
- Local and former[1] UK Priority Species.

[1] The UK Biodiversity Action plan was repealed in 2012, however it's Priority Habitat and Species continue to provide a framework for conservation in the UK.

2 Methods

Overview

2.1 The surveys were co-ordinated by Steve Jackson-Matthews CEnv MCIEEM, a Natural England and SNH licenced bat worker. Steve was supported in the field by Sophie Punteney GradCIEEM, Juli Comery MCIEEM and Carolyn Goldie GradCIEEM.

2.2 The survey extended to relevant habitats falling within the red line boundary; Figure 1 of Annex 1 illustrates the red line boundary, hereafter referred to as the Study Area.

Background data and desk study

2.3 A number of data sources were contacted and searched for records of bats, including:

- Ayrshire Bat Group (records were requested within 10 km of a central site location);
- A search was made of the NBN gateway[2] for records within the same 10 km grid square as the site (records pre 1990 are not discussed).

Field surveys

Habitat Assessment

2.4 A habitat assessment was carried out on the 26th and 27th November 2013. The site's suitability to support roosting, foraging and commuting bats was considered. This assessment was undertaken to inform the locations for detailed surveys.

2.5 The habitat was assessed following guidance in current good practice[3] to determine the level of survey effort required. As the site does not support any built structures, only trees were considered with regard to their suitability to support roosting bats. The criteria set out in the table below were used to determine, and classify, roost potential.

[2] http://data.nbn.org.uk/ Search squares NS51- Accessed 03 December 2014
3 Hundt (2012) Bat Surveys – Good Practice Guidelines, 2nd Edition, Bat Conservation Trust, London

Table 2.1: Bat Roost Potential Categories

Category	Description
Known or confirmed bat roost	Bats or evidence of bats recorded, both of recent and/or historic activity. Works affecting a roost are licensable. Further survey (e.g. dusk emergence/dawn re-entry survey in accordance with best practice) is required to determine the bat species present, nature of roost and level of use before mitigation can be determined. Seasonal constraints may apply.
1 High BRP Trees with features capable of supporting a bat roost.	Features include holes, cracks or crevices that extend or appear to extend back to cavities suitable for bats. This may include rot holes, woodpecker holes, splits and flaking or raised bark which could provide roosting opportunities. Any ivy cover is sufficiently well-established and matted so as to create potential crevices beneath. Further survey is required to determine whether or not bats are present and if so, the bat species present, nature of roost and level of use. Appropriate mitigation and potentially licensing requirements may then be determined. Seasonal constraints may apply.
2 Low BRP	From the ground, tree appears to have features (e.g. holes, cavities or cracks) that may extend back into a cavity. However, owing to the characteristics of the feature, they are deemed to be sub-optimal for roosting bats. Alternatively, if no features are visible but owing to the size and age and structure, hidden features, sub-optimal for roosting bats, may occur that only an elevated inspection may reveal. In respect of ivy cover, this is not dense (i.e. providing BRP in itself) but may mask presence of BRP features. No further survey is required. Works may proceed using reasonable precautions (e.g. controlled working methods, supervision of a bat worker. Seasonal constraints may apply).
3 Negligible	An inspected tree that is considered not to have potential for roosting bats. No further survey or mitigation required.

Static Activity Surveys

2.6 Static detector surveys were undertaken within areas considered suitable through habitat assessment. Areas and habitats where foraging and commuting activity was likely to be greatest were targeted in order to increase likelihood of detection. These habitat types included; narrow plantation rides, Plantation rides which open onto exposed bog, riparian areas, scattered broadleaved trees within forestry plantation and scattered broadleaved trees within open areas.

2.7 The habitat assessment in conjunction with best practice guidelines[3] found the Study Area to be 'high risk' despite few roosting opportunities and dense Sitka Spruce plantations within the wider area. This is due to the likelihood of encountering Leisler's bats within this area of Scotland, a bat categorised at being at high risk of collision with wind turbines owing to flight behaviour[4].

