TECHNICAL APPENDIX 8.4

Clauchrie Windfarm

Bat Survey Report

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Executive Summary

The proposed Clauchrie Windfarm lies approximately 7 km north east of Barrhill and is fully within the administrative boundary of South Ayrshire apart from the site entrance and junction which lies within the Dumfries and Galloway administrative area. The central OS grid reference of the Site (the area within the application boundary) is NX 306 880. It is the intention of ScottishPower Renewables (UK) Ltd (hereafter SPR), subject to planning permission being approved, to develop the Site into a windfarm site with 18 wind turbines and associated infrastructure.

Echoes Ecology Ltd were contracted by ITPEnergised to carry out a baseline assessment of the Site for bats to identify the potential for use by roosting, foraging and commuting bats, to identify any roosts on Site, and to identify any potential conflicts between bats and the proposed Development. A bat survey programme took place during the period 25.04.19 to 04.10.19.

The habitat within the Site is predominantly coniferous plantation with areas of clear-fell and open moorland to the north. The derelict Little Shalloch structure lies in the west of the Site. There are three private residential dwellings located approximately 1 km south of the Site boundary which were not included within the survey effort.

A Preliminary Roost Assessment (PRA) of Little Shalloch was carried out on 10.05.19 by two surveyors. The building is a derelict stone farm house with a pitched slated roof. Remnants of a wall are still present, attached to the south-western gable end of the building. Multiple gaps were present in the stonework of the building, around the window and door frames, at wall-heads and underneath the roof slates. The building was assessed as having moderate suitability for summer and winter roosting bats. Two activity surveys were carried out at Little Shalloch on 19.08.19 and 03.09.19, with four small summer non-breeding bat roosts recorded within the building. The species roosting included three soprano pipistrelles (*Pipistrellus pygmaeus*), a possible brown long-eared bat (*Plecotus auritus*) or *Myotis* species bat and three unidentified non-echolocating bats.

In total, 23,812 bat passes were recorded throughout the Site. The most commonly recorded species was soprano pipistrelle (41.4 % of all bat passes), followed by common pipistrelle which made up 39.8 % of all bat passes. 17.5 % of all bat passes recorded were from *Myotis* species, followed by *Nyctalus* species (noctule or Leisler's bat) (1.2 %), brown long-eared bat (0.1 %) and Nathusius' pipistrelle (0.01 %).

At a whole site level, the median risk was medium for common and soprano pipistrelles and low for Nathusius' pipistrelle and *Nyctalus* species. When considered per month, the median risk to common and soprano pipistrelle was medium for all months (except April for soprano pipistrelle which was low risk). The median risk for Nathusius' pipistrelle in both recorded months was low. For *Nyctalus* bats the median risk was low for four months of the survey and medium for June and August. Thus, there were no real temporal patterns in activity. Looking at detector location, the median risk for common pipistrelle varied from low at D6 to D10, to medium at the other locations with the exception of D3 where risk was high. The median risk for soprano pipistrelle was low (at five locations), medium (at six locations) and high at D3. For Nathusius' pipistrelle the median risk at both detector locations was low. Generally the risk at detector locations at turbine locations (whether it be open or edge habitat) was low whereas risk at detectors closer to bat-friendly features (a structure ad a water body) was higher (D3 and D5). Low risk species (*Myotis* species and brown long-eared bat) have low collision risk, so the impact of the development on the local bat population would likely be negligible.

The windfarm should be designed to allow the locations of the turbines to be situated well away from trees, forestry and water features to minimise the risk to bats. The survey guidelines (SNH, 2019a) suggests a minimum buffer of 50 m from rotor swept area to feature (e.g. woodland edge). The proposed layout shows that keyholing of woodland may be necessary around at least 15 of the 18 turbines, and so a minimum buffer between turbine and habitat feature of 68 m should be implemented.

Conservation considerations include reducing the impact of lighting during construction of the wind farm site.

When the activity levels at D5 are compared to other SPR sites, the fatality risk is considered greater than incidental for *Pipistrellus* species, and between incidental and greater than incidental for *Nyctalus* species. Due to the proposed location of T4 in similar habitat to D5 and the potential for bat fatalities at T4 because of this, it is considered necessary to implement a mitigation strategy.

The mitigation measures will comprise curtailment of the operation of T4 while it is idling i.e. below the cut-in wind speed at which electricity generation occurs. The mitigation measure will be implemented at T4 between the months of April to October between sunset and sunrise each year for the lifetime of the proposed Development unless monitoring results necessitate a change. Monitoring involving acoustic surveying and carcass detection will also be carried out.

1 Introduction

1.1 Contract Overview

1.1.1 The proposed Clauchrie Windfarm lies approximately 7 km north east of Barrhill and is fully within the administrative boundary of South Ayrshire apart from the site entrance and junction which lies within the Dumfries and Galloway administrative area. The central OS grid reference of the Site (the area within the application boundary) is NX 306 880.

1.1.2 It is the intention of ScottishPower Renewables (UK) Ltd (hereafter SPR), subject to planning permission being approved, to develop the Site into a windfarm site with 18 wind turbines and associated infrastructure. The proposed turbines are 200 m in height from ground to blade tip. When the survey programme started the proposal was for 16 turbines and the survey effort regarding number of detectors needed was based on 16 turbines.

1.1.3 The planning application is proposed to be submitted in October 2019.

1.1.4 Echoes Ecology Ltd were appointed by ITPEnergised on behalf of SPR to carry out bat surveys at the site. The bat surveys were restricted to the application boundary (the Site). For a plan of the proposed Site, see **Figure TA_8.4.1**.

1.1.5 The aims of the survey were:

- to carry out a Preliminary Roost Assessment (PRA) of any buildings and trees within the site to determine the suitability of features for use by roosting, foraging and commuting bats at the site;
- to install automated detectors at turbine locations to record bat activity during spring, summer and autumn periods;
- to assess the potential impacts of the development on bats; and
- to suggest mitigation and compensation to minimise any predicted impacts and maintain favourable conservation status of the species in question.

1.1.6 The following figures are included in this report:

- **Figure TA_8.4.1** - Plan of the proposed site;
- **Figure TA_8.4.2** - External view of Little Shalloch;
- **Figure TA_8.4.3** - Location of roosts at Little Shalloch;
- **Figure TA_8.4.4** - Species composition of bat passes at each detector;
- **Figure TA_8.4.5** - Species-specific emergence time shown for D3; overlap of coloured dots on grey bar shows bat activity close to and before the species-specific roost emergence time;
- **Figure TA_8.4.6** - Species-specific emergence time shown for D3; overlap of coloured dots on grey bar shows bat activity close to and before the species-specific roost emergence time;

- **Figure TA_8.4.7** - Number of pipistrelle bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality;
- **Figure TA_8.4.8** - Number of *Nyctalus* species bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality;
- **Figure TA_8.4.9** - Number of pipistrelle bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality - removing data from D3 and D5;
- **Figure TA_8.4.10** - Number of *Nyctalus* species bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality - removing data from D3 and D5;
- **Figure TA_8.4.11** - Number of pipistrelle bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality - D5 only; and
- **Figure TA_8.4.12** - Number of *Nyctalus* species bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality - D5 only.

1.1.7 The following tables are included in this report:

- **Table TA_8.4.1** - Guidelines for assessing suitability of habitat features in proposed development sites for bats (as adapted from Collins, 2016);
- **Table TA_8.4.2** - Detector locations;
- **Table TA_8.4.3** - Deployment lengths of detectors;
- **Table TA_8.4.4** - Level of potential vulnerability of populations of British bat species in Scotland (SNH, 2019a, adapted from Wray *et al*., 2010);
- **Table TA_8.4.5** - Site risk levels based on habitat risk and project description (SNH, 2019a);
- **Table TA_8.4.6** - Overall risk assessment (SNH, 2019a);
- **Table TA_8.4.7** - Resources and database search results;
- **Table TA_8.4.8** - Statutory designated sites;
- **Table TA_8.4.9** - Total number of bat passes recorded for each species across all detectors;
- **Table TA_8.4.10** - Median pass rate of each species/species group per detector;
- **Table TA_8.4.11** - Summary table showing key metrics for each species for site as a whole;
- **Table TA_8.4.12** - Summary table showing key metrics for each species for the whole site, split by month;
- **Table TA_8.4.13** - Summary table showing key metrics for each species split by detector; and
- **Table TA_8.4.14** - Overall risk assessment of high risk species for the site and per detector.

2 Legislation

2.1 Legal Considerations

2.1.1 Bats and their roosts are protected under UK and European Legislation. In Scotland, this is mainly provided by the Conservation (Natural Habitats, &c.) Regulations 1994, as amended (known as the Habitats Regulations). Under this legislation, bats are regarded as European Protected Species (EPS).

2.1.2 It is an offence to deliberately or recklessly:

- capture, injure or kill a bat;
- harass a bat;
- disturb a bat while it is occupying a roost (any place of shelter or protection);
- disturb a bat while it is rearing or otherwise caring for its young;
- obstruct access to a roost or deny a bat use of a roost;
- disturb a bat in a way which is likely to significantly affect the local distribution or abundance of the species;
- disturb a bat in a way that is likely to impair its ability to survive, breed or reproduce, or rear or care for its young; and
- disturb a bat while it is migrating or hibernating.

2.1.3 It is a strict liability offence to damage or destroy a bat roost. A bat roost is protected at all times irrespective as to whether any bats are using the roost at a given time.

2.1.4 If the work proposed is to affect bats or their roosts, an EPS licence, issued by the licensing authority SNH under Regulation 44 of the Habitats Regulations will be required so as to permit an otherwise illegal activity. There are three tests that must be satisfied before a licence will be granted, in addition to which mitigation and/or compensation will almost certainly be required. The three tests are:

- the activity must fall within one of the licensable purposes listed in Regulation 44 (including preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment);
- there must be no satisfactory alternative; and
- the action authorised will not be detrimental to the maintenance of the population of the species at a favourable conservation status in their natural range.

2.2 Scottish Biodiversity Strategy

2.2.1 The Nature Conservation (Scotland) Act 2004 places a 'Biodiversity Duty' on public bodies to further the conservation of biodiversity and it requires Scottish Ministers to designate one or more strategies for the conservation of biodiversity as the Scottish Biodiversity Strategy. 'Scotland's Biodiversity: It's in Your Hands - A strategy for the conservation and enhancement of biodiversity in Scotland' (Scottish Executive, 2004) and '2020 Challenge for Scotland's Biodiversity' (Scottish Government, 2013a) together form the Scottish Biodiversity Strategy.

2.2.2 'Scotland's Biodiversity: It's in Your Hands - A strategy for the conservation and enhancement of biodiversity in Scotland' sets out a 25-year strategy to assist government, the private and public sectors, non-governmental bodies and individual members of the public to conserve and enhance biodiversity in Scotland. The document '2020 Challenge for Scotland's Biodiversity' was published in response to the Aichi Targets set by the United Nations Convention on Biological Diversity (2010) and the European Union's Biodiversity Strategy for 2020 (2011).

2.3 Scottish Biodiversity List

2.3.1 The Scottish Biodiversity List (SBL) was published in 2005 and last updated in 2012 (Scottish Government, 2013b). The aim of the list is to help public bodies carry out their 'Biodiversity Duty', as required by the Nature Conservation (Scotland) Act 2004, by identifying the species and habitats which are the highest priority for biodiversity conservation in Scotland. Nine species of bat are included on the SBL as detailed below:

- Brandt's bat (*Myotis brandtii*);
- Daubenton's bat (*Myotis daubentonii*);
- whiskered bat (*Myotis mystacinus*);
- Natterer's bat (*Myotis nattereri*);
- noctule (*Nyctalus noctula*);

- Nathusius' pipistrelle (*Pipistrellus nathusii*);
- common pipistrelle (*Pipistrellus pipistrellus*);
- soprano pipistrelle (*Pipistrellus pygmaeus*); and
- brown long-eared bat (*Plecotus auritus*).

2.4 Local Biodiversity Action Plan

2.4.1 Local Biodiversity Action Plan Partnerships were established in the UK following the ratification of the Convention on Biological Diversity in 1992. Each local partnership publishes biodiversity action plans which identify the habitats or species selected as priorities for targeted conservation work. The survey area lies predominantly within South Ayrshire, for which the Ayrshire Local Biodiversity Action Plan (LBAP) has been published (Ayrshire Biodiversity Partnership, 2007).

3 Methodology

3.1 Survey Methodology

3.1.1 The survey methods employed were taken from 'Bats and Onshore Wind Turbines: Survey Assessment and Mitigation' (SNH, 2019a) and 'Bat Surveys for Professional Ecologists: Good Practice Guidelines' (Collins, 2016).

3.2 Desk Study Methods

3.2.1 A desk study was carried out to obtain baseline data of bat activity in or near to the study area. This desk study allowed for data within a 10 km radius of the site to be considered (see Table 1 for details). The following resources were consulted:

- South West Scotland Environmental Information Centre (SWSEIC);
- Ayrshire LBAP (Ayrshire Biodiversity Partnership, 2007);
- SiteLink (SNH, 2019b);
- NBN Atlas (NBN Atlas Partnership, 2019);
- 'Distribution Atlas of Bats in Britain and Ireland 1980-1999' (Richardson, 2000); and
- Echoes Ecology Ltd, 'ScoMam' Database (a database of over 5,000 mammal records collected by Echoes Ecology Ltd and associate surveyors over 10 years of surveys).