2.8 Based on this assessment, monthly surveys have been undertaken at the Study Area, between May and October 2014.

2.9 The surveys were undertaken using Anabats (model SD2 and express). Six Anabat locations were surveyed during each survey month and each location was surveyed for a minimum of 5 nights per month. Detectors were timed to switch on at least 30 minutes prior to sunset and switch off at sunrise. The Anabat locations are shown on Figure 2, Annex 1 and a description of each location is provided in Table 2.2. Details of survey dates and weather conditions over the survey period are provided in Table 2.3.

[4] TIN051 edition 3 - Bats and onshore wind turbines Interim guidance – located from http://publications.naturalengland.org.uk/publication/35010. Accessed 03 December 2014.

Table 2.2: Details of Anabat Locations

Anabat Location Number	Grid Reference	Habitat description at location
1	NS 51179 10790	Plantation edge facing out onto open bog habitat. Open / edge habitat.
2	NS 50770 11811	Narrow forestry ride. Edge habitat.
3	NS 51148 12814	In a dry stone wall by a river. Riparian habitat.
4	NS 52045 11644	On woodland edge overlooking a small marshy burn. Edge / riparian habitat.
5	NS 51924 10541	Situated within young birch plantation, enclosed within forest. Edge habitat.
6	NS 51843 09336	Situated within scattered trees by road facing out onto open habitat.

Table 2.3: Summary of Static Activity Surveys

Month	Dates	Anabat Locations	No. of survey nights	Weather conditions during survey period
May	1 - 5	1 – 6	5	Cloudy with some light rain. Dusk temperatures ranging between 8 – 13°C.
June	10 – 15	1 – 6	6	Generally cloudy but dry with dusk temperatures ranging between 13 – 18°C.
July	9 – 14	1 – 6	6	One night of light rain but otherwise dry. Dusk temperatures 15 – 17°C.
August	14 – 18	1 – 6	5	Dry with some cloud. Dusk temperatures between 11 – 14°C.
September	10 – 14	1 – 6	5	Dry with some cloud. Temperatures ranging between 14 – 16°C.
October	22 - 26	1 – 6	5	Some rain, dusk temperatures generally 11 – 15°C, but fell to 5-6°C for the last two nights of deployment.

Transect Surveys

2.10 Two transect routes were undertaken each month, however, refer to limitations section for information regarding changes to transects across the season. The transect routes are shown on Figure 3, Annex 1.

2.11 In line with best practice guidance[3], transects started around sunset and continued for between 1.5 and 2.5 hours after sunset. Transects were walked slowly and BatNav GPS devices were used in conjunction with Anabat detectors in order to precisely map any bat passes. However, May surveys were completed using BatBox Duets and Garmin Etrex GPS units.

2.12 Full details of survey dates and conditions are summarised in Table 2.4 below.

Table 2.4: Summary of Transect Surveys

Date	Sunset	Weather conditions	Notes
1 May 2014	20:54	Dry and calm (Force 1, Beaufort scale) with scattered clouds. 8°C.	Transects 1 and 2
17 June 2014	22:02	Dry with light breeze (Force 2, Beaufort scale) and scattered clouds. 15°C.	Transects A and B
14 July 2014	21:51	Dry, with light breeze (Force 2, Beaufort scale) and overcast. 14°C.	Transects A and B
19 August 2014	20:43	Dry, with moderate breeze (Force 3, Beaufort scale) and overcast. 14°C.	Transects A and B
15 September 2014	19:35	Dry and partly cloudy with a light breeze (Force 2, Beaufort scale). 14°C.	Transects A and B
29 October 2014	16:46	Overcast and dry with moderate breeze (Force 2, Beaufort scale). 5°C.	Transects A and B

Limitations to Survey

2.13 The desk study records identified as part of this study should not be interpreted as a full account of bat activity within the Study Area. Existing desk study records are influenced by survey effort and focus.