3.3 Preliminary Roost Assessment of Buildings and Trees

3.3.1 A Preliminary Roost Assessment (PRA) of Little Shalloch (NX 26185 88164) was carried out on 10.05.19 by Mingaile Anderson ACIEEM (SNH Licence No. 104717) and Rosanna Hignett GradCIEEM, inspecting the exterior of the farm building, as well as some of the internal areas, where safe to access, in order to assess the suitability for use by bats, and to look for any evidence of bats, such as corpses, droppings and feeding remains. Any potential roosting features (PRFs) (e.g. cracks, crevices, holes) were noted.

3.3.2 A torch was used where needed, and binoculars were used to see high level external areas (magnification 10x42).

3.3.3 The PRA allowed the roost suitability of the structure to be determined (see **Table TA_7.4.1** for descriptions).

Table TA_8.4.1 - Guidelines for assessing suitability of habitat features in proposed development sites for bats (as adapted from Collins, 2016)

Suitability	Roosting Habitats	Foraging and Commuting Habitats
Negligible	No habitat features on site likely to be used by roosting bats.	No habitat features on site 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. Such potential roost sites do not provide enough space, shelter, protection or appropriate conditions to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated and poorly connected to the surrounding landscape. 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 with one or more potential roost sites that could be used by bats due to the size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation statues (with respect to roost type only, not species conservation status).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as 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 are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	Continuous, high-quality habitat, 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. High-quality habitat that is well connected to wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

3.4 Winter Hibernation Assessment

3.4.1 During the PRA the Little Shalloch building was assessed as to its suitability to support over-wintering bats.

3.5 Activity Surveys

3.5.1 One dusk emergence survey and one dawn emergence survey were carried out, on 19.08.19 and 03.09.19. There were two surveyors present on each survey, and the following surveyors were used: Mingaile Anderson ACIEEM (SNH Licence No. 104717), Heather Campbell ACIEEM (SNH Licence No. 104080), Rosanna Hignett GradCIEEM and Russell Keen ACIEEM.

3.5.2 The dusk survey commenced 20 minutes before sunset and lasted until 90 minutes after sunset, and the dawn survey commenced 70 minutes before sunrise and ended 15 minutes after sunrise.

3.5.3 Bat activity was recorded using Batbox Duet frequency division bat detectors and Roland R-05 digital recorders. Subsequent analysis of recordings was carried out using BatSound version 4.4.0 software.

3.6 Automated Bat Detector Surveys

3.6.1 A walkover assessment of the site was conducted on 25.04.19 to assess the habitats within the site and determine the locations for the automated recorders. The methodology follows that in the survey guidelines (SNH, 2019a).

3.6.2 Twelve automated bat detectors (Titley Anabat Swift detectors with omni-directional microphone on a 1.5 m microphone extension cable) were deployed in twelve locations within various habitats across the Site (**Table**

TA_8.4.2). The locations were chosen for being close to either the proposed turbine locations or to features of interest. The detectors were located on the ground with the microphones at least 1 m off the ground and sited horizontally so as to avoid water damage from rain. The microphones were attached to a habitat feature such as fence post or pile of stones in a bid to keep them secure.

3.6.3 Each detector was deployed with eight AA lithium batteries and two SD memory cards of at least 16 Gb storage in total. The bat detectors were all deployed with the following settings:

- sensitivity - 15;
- minimum frequency - 15 kHz
- maximum frequency - 150 kHz; and
- minimum event - 2 ms.

3.6.4 The detectors were deployed for periods of over 30 days with the aim of gaining at least 30 days of consecutive bat data each for three seasons (spring, summer and autumn), recording in full spectrum. **Table TA_8.4.3** shows the number of nights each detector recorded for.

3.6.5 Weather data was gathered from a met mast at Knockinlochie near Turbine 13 (NX 31178 89794) and included temperature measured at 3 m height and wind speed at various heights.

Table TA_8.4.2 - Detector locations

Detector	OS Grid Ref	Lat	Long	Description
D1	NX 27296 88675	55.162165	-4.7125828	On a tree in woodland ride, edge habitat
D2	NX 27340 87867	55.154928	-4.7114005	On a tree in woodland ride, edge habitat
D3	NX 26195 88161	55.157166	-4.7295287	On fence adjacent to Little Shalloch building
D4	NX 32580 89637	55.172617	-4.6303044	Large layby adjacent to track, edge habitat
D5	NX 28446 89040	55.165842	-4.6947739	On tree by loch, open water habitat
D6	NX 29331 88207	55.158671	-4.6803954	On tree at edge of track, edge habitat
D7	NX 28881 89770	55.172545	-4.6883945	On a tree on hilltop, open habitat
D8	NX 29327 89526	55.170509	-4.6812530	On hummock adjacent to burn in valley, running water/edge habitat
D9 spring and summer	NX 31108 89934	55.174782	-4.6535669	On a tree on hillside, open habitat
D9 autumn	NX 31084 90043	55.175753	-4.6540083	On a tree on hillside, open habitat
D10	NX 30220 89584	55.171337	-4.6672839	On small tree, open habitat
D11	NX 30878 89308	55.169085	-4.6568001	On fallen tree in woodland ride, edge habitat
D12	NX 31852 89789	55.173734	-4.6418120	On a tree stump, edge habitat

Table TA_8.4.3 - Deployment lengths of detectors

Survey Session	Survey Dates	Detector	Habitat	Nights Recorded
Spring 2019	25.04.19 – 28.05.19	D1	Edge	17
		D2	Edge	24
		D3	Building	33
		D4	Edge	18
		D5	Open water	33
		D6	Edge	29
		D7	Open	33
		D8	Running water/edge	33
		D9	Open	33
		D10	Open	23
		D11	Edge	33
		D12	Edge	30
				339 nights / 12 detectors = average 28.25 nights per detector
Summer 2019	18.06.19 - 19.07.19	D1	Edge	15
		D2	Edge	31
		D3	Building	18
		D5	Open water	31
		D6	Edge	7
		D7	Open	31
		D8	Running water/edge	31
		D9	Open	30
		D10	Open	30
		D11	Edge	30
		D12	Edge	30
	26.06.19 - 23.07.19	D4	Edge	29
	06.08.19 - 19.08.19	D1	Edge	13
		D3	Building	13
		D6	Edge	13
				352 nights / 12 detectors = average 29.3 nights per detector
Autumn 2019	03.09.19 - 03.10.19	D1	Edge	31
		D2	Edge	31
		D3	Building	31
		D4	Edge	2
		D5	Open water	31
		D6	Edge	31
		D7	Open	31
		D8	Running water/edge	11
		D9	Open	19
		D10	Open	31

Survey Session	Survey Dates	Detector	Habitat	Nights Recorded
		D11	Edge	31
		D12	Edge	31
				311 nights / 12 detectors = average 25.9 nights per detector

3.7 Automated Bat Detector Analysis

3.7.1 Bat activity was downloaded from the SD memory cards and onto PCs in .wav file format and analysed using Anabat Insight (v 1.9.0-4-g15fdd88) software (Titley Scientific).

3.7.2 Insight includes an auto-identification (ID) tool called Bat Classify UK which was designed to allow identification of British bat species based on call parameters. The data was processed in either one of two ways. Data from spring and summer was inputted into Insight and Bat Classify was run on each night folder from each detector at 80 % confidence. An audit was carried out as follows and calls were re-labelled as appropriate:

- 25 % of all *Pipistrellus* bat calls;
- 100 % of all *Myotis* bat calls;
- 100 % NSL (noctule/serotine/Leisler's) calls;
- 100 % of any rare species; and
- 100 % of any calls with multi-species labels.

3.7.3 From the analysed folder all non-labelled files were run through Bat Classify again but at a lower threshold of 60 % confidence. Of the output of labelled files, 100 % were checked for any false positive identification, and a minimum of 25 % of the remaining files with no labels (i.e. those still with no labels) were checked to confirm they were non-bat-related, other noise files.

3.7.4 Data from autumn were inputted into Insight and initially sorted using a pre-determined filter called 'All Bats'. Any files with no bats were sorted into a Trash folder. Every file in the Trash folder was then manually audited to ensure no files containing bats had been moved there. If files containing bats were found they were restored to their original location. The auto-ID (Bat Classify) was then run on all of the files containing bat calls, at 70 % confidence. Of all of the calls with generated species labels, the audit was carried out as above (see para 3.6.2). Any files with no bat registrations were removed. Once all of the files containing bat calls were labelled and the appropriate audit had occurred, the data was exported from Insight, per season and per detector location, using the disperse reporting format.

3.7.5 Guidance on call parameters was taken from Russ (2012) and Middleton *et al*. (2014).

3.8 Quantifying Bat Activity

3.8.1 In order to allow an objective assessment of bat activity a measure of relative activity was obtained using the online tool Ecobat, hosted and developed by the Mammal Society (Lintott *et al.*, 2017). The data input reveals a percentile score and categorised level of bat activity and the results can be interpreted at the local scale and site scale. For the purposes of this report, a single labelled Insight file of up to a maximum of 10 seconds in length containing a sequence of bat pulses was counted as one bat registration (i.e. a single bat pass).

3.8.2 Data was entered to allow analysis for within night variation (as opposed to just between night).

3.8.3 The data set range used for reference for the percentile analysis was stratified to include:

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

3.9 Alternative Method of Comparing Bat Activity

3.9.1 SPR have provided data to allow comparison of bat activity at the Site to that collected from operational projects in the same region (i.e. south west Scotland) which have a known rate of bat fatalities. SPR has conducted detailed acoustic and fatality monitoring at 10 operational windfarms and acoustic monitoring aligned to the current windfarm guidance (SNH, 2019a) at three development phase projects. This combined data set comprised data collected at 71 unique locations with static bat detectors deployed for a total of 1,710 nights, providing a total sample size of 9,367 detector nights of bat activity (sample unit = one detector/night) after some samples were removed due to equipment failure. Of these, 7,269 samples are from nine projects in south-west Scotland and were used for the comparison analysis.

3.9.2 Carcass surveys have been undertaken at all 10 of the operational wind farms using methods consistent with the DEFRA study (Mathews *et al.*, 2016). Of these, six were found to have zero bat fatalities, two had an 'incidental' rate of fatality (considered to be less than two bat fatalities/turbine/year) and two had fatality rates greater than two bat fatalities/turbine/year. The maximum increase to natural mortality due to bat fatalities which is considered unlikely to have a significant effect on bat populations, and therefore deemed 'incidental', is considered to be two bat fatalities per turbine per year (based on fatalities at German wind farms) (Behr, 2015). There are currently no estimates for a UK context.

3.9.3 That dataset can be used as a reference for new projects by providing a comparison of bat activity within a region in a similar manner to Ecobat, but in addition it can benchmark activity rates for new projects against activity rates of sites with a known rate of bat fatality.

3.10 Assessing Potential Risk

3.10.1 The potential vulnerability of bat populations to windfarms is based on the collision risk, the relative abundance and the activity at the Site. **Table TA_8.4.4** shows the potential vulnerability of bat populations in Scotland based on the collision risk (inferred by a number of factors including habitat preference, flight speed, foraging techniques and echolocation characteristics) and relative abundance.

3.10.2 The risk factors of the Site also need to be considered (**Table TA_8.4.5**) based on the habitat types present and the size of the proposed project. The bat activity output from Ecobat can then be assessed along side the risk factors of the Site (**Table TA_8.4.5**) and taking into account the relative species vulnerability (**Table TA_8.3.4**) to complete an overall risk assessment (**Table TA_8.4.6**). This overall risk can then guide the decision-making process in relation to the mitigation options.

Table TA_8.4.4 - Level of potential vulnerability of populations of British bat species in Scotland (SNH, 2019a, adapted from Wray *et al.*, 2010)

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

Table TA_8.4.5 - Site risk levels based on habitat risk and project description (SNH, 2019a)

Site Risk Level (1-5)*		Project Size		
		Small	Medium	Large
Habitat Risk	**Low**	1	2	3
	Moderate	2	3	4
	High	3	4	5
Green (1-2) = lowest/low site risk Amber (3) = medium site risk Red (4-5) = high/highest site risk				

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 TA_8.4.6 - Overall risk assessment (SNH, 2019a)

	Ecobat Activity Category					
Site Risk	**Nil (0)**	**Low (1)**	**Low-moderate (2)**	**Moderate (3)**	**Moderate-high (4)**	**High (5)**
Lowest (1)	0	1	2	3	4	5
Low (2)	0	2	4	6	8	10
Medium (3)	0	3	6	9	12	15
High (4)	0	4	8	12	16	20
Highest (5)	0	5	10	15	20	25
Green (0-4) = Low risk Amber (5-12) = medium risk Red (15-25) = high risk						

3.11 Limitations

3.11.1 The detectors were located as close as possible to proposed turbine locations, however, there are 18 locations and following the guidelines 12 detectors were required to be deployed and so not all of the turbine locations were surveyed with a detector. Also, some of the turbine locations are currently inaccessible e.g. in dense plantation, and suitable locations nearby were chosen instead so that the detectors were in habitats representative of where the turbines were to be constructed.

3.11.2 Due to errors with the detectors, memory cards or batteries it was not always possible to achieve 30 consecutive nights of recording on all detectors simultaneously. In spring not all of the detectors recorded for 30 nights but due to time constraints could not be redeployed as the time period has crossed into summer. In the summer period the detectors D1, D3 and D6 did not recorded for the required length of nights so were redeployed to gain more data. A malfunction at D4 in autumn meant only two nights of data were recorded.