2.14 The range over which static detectors are able to record bats is limited to between 5 and 100m depending on the strength of the echolocation (for example brown long-eared bats may be under recorded due to their weak echolocation). Weather conditions and the location of the microphone can also affect the level of detection. Whilst the limitations of static detectors are known, they are the most appropriate survey method available and their use is recommended within standard survey guidance.

2.15 It is not always possible to distinguish some pipistrelle, Myotis and Nyctalus bat calls to species level, for example, bats may change how they echolocate depending upon a number of factors including habitat type in which they are flying. This may mean that they alter the frequency of their calls or repetition rates of pulses, which can result in recorded calls being difficult to distinguish between similar species, this is a widely accepted limitation of bat surveys.

2.16 The data collected via the Anabats represents single bat passes and from this it cannot be determined if multiple passes are from a single bat foraging in the area or from several bats. Given this, caution is applied when reviewing the data as the weather information should also be considered as activity may be greater during periods of fine weather.

2.17 Normally the accepted survey season for bats occurs between April and October. However, LUC were not commissioned to carry out this work until late April so the earliest any survey could be carried out was May. This is not considered to alter the findings of the study owing to

the fact that activity levels in the early part of the year are expected to be generally low, indeed bat activity on the whole for the entire season was low.

2.18 May transects were carried out using hard-core forestry tracks to the south of the site as it was anticipated that much of the site would be inaccessible in the dark, as shown as Transects 1 and 2 in Figure 3 in Annex 1. It was later identified that tracks existed running north to south along both the west and east boundaries of the site, so transect routes were altered (Transects A and B) in order to allow for greater coverage of the survey area.

2.19 Transects during the May survey period were undertaken using Batbox Duets and Garmin Etrex GPS units; whilst transects in survey periods June-October were undertaken using Anabat SD2 units in conjunction with BatNavs. This is not considered to be a major limitation given that both survey methods are appropriate for this study, and both follow good practice guidance for transects surveys.

2.20 The October transect took place when the temperature was 5°C, which is below the generally accepted temperature of 9°C for a bat survey. This, however, is not thought to impact massively upon findings owing to the fact that static detectors were out in the Study Area within this month on nights of favourable weather conditions for bats and bats were only detected on a maximum of two nights by three out of six detectors. Therefore despite cold temperatures during this transect, bat activity was particularly low over this survey period.

3 Results

Desk study

3.1 Records of the following bat species were identified from the NBN Gateway as being active within the same 10 km grid square as the site:

- Unidentified bat;
- Unidentified pipistrelle bat;

3.2 Bat records from Ayrshire Bat Group identified the following species within 10km of the Study Area. These include:

- Nathusius' pipistrelle;
- Common pipistrelle;
- Leisler's bat.

3.3 Information from Ayrshire bat group also included details of a large hibernacula site close to New Cumnock, which lies approximately 8 km east of the Study Area. They described this site as being 'one of the most important in Scotland'.

Field surveys

Habitat Assessment

3.4 A large proportion of the Study Area consists of open moorland with large areas of conifer plantation. Within the Study Area there are a number of water courses of varying size and character. There are also a series of dry stone walls.

3.5 A house with associated agricultural out-buildings lies immediately adjacent to the eastern boundary of the Study Area. These buildings may provide potential roosting habitat for bats. Depending upon the character of the out-buildings, further potential for use as hibernacula may be possible.

3.6 Within the wider context, the Study Area is as an open area within the centre of a large expanse of dense Sitka Spruce forestry plantation. Networks exist via rivers and roads which may act to open up this area or provide commuting access to the Study Area.

3.7 Despite the site supporting few roosting opportunities and the dense Sitka spruce plantations within the surrounding area, the habitat assessment found the Study Area to be of 'high risk'. This is due to the likelihood of encountering Leisler's bats within this area of Scotland, a bat categorised at being at high risk of collision with wind turbines owing to their flight behaviour.

Static Activity Surveys - At Ground Level

3.8 Bat activity was recorded at all of the Anabat locations. The level of activity was considered to be low, with a slight peak of activity in September.

3.9 The species assemblage is consistent across the survey period, and at least six species of bat were recorded by the Anabats:

- Pipistrellus pipistrellus;
- Pipistrellus pygmaeus;
- Myotis daubentonii;
- Myotis mystacinus;

- Nyctalus leisleri, and;
- Nyctalus noctula.

3.10 Pipistrelle, Nyctalus and Myotis genus calls which could not be identified to species level were recorded simply as Pipistrelle, Nyctalus or Myotis sp.

3.11 No patterns were evident in the number of each bat species using the site and seemed to vary between detectors on a monthly basis. There were also no obvious patterns in habitat used by bats within the Study Area, apart from the highest activity being recorded by Anabat 3.

3.12 Leisler's activity was recorded in the Study Area in June, July, August and September, and was recorded at all of the Anabat locations within the Study Area. There were many recordings of Leisler's within the Study Area, with the highest number of recordings and recordings at all 6 Anabat locations in July.

3.13 Social calling was also taken into account during analysis, but levels recorded were very low throughout the season, suggesting this site is not used as an Autumn swarming site.

3.14 Tables containing the number of passes recorded each month across the whole survey period are provided in Annex 2. A series of maps showing the number of registrations recorded and the species composition at each Anabat location, from each survey month, are shown in Figures 4 – 9, Annex 1.

Transect Surveys

3.15 No bat activity was recorded during either the May or October transects.

3.16 Four species of bats were detected during transect surveys: common pipistrelle, soprano pipistrelle, Leisler's bat and an unidentified Myotis Sp.

3.17 Full details of the transect surveys are provided in Annex 3, with results mapped in Figures 10 – 15, Annex 1.

4 Discussion and Conclusions

Desk study

4.1 Records of bats were identified within the two 10km squares in which the survey area is located. Additionally records of a number of species of bats were identified from Ayrshire Bat Group suggesting that the surrounding area provides suitable habitat for these species. However, the difference in numbers of species recorded during this study and those obtained from external sources suggests that bats are generally under recorded within the local area.

4.2 The important hibernacula site located at New Cumnock is unlikely to be affected by the proposals. As the current study shows there is no evidence that this area is being used for autumn swarming by any species recorded.

4.3 Leisler's bat is considered to be a 'High Risk'[4] species as they are active within the rotor sweep of large turbines. The behaviour of these bats puts them at risk from such schemes as they can commute very long distances at high speed; flying straight across the landscape at great height for kilometres at a time. Their large wings mean they are less manoeuvrable, which in turn makes it difficult for them to adjust their course of flight quickly upon encountering a turbine, resulting in increased likelihood of collisions.

Field surveys

Habitat Assessment

4.4 Generally, moorland is considered to be a sub-optimal habitat for bats. It provides few roosting opportunities, linear features by which bats navigate and limited foraging potential. However, in this instance, features including watercourses and tree lines, may allow bats to be active within the Study Area. Watercourses are likely to attract bats to the area in order to forage on insect prey breeding there.

4.5 Coniferous plantation is generally unsuitable for roosting bats owing to the dense character of these plantations and trunks tend to be protected from damage by thick branches, reducing likelihood of crevices suitable for roosting bats. Broadleaved trees within the study area are for the most part very young and spindly, therefore are unlikely to support roosting bats.

4.6 A house with associated agricultural out-buildings lies immediately adjacent to the eastern boundary of the Study Area and may support opportunities for roosting bats. However, not being within the Study Area, this is only of relevance as providing suitable habitat within the wider area; the proposed development should cause no disturbance to any roosting bats within these buildings.

4.7 As only low numbers of bats were found to be using the Study Area, it is unlikely that roosts are present within the Study Area, or roosting is present in very small numbers.