3.11.3 Weather data from a met mast on site was obtained, although due to the format it was not included within this report for comparison against bat activity.

3.11.4 The detector records in Full Spectrum, but the application of any filters created within the Insight software takes data only from a ZCA version of the recorded call. Irrespective of this it was the Full Spectrum version of any call, or other noise, being audited that was investigated manually.

3.11.5 There are several limitations with regards to Bat Classify, the auto-ID plug-in used in Insight. Because Bat Classify was designed for woodland bat species there is no species label allocation for Nathusius' pipistrelle. Nathusius' pipistrelle bat calls would therefore only be identified during the audit of either noise files or tracks containing other pipistrelle calls. Also, calls with low frequency components may be allocated the species label NSL, meaning noctule/serotine/Leisler's. Calls labelled as NSL were found often not to be bat calls as instead they contained social calls relating to common or soprano pipistrelle, or background noise such as rain, small mammal calls or bird noise.

3.11.6 There are limitations with regards to the identification of bat species using sound analysis (Russ, 2012). For example, a pipistrelle bat calling at 50kHz could be either a common or a soprano pipistrelle because their frequency ranges overlap and therefore would be labelled an unidentified pipistrelle. In addition to this, some very faint pipistrelle calls cannot be identified due to the signal being too weak to analyse using the software. A similar issue is encountered while analysing *Nyctalus* species calls, as the two species, noctule and Leisler's bat will produce calls that overlap in frequency, depending on habitat and bat behaviour. Because of this all calls from these two species were labelled as *Nyctalus* species and separation to species level was not attempted. Both of these species would be treated the same for assessment purposes in any case. Serotine bats (*Eptesicus seritonus*) are not found in Scotland and so any confirmed bat calls with this label were a bat from the *Nyctalus* genus (noctule or Leisler's). Similarly, the echolocation calls of *Myotis* bats are notoriously difficult to narrow down to a species due to structural similarities and rather than attempt separation bats from this genus were labelled as *Myotis* species. All species of *Myotis* occurring within Scotland are deemed to be at the same level of collision risk (i.e. low) when considering wind farm development.

3.11.7 In spite of the above regarding the overlap of *Pipistrellus* calls, the Ecobat analysis software cannot presently deal with processing named pipistrelle species and calls labelled as *Pipistrellus* species, and the resultant report would contain errors if this was attempted. To avoid any errors in the Ecobat output no calls were labelled as *Pipstrellus* species but were identified as either soprano, common or Nathusius' pipistrelle and the decision for which species to label the call as was based on peak frequency of the call, the shape and structure of the call and information on that habitat in which the call was recorded.

3.11.8 The approach to carrying out the analysis through Insight was amended after the summer period. However, due to the rigorous auditing process bat calls were unlikely to be mis-identified or missed altogether (i.e. be categorised as noise) and so the variation in approach is not considered to have an impact on the resultant data. It should be borne in mind, that with the exception of *Pipistrellus* species, 100 % of all other bat calls were checked.

3.11.9 When data are entered into Ecobat for analysis, there is no allowance for entering nights where no bat passes were recorded, and so the analysis is carried out only on presence data. This acts to skew the results and elevate the risk

levels of the species. The detectors recorded on Site for 1,002 nights but bats were only recorded on 101 nights, and so 90 % of the nights of zero data have not been included within the analysis. On a site such as Clauchrie where there is open, remote ground and monoculture plantation with only few roosting opportunities for bats, it is not unexpected to have nights where bats have not been recorded, due to the fact that there are no bats on these occasions (i.e. rather than due to any other factor such as inclement weather). Although the output from Ecobat has been used to guide the results and discussion of this report, as per the recommendations of the guidelines (SNH, 2019a), it is clear that results incorporating all of the data from the Site (both presence and absence) would have given clearer results to base recommendations for mitigation and compensation on.

4 Results

4.1 Desk Study Results

4.1.1 A resources and database search was carried out during September 2019. The results are shown in **Table TA_8.4.7** below. Where no records exist for a particular species, the Bat Distribution Atlas (Richardson, 2000) has been consulted to identify species known to occur in the area.

4.1.2 There are no bat records in ScoMam within 10 km from within the last 10 years.

4.1.3 The Ayrshire LBAP (Ayrshire Biodiversity Partnership, 2007) contains a list of key Ayrshire species which includes the following bat species:

- whiskered bat;
- noctule;
- common pipistrelle; and
- soprano pipistrelle.

4.1.4 There are no Habitat Action Plans that may be relevant to the protection of bats at the study site.

4.1.5 There are three designated sites located within 10 km of the Site (Scottish Natural Heritage, 2019b). These include Lendalfoot Hills Complex Special Area of Conservation (SAC), Feoch Meadows Site of Special Scientific Interest (SSSI) and Aldons Hill SSSI, which are all located over 5km from the Site (see **Table TA_8.4.8**).

Table TA_8.4.7 - Resources and database search results

Species	Potential Roosting within Structures and Trees at the Site*	Record Type	Location
Natterer's bat (*M. nattereri*)	Moderate	Records provided by SNH Bat Casework Records 1970-2007 Human Observation, accessed through NBN Atlas website (data set covered by a Open Government Licence (OGL): http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/)**	10 km north of the site
Soprano pipistrelle (*Pipistrellus pygmaeus)*	High	Known to occur in this area	
Common pipistrelle (*P. pipistrellus*)	High	Known to occur in this area	
Nathusius' pipistrelle (*P. nathusii*)	Low	Known to occur in this area	
Brown long-eared bat (*Plecotus auritus*)	Low	Known to occur in this area	
Daubenton's bat (*Myotis daubentonii*)	Moderate	Known to occur in this area	
Whiskered bat (*M. mystacinus*)	Low	Known to occur in this area	
Noctule (*Nyctalus noctula*)	Low	Known to occur in this area	
Leisler's bat (*N. leisleri*)	Low	Known to occur in this area	

Notes:
The lack of bat records in any given area should by no means be interpreted as an indication that no bats and/or roosts exist.
*The potential for the species to be found at the site takes into account not just the geographic species distribution but also the habitat in and around the site.
** The Data Provider, Original Recorder [where identified], and the NBN Trust bear no responsibility for any further analysis or interpretation of that material, data and/or information.

Table TA_7.4.8 - Statutory designated sites

Name and Distance from Site	Details
Feoch Meadows is located 6.5 km south of the site	**Designation:** SSSI **Notified natural features:** Fen meadow and lowland neutral grassland.
Aldons Hill is located 9 km west of the site	**Designation:** SSSI **Notified natural features:** Upland habitats including: calaminarian grassland and serpentine heath; subalpine dry heath; subalpine wet heath; and upland assemblage.
Lendalfoot Hills Complex is located 9 km west of the site	**Designation:** SAC **Notified natural features:** Base-rich fens, grasslands on soils rich in heavy metals, dry heaths, wet heathland with cross-leaved heath, species-rich grassland with mat-grass in upland areas and very wet mires often identified by an unstable `quaking` surface.