4.8 Within the wider context, the site is more or less completely surrounded by dense, mature Sitka spruce plantation, which again, is generally unsuitable for roosting bats. Larger bat species, such as Leisler's, will easily be able to fly over these areas, but smaller bat species which are more generally associated with woodland edges, such as pipistrelles, would be unlikely to do this. There are, however, some open areas which may allow smaller bat species to gain access to the Study Area via linear features by which to navigate, such as watercourse and road corridors. These features may increase the likelihood of bats being present within the Study Area.

Static Activity Surveys

4.9 At least six species were recorded within the Study Area: soprano pipistrelle, common pipistrelle, Daubenton's bat, whiskered bat, Leisler's and noctule.

4.10 Low levels of bat activity were recorded across the season, with average nightly passes reaching a maximum of 58 (Daubenton's bat in October). As demonstrated in the Data tables (Appendix 2), Anabats routinely had no registrations across the season.

4.11 Of all 6 locations, Anabat 3 registered the greatest number of bat passes, primarily comprising pipistrelle species. The proximity of the detector to a nearby water course, i.e potential foraging corridor, accounts for this.

4.12 No obvious patterns were observed in bat activity across the season with sporadic species recordings evident at each of the different Anabat locations. The only detector which showed any level of consistency in species recorded was Anabat 1, located on a forest edge overlooking an area of open moorland. Species recorded here were predominantly soprano pipistrelle with lesser numbers of common pipistrelle, Leisler's and unidentified Nyctalus sp. (which is likely to have been Leisler's).

4.13 A relatively high occurrence of Leisler's bat was recorded within the Study Area, which is a species considered to be at 'High risk' from wind farm developments. Leisler's were recorded in the Study Area from June to September, with the highest number of recordings and recordings at all 6 Anabat locations in July, suggesting that the species is regularly using the site during the peak activity season. From July the number of recordings starts to taper off, and were not recorded during the October surveys. This suggests that by this time Leisler's have moved out with the Study Area to mate and hibernate.

4.14 It is likely that the overall low level of bat activity recorded is due to the general lack of connectivity to and from the Study Area. Excepting two watercourses, it is surrounded by tall forestry plantations which appear to reduce movement of smaller species of bats in particular, across the Study Area. The site appears to be used during the peak activity season by larger species of bat, such as Leisler's, which are able to fly higher above barriers to connectivity such as the large blocks of conifer plantations.

Transect Surveys

4.15 Very little activity was recorded during the transect surveys, and no bat activity was recorded during both the May and October transects, and no trends can be identified from this.

4.16 In total 4 species were identified from transect surveys: common pipistrelle, soprano pipistrelle, Leisler's bat and an unidentified Myotis Sp. Bat.

4.17 Activity was found to be at its highest in June, and the maximum number of bat passes detected on a single transect was 5 on Transect B.

4.18 Ultimately, the transect data supports the other data collected within the Study Area, suggesting the presence of bat population, exercising low activity.

Annex 1
Figures

Annex 2
Data Tables

Table 4.1: Static Anabat Results - May Period

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
1	1 May 2014								
	2 May 2014								
	3 May 2014								
	4 May 2014								
	5 May 2014								
	Total	0	0	0	0	0	0	0	0
	Average per night	0	0	0	0	0	0	0	0
2	1 May 2014								
	2 May 2014								
	3 May 2014								
	4 May 2014								
	5 May 2014								
	Total	0	0	0	0	0	0	0	0
	Average per night	0	0	0	0	0	0	0	0

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
3	1 May 2014								
	2 May 2014								
	3 May 2014								
	4 May 2014								
	5 May 2014								
	Total	0	0	0	0	0	0	0	0
	Average per night	0	0	0	0	0	0	0	0
4	1 May 2014								
	2 May 2014								
	3 May 2014								
	4 May 2014								
	5 May 2014								
	Total	0	0	0	0	0	0	0	0
	Average per night	0	0	0	0	0	0	0	0

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
5	1 May 2014								
	2 May 2014								
	3 May 2014								
	4 May 2014				1				
	5 May 2014								
	Total	0	0	0	1	0	0	0	0
	Average per night	0	0	0	0.2	0	0	0	0
6	1 May 2014				12	1			
	2 May 2014				1				
	3 May 2014			1					
	4 May 2014			1					
	5 May 2014								
	Total	0	0	2	13	1	0	0	0
	Average per night	0	0	0.4	2.6	0.2	0	0	0

Table 4.2: Static Anabat Results - June Period

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
1	June 10 2014								
	June 11 2014								1
	June 12 2014	1							
	June 13 2014		1						
	June 14 2015	3	1						
	June 15 2014								
	Total	4	2	0	0	0	0	0	1
	Average per night	0.667	0.333	0	0	0	0	0	0.167
2	June 10 2014	1							
	June 11 2014	1	1						
	June 12 2014	2	2						
	June 13 2014								
	June 14 2015	1	3				2		
	June 15 2014	1	1				2	1	
	Total	6	7	0	0	0	4	1	0
	Average per night	1	1.167	0	0	0	0.667	0.167	0

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
3	June 10 2014								
	June 11 2014						1		
	June 12 2014								
	June 13 2014								
	June 14 2015								
	June 15 2014								
	Total	0	0	0	0	0	1	0	0
	Average per night	0	0	0	0	0	0.167	0	0
4	June 10 2014				1				
	June 11 2014		1						
	June 12 2014								
	June 13 2014								
	June 14 2015		2						
	June 15 2014	2			2				2
	Total	2	3	0	3	0	0	0	2
	Average per night	0.333	0.5	0	0.5	0	0	0	0.333

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
5	June 10 2014					4			
	June 11 2014			2		2			
	June 12 2014			1		1	1		
	June 13 2014		1			1			1
	June 14 2015	1	2	2		2	6		
	June 15 2014	1	1				3		
	Total	2	4	5	0	10	10	0	1
	Average per night	0.333	0.667	0.833	0	1.667	1.667	0	0.167
6	June 10 2014		30	1					
	June 11 2014		28		1				
	June 12 2014	1	4				3		1
	June 13 2014		4		1		7		
	June 14 2015	1	3				4		
	June 15 2014		3	1			4		
	Total	2	72	2	2	0	18	0	1
	Average per night	0.333	12	0.333	0.333	0	3	0	0.167

Table 4.3: Static Anabat Results – July Period

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
1	9 July 2014		1				1		
	10 July 2014	1	4				4		
	11 July 2012	7	1				1		1
	12 July 2014		1						
	13 July 2014								
	14 July 2014								
	Total	8	7	0	0	0	6	0	1
	Average per night	1.333	1.167	0	0	0	1	0	0.167
2	9 July 2014		3						
	10 July 2014	2	7				2		
	11 July 2012	2	4	1			1		
	12 July 2014								
	13 July 2014		1						
	14 July 2014								
	Total	4	15	1	0	0	3	0	0
	Average per night	0.667	2.5	0.167	0	0	0.5	0	0

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
3	9 July 2014	1	1				1		
	10 July 2014	2					2		
	11 July 2012	26	20	1			1		
	12 July 2014								
	13 July 2014								
	14 July 2014								
	Total	28	21	1	0	0	4	0	0
	Average per night	4.833	3.5	0.167	0	0	0.667	0	0
4	9 July 2014						2		
	10 July 2014	1	2				6		
	11 July 2012	2					5		
	12 July 2014						1		
	13 July 2014						1		
	14 July 2014								
	Total	3	2	0	0	0	15	0	0
	Average per night	0.5	0.333	0	0	0	2.5	0	0