4.2 Preliminary Roost Assessment

4.2.1 The building Little Shalloch (**Figure TA_8.4.2**) is a derelict stone farm house with pitched slated roof located in the west of the Site. Remnants of a wall are still present, attached to the south-western gable end of the building. The loft space was inspected from a gap in the ground floor ceiling, as the loft floorboards were in poor condition and not safe to access. Multiple gaps were present in the stonework of the building, around the window and door frames, at wall-heads and underneath the roof slates. The building was assessed as having moderate suitability for summer roosting bats due to the type of features and the setting of the structure within open habitat associated with recently felled coniferous plantation.

4.2.2 No trees with potential for use by roosting bats were identified within the Site.

4.3 Winter Hibernation Assessment Results

4.3.1 Little Shalloch was assessed as having moderate suitability for winter roosting bats. There are features suitable for small numbers of bats but due to the partially exposed nature of the structure it is considered unlikely for a large hibernation roost to be present as the conditions would not be what bats are seeking to protect themselves from winter weather and temperature changes.

Figure TA_8.4.2 - External view of Little Shalloch

4.4 Little Shalloch Bat Activity Surveys

4.4.1 Two activity surveys were carried out at Little Shalloch on 19.08.19 and 03.09.19, with four summer non-breeding bat roosts recorded within the building (see **Figure TA_8.4.3**). The species roosting included three soprano pipistrelles (roosts 2 and 3), a possible brown long-eared bat or *Myotis* species bat (roost 4) and three unidentified non-echolocating bats (roost 1). The survey forms are shown in Annex A.

Figure TA_8.4.3 - Locations of roosts (R) at Little Shalloch

4.5 Whole Site Results

4.5.1 The resultant tables and figures from Ecobat refer to 'month' whereby April and May constitute spring, June and July are summer and August, September and October are autumn.

4.5.2 Twelve detectors were located throughout the Site over three survey seasons and a total recording time of 1,002 nights was achieved, averaging 28 nights per detector per season. The location of the detectors is shown in **Figure TA_8.4.1.**

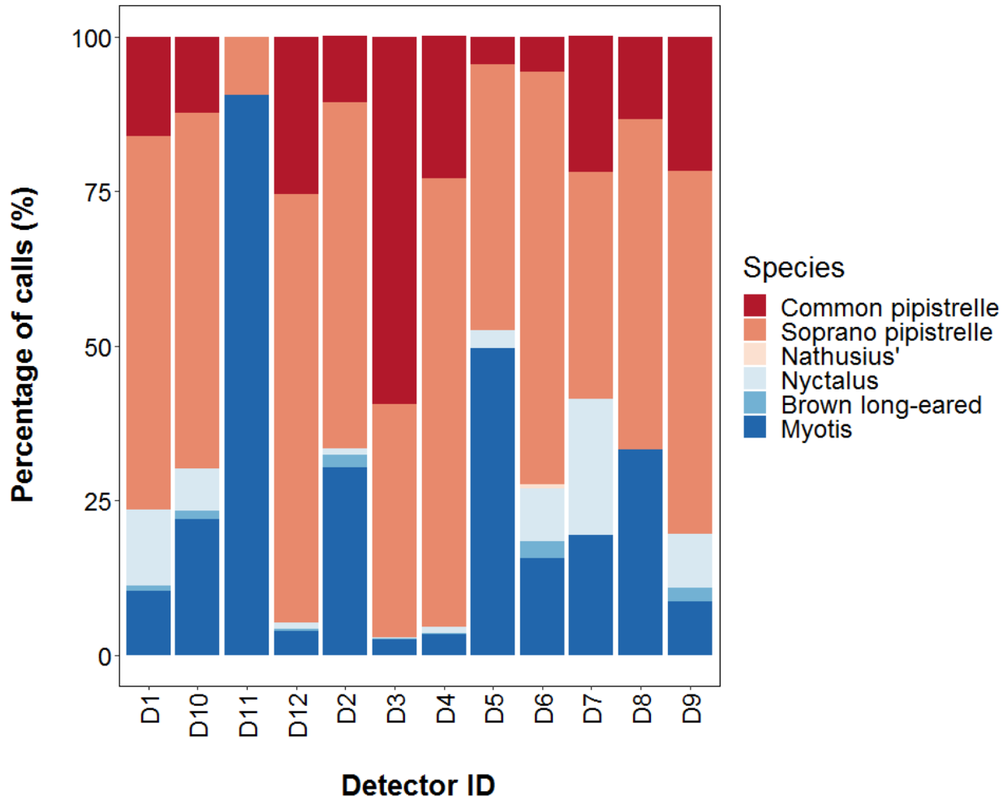
4.5.3 In total, six species (or genera in the case of more cryptic species) were recorded on the static detectors: soprano pipistrelle, common pipistrelle, Nathusius' pipistrelle, *Myotis* species, *Nyctalus* species and brown long-eared bat. Across all detectors for the whole survey period, the total number of passes of all bat species was 23,812, shown in **Table TA_8.4.9**. The most commonly recorded species was soprano pipistrelle (41.4 % of all bat passes), followed by common pipistrelle which made up 39.8 % of all bat passes. 17.5 % of all bat passes recorded were from *Myotis* species, followed by *Nyctalus* species (noctule or Leisler's bat) (1.2 %), brown long-eared bat (0.1 %) and Nathusius' pipistrelle (0.0 % when rounded to one decimal place).

Table TA_8.4.9 - Total number of bat passes recorded for each species across all detectors

Species/Species Group	No. of Passes	Percentage of total (%)
Common pipistrelle	9,480	39.8
Soprano pipistrelle	9,848	41.4
Nathusius' pipistrelle	4	0.0
Nyctalus	286	1.2
Brown long-eared	35	0.1
Myotis	4,159	17.5
Total	**23,812**	**100**

4.5.4 The species composition of passes at each detector (D1 to D12) is shown as a percentage in **Figure TA_8.4.4.** Soprano pipistrelle made up 72.5 % of passes at D4, although the largest number of soprano pipistrelle passes was at D3 (5,585 passes). Common pipistrelle passes formed the greatest composition of passes at D3 (59.4 % of passes) and were also most frequent at D3 (8,795 passes). Nathusius' pipistrelle were only encountered at D3 (3 passes) and D6 (one pass) although at D6 the species composition was 0.7 % Nathusius' pipistrelle. D7 recorded the highest species composition of *Nyctalus* bats (22 %) although the highest number of *Nyctalus* bat passes was recorded at D5 (208 passes). The species composition of brown long-eared bat was highest at D6 (2.8 %) and brown long-eared bat were most numerous at D3 (12 passes). Almost all of the bats at D11 were *Myotis* species (90.6 %) whereas the largest number of *Myotis* bat passes was recorded at D5 (3,601 passes).

Figure TA_8.4.4 - Species composition of bat passes at each detector



4.5.5 As the detectors were not sampling the whole Site, presence only data has been used as a precaution (i.e. nights where no bats of a certain species were recorded have been removed from the analysis). The nightly bat pass rate (bat passes per hour) only takes into account the presence, not the absence, of each bat species so for each night, there is no 'zero data' for when species were not detected.

4.5.6 The median pass rate has been chosen to present the data, as bat activity levels between nights can be highly variable, and thus the median provides a more reliable value than the mean (Lintott and Mathews, 2018). The data set is unlikely to be normally distributed, therefore the median will be the most appropriate metric to report.

4.5.7 The median nightly pass rate of each species at each detector is shown in **Table TA_8.4.10**. Common pipistrelle showed the highest median pass rate at D3 (5.4 bat passes/hour/night) while the lowest (0.1 passes/hour/night) was recorded at D6 and D7. The highest activity overall was seen by soprano pipistrelle at D3 (3.3 bat pass/hour/night), with its lowest (0.1 passes/hour/night) being recorded at D7, D8 and D11. Nathusius' pipistrelle activity was 0.2 passes/hour/night at D3 and 0.1 passes/hour/night at D6. *Nyctalus* activity ranged between 0.1 passes/hour/night at five locations to 0.5 passes/hour/night at D5. *Myotis* species activity was fairly low across all detectors (ranging between 0.1 and 0.4 passes/hour/night recorded), with the exception of D5 where a rate of 1.6 passes/hour/night was recorded. Brown long-eared bat activity was low across all detectors they were recorded on, with rates of 0.1 or 0.2 passes/hour/night.

Table TA_8.4.10 - Median pass rate of each species/species group per detector

Species/Species Group	Detector	Median Pass Rate (passes/hour/night)
Common pipistrelle	D1	0.3
	D2	0.2
	D3	5.4
	D4	0.9
	D5	0.4
	D6	0.1
	D7	0.1
	D8	0.2
	D9	0.2
	D10	0.2
	D12	0.5
Soprano pipistrelle	D1	0.2
	D2	0.2
	D3	3.3
	D4	0.2
	D5	1.8
	D6	0.2
	D7	0.1
	D8	0.1
	D9	0.2
	D10	0.2
	D11	0.1
	D12	0.4
Nathusius' pipistrelle	D3	0.2
	D6	0.1
Nyctalus	D1	0.4
	D2	0.1
	D3	0.1
	D4	0.2
	D5	0.5
	D6	0.1
	D7	0.2
	D9	0.1
	D10	0.1
	D12	0.2
Myotis	D1	0.1
	D2	0.2
	D3	0.4
	D4	0.1
	D5	1.6
	D6	0.1

Species/Species Group	Detector	Median Pass Rate (passes/hour/night)
	D7	0.1
	D8	0.1
	D9	0.1
	D10	0.2
	D11	0.2
	D12	0.2
Brown long-eared	D1	0.1
	D2	0.2
	D3	0.1
	D4	0.2
	D5	0.1
	D6	0.1
	D9	0.1
	D10	0.1
	D12	0.1

4.6 Potential Roosts Within or Close to the Site

4.6.1 Ecobat showed that on numerous occasions throughout the survey period there were high numbers of bat passes recorded on detectors within the species-specific roost emergence times which may potentially indicate roosts nearby.

4.6.2 High numbers of soprano and common pipistrelle were recorded by D3 at Little Shalloch (over the full survey period there were 315 common pipistrelle passes and 307 soprano pipistrelle passes before the end of the species-specific emergence time range) (**Figure TA_8.4.5**). This corresponds with the overall median activity rate for these species being highest at D3. Pipistrelle bat passes were recorded as much as 15 minutes before sunset on occasion at D3. There were also 21 early passes from *Myotis* bats at D3 on a number of dates (**Figure TA_8.4.5**).

4.6.3 Activity surveys at Little Shalloch confirm the presence of roosts of soprano pipistrelles, a possible brown long-eared bat or *Myotis* species bat and three unidentified non-echolocating bats which may be common pipistrelle.

4.6.4 At D5 there were 34 common pipistrelle passes and 75 soprano pipistrelle passes during the whole survey season within the upper limit of the species-specific emergence time range which may suggest proximity of a roost (**Figure TA_8.4.6**).

4.6.5 There were other species recorded on other detectors close to the specific-emergence times although the numbers were not considered high enough to indicate the proximity of a roost.

Figure TA_8.4.5 - Species-specfic emergence time shown for D3; overlap of coloured dots on grey bar shows bat activity close to and before the species-specific roost emergence time