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
5	9 July 2014		1						
	10 July 2014	1					10		
	11 July 2012	1	1				2		
	12 July 2014						1		
	13 July 2014						3		
	14 July 2014			1			2		
	Total	2	2	1	0	0	18	0	0
	Average per night	0.333	0.333	0.166	0	0	3	0	0
6	9 July 2014		2			1	1		
	10 July 2014	1	4				3		
	11 July 2012								
	12 July 2014								
	13 July 2014								
	14 July 2014								
	Total	1	6	0	0	1	4	0	0
	Average per night	0.167	1	0	0	0.167	0.667	0	0

Table 4.4: Static Anabat Results - August Period

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
1	14 August 2014	4					1		
	15 August 2014	2							
	16 August 2014								
	17 August 2014								
	18 August 2014								
	Total	6	0	0	0	0	1	0	0
	Average per night	1.2	0	0	0	0	0.2	0	0
2	14 August 2014	12	4				3		
	15 August 2014								
	16 August 2014								
	17 August 2014								
	18 August 2014								
	Total	12	4	0	0	0	3	0	0
	Average per night	2.4	0.8	0	0	0	0.6	0	0

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
3	14 August 2014								1
	15 August 2014								
	16 August 2014								
	17 August 2014								
	18 August 2014								
	Total	0	0	0	0	0	0	0	1
	Average per night	0	0	0	0	0	0	0	0.2
4	14 August 2014	1	1				1		1
	15 August 2014								
	16 August 2014								
	17 August 2014								
	18 August 2014								
	Total	1	1	0	0	0	1	0	1
	Average per night	0.2	0.2	0	0	0	0.2	0	0.2

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
5	14 August 2014	5	2				3		
	15 August 2014								
	16 August 2014								
	17 August 2014								
	18 August 2014								
	Total	5	2				3		
	Average per night	1	0.4				0.6		
6	14 August 2014								1
	15 August 2014								
	16 August 2014								
	17 August 2014								
	18 August 2014								
	Total	0	0	0	0	0	0	0	1
	Average per night	0	0	0	0	0	0	0	0.2

Table 4.5: Static Anabat Results – September Period

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
1	10 September 2014	7	3						
	11 September 2014	8	1						
	12 September 2014	6	1						
	13 September 2014								
	14 September 2014								
	Total	21	5	0	0	0	0	0	0
	Average per night	4.2	1	0	0	0	0	0	0
2	10 September 2014	5		1					
	11 September 2014	11	2						
	12 September 2014								
	13 September 2014								
	14 September 2014								
	Total	16	2	1	0	0	0	0	0
	Average per night	3.2	0.4	0.2	0	0	0	0	0

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
3	10 September 2014	2	1						
	11 September 2014	16	9		8		2		
	12 September 2014	15		7	3				
	13 September 2014	11	2	7	3				
	14 September 2014								
	Total	44	12	14	14	0	2	0	0
	Average per night	8.8	2.4	2.8	2.8	0	0.4	0	0
4	10 September 2014	2							
	11 September 2014	5	1		2				
	12 September 2014	2							
	13 September 2014	2							
	14 September 2014	1							
	Total	12	1	0	2	0	0	0	0
	Average per night	2.4	0.2	0	0.4	0	0	0	0

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
5	10 September 2014	1	1						
	11 September 2014	4							
	12 September 2014	1							
	13 September 2014		1						
	14 September 2014	1						1	
	Total	7	2	0	0	0	0	1	0
	Average per night	1.4	0.4	0	0	0	0	0.2	0
6	10 September 2014	3	1						
	11 September 2014	4	1	2		1	1		
	12 September 2014	1			2			1	
	13 September 2014			1					
	14 September 2014	9	4	1				4	
	Total	17	6	4	2	1	1	5	0
	Average per night	3.4	1.2	0.8	0.4	0.2	0.2	1	0

Table 4.6: Static Anabat Results – October Period

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
1	22 October 2014								
	23 October 2014								
	24 October 2014								
	25 October 2014								
	26 October 2014								
	Total	0	0	0	0	0	0	0	0
	Average per night	0	0	0	0	0	0	0	0
2	22 October 2014								
	23 October 2014								
	24 October 2014			1	16				
	25 October 2014			2	10				
	26 October 2014				3				
	Total	0	0	3	29	0	0	0	0
	Average per night	0	0	0.6	5.8	0	0	0	0

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
3	22 October 2014								
	23 October 2014								
	24 October 2014								
	25 October 2014								
	26 October 2014								
	Total	0	0	0	0	0	0	0	0
	Average per night	0	0	0	0	0	0	0	0
4	22 October 2014								
	23 October 2014								
	24 October 2014								
	25 October 2014								
	26 October 2014								
	Total	0	0	0	0	0	0	0	0
	Average per night	0	0	0	0	0	0	0	0

Detector location	Date	Soprano pipistrelle	Common pipistrelle	Myotis Sp.	Daubenton's Bat	Whiskered bat	Leisler's bat	Noctule bat	Nyctalus Sp.
5	22 October 2014								
	23 October 2014								
	24 October 2014			1					
	25 October 2014								
	26 October 2014								
	Total	0	0	1	0	0	0	0	0
	Average per night	0	0	0.2	0	0	0	0	0
6	22 October 2014								
	23 October 2014								
	24 October 2014				1				
	25 October 2014								
	26 October 2014								
	Total	0	0	0	1	0	0	0	0
	Average per night	0	0	0	0.2	0	0	0	0

Annex 3
Transect Data

Table 4.7: May Transect 1 Survey Results

Transect 1		Date: 1/5/14
Species	Time	Grid reference
No bats detected		

Table 4.8: May Transect 2 Survey Results

Transect 2		Date: 1/5/14
Species	Time	Grid reference
No bats detected		

Table 4.9: June Transect A Survey Results

Transect A		Date: 17/6/14
Species	Time	Grid reference
Leisler's	21:49:47	NS 51125 10871

Table 4.10: June Transect B Survey Results

Transect B		Date: 17/6/14
Species	Time	Grid reference
Leisler's	21:54:13	NS 51914 10454
Leisler's	22:04:16	NS 51999 10208
Leisler's	22:15:35	NS 52085 09641
Leisler's	22:16:53	NS 52042 09571
Soprano pipistrelle	22:18:45	NS 51981 09469

Table 4.11: July Transect A Survey Results

Transect A		Date: 14/7/14
Species	Time	Grid reference
Soprano pipistrelle	22:21:58	NS 51212 10178
Common pipistrelle	22:37:36	NS 51792 09280

Table 4.12: July Transect B Survey Results

Transect B		Date: 14/7/14
Species	Time	Grid Reference
Myotis	23:27:05	NS 51832 09267

Table 4.13: August Transect A Survey Results

Transect A		Date: 19/8/14
Species	Time	Grid reference
Common pipistrelle	21:08:45	NS 51680 09294
Common pipistrelle	21:09:34	NS 51751 09283

Table 4.14: August Transect B Survey Results

Transect B		Date: 19/8/14
Species	Time	Grid reference
Common pipistrelle	20:24:50	NS 51928 10529

Table 4.15: September Transect A Survey Results

Transect A		Date: 15/9/14
Species	Time	Grid reference
No bats detected		

Table 4.16: September Transect B Survey Results

Transect B		Date: 15/9/14
Species	Time	Grid reference
Soprano pipistrelle	19:43:53	NS 51898 09373
Soprano pipistrelle	19:57:54	NS 51847 09278
Soprano pipistrelle	19:58:49	NS 51846 09276
Soprano pipistrelle	19:59:02	NS 51846 09276

Table 4.17: October Transect A Survey Results

Transect A		Date: 29/10/14
Species	Time	Grid reference
No bats detected		

Table 4.18: October Transect B Survey Results

Transect B		Date: 29/10/14
Species	Time	Grid reference
No bats detected		