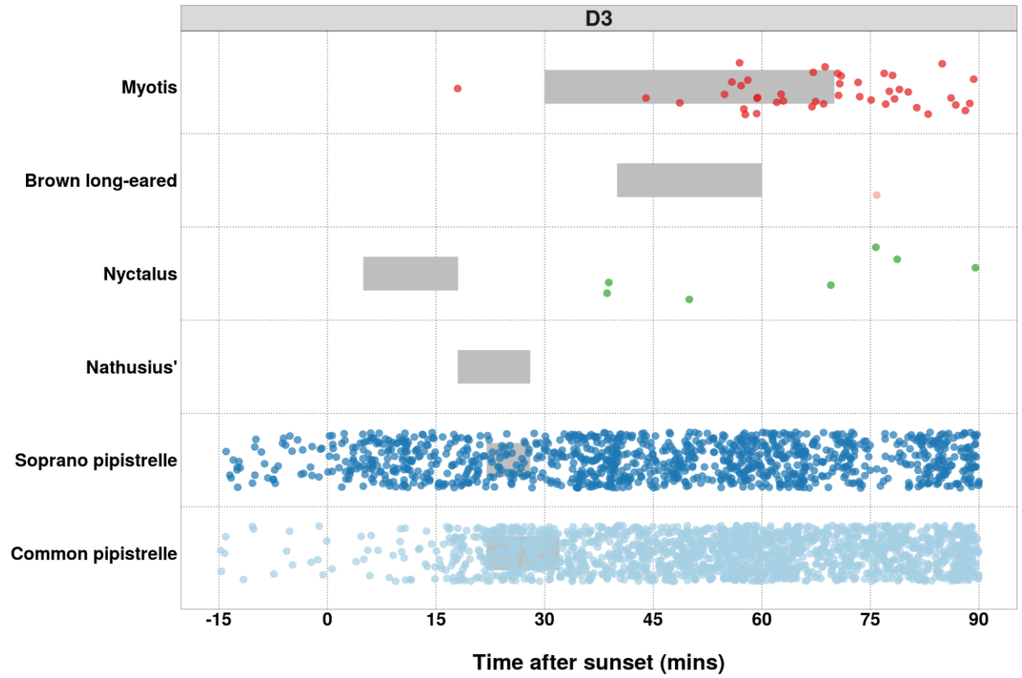
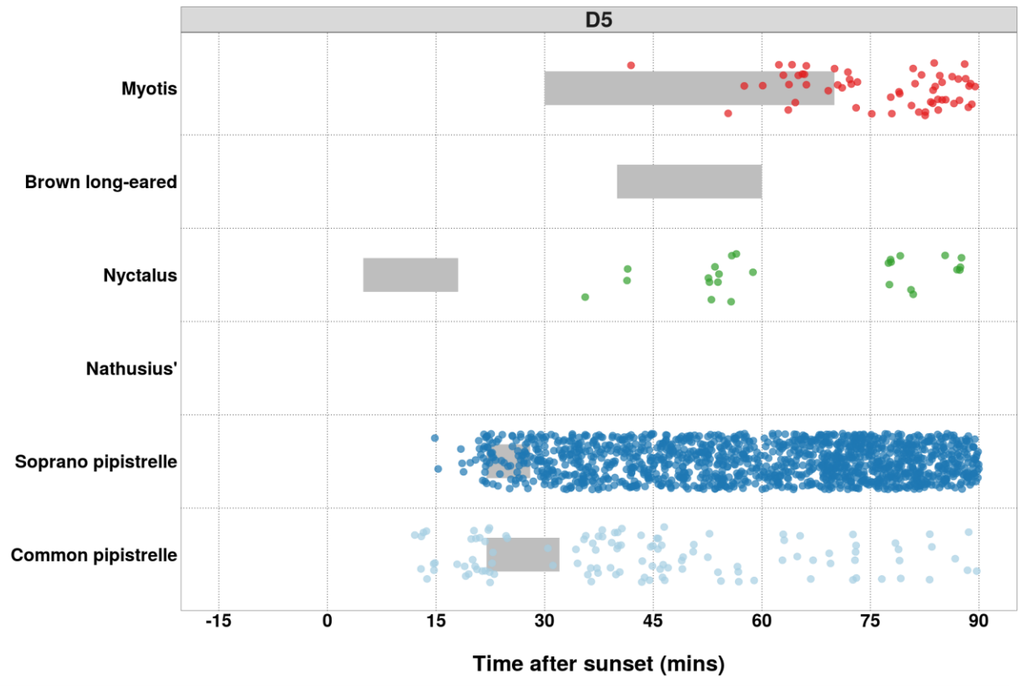


Figure TA_8.4.6 - Species-specfic emergence time shown for D5; overlap of coloured dots on grey bar bat activity close to and before the species-specific roost emergence time



4.7 Data Compared to Reference Range

4.7.1 The data gathered at the Site was compared to a stratified reference range of data from other Sites to allow for bat activity to be categorised into percentiles. The reference range for each species is shown in the last column in **Table TA_8.4.11**.

4.7.2 Activity bands were categorised into percentiles as follows:

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

4.7.3 **Table TA_8.4.11** shows the median percentile and corresponding activity level, and maximum percentile and maximum activity level for each species for the Site as a whole. The median activity level for soprano pipistrelle, common pipistrelle and *Myotis* species was moderate, and low for Nathusius' pipistrelle, *Nyctalus* species and brown long-eared bat. However, when considering the maximum percentile and corresponding activity level, common pipistrelle, soprano pipistrelle, *Nyctalus* and *Myotis* species all displayed high activity, while brown long-eared bat showed moderate activity and Nathusius' pipistrelle low/moderate activity.

Table TA_8.4.11 - Summary table showing key metrics for each species for site as a whole

Species / Species Group	Median Percentile	Activity Level	95 % CIs	Max Percentile	Activity Level	Nights Recorded	Reference Range
Common pipistrelle	59	Moderate	81-90	99	High	176	2,467
Soprano pipistrelle	59	Moderate	78.5-87	99	High	285	2,951
Nathusius' pipistrelle	6	Low	20-20	34	Low/ moderate	3	40
Nyctalus	6	Low	6-6	93	High	61	1,144
Myotis	47	Moderate	69-78.5	99	High	233	1,748
Brown long-eared	6	Low	6-6	47	Moderate	27	247

4.7.4 The activity levels were calculated per species or species group per month, to allow any temporal variations to be seen (**Table TA_8.4.12**). Again, median and maximum percentiles and corresponding activity levels were examined. For common pipistrelle the median percentile ranged between 47 and 67 with the greatest activity level occurring in May whereby activity was moderate/high in comparison to the reference range. The maximum percentile activity was high in six of the seven months, but highest in September (autumn). For soprano pipistrelle the median percentile range was wider (6 to 72), with a greatest median percentile level in October (72nd percentile, which corresponds to moderate/high activity level); the maximum percentile was high in six of the seven months and in the 99th percentile in May, June and September.

4.7.5 Nathusius' pipistrelle was only encountered in June and October and showed the highest median and maximum percentile, representative of low/moderate activity, in June. The median percentile was greatest in *Nyctalus* bats in June and August although this level was low/moderate comparable to reference sites, while the maximum percentile in July was high (93rd percentile) compared to the reference range. The median percentile of *Myotis* species ranged from was low in August to moderate in May, June and September; activity was greatest in (54th percentile). The maximum percentile was high in five of the seven months, peaking at the 99th percentile in May.

The percentiles for median and maximum brown long-eared bat activity were low for all months the species was encountered, with the exception of maximum percentile in August which was 47 and indicated moderate levels of activity.

Table TA_8.4.12 - Summary table showing key metrics for each species for the whole site, split by month

Species/ Species Group	Month	Median Percentile	Activity Level	95 % CIs	Max Percentile	Activity Level	Nights Recorded
Common pipistrelle	Apr	65	Moderate/ high	81-90	81	High	5
	May	67	Moderate/ high	81-90	99	High	32
	Jun	47	Moderate	81-90	99	High	35
	Jul	54	Moderate	81-90	99	High	33
	Aug	59	Moderate	81-90	94	High	12
	Sep	58	Moderate	81-90	100	High	56
	Oct	62	Moderate/ high	81-90	69	Moderate/ high	3
Soprano pipistrelle	Apr	6	Low	78.5-87	76	Moderate/ high	7
	May	59	Moderate	78.5-87	99	High	53
	Jun	62	Moderate/ high	78.5-87	99	High	49
	Jul	65	Moderate/ high	78.5-87	98	High	49
	Aug	47	Moderate	78.5-87	90	High	21
	Sep	59	Moderate/ high	78.5-87	99	High	106
	Oct	72	Moderate/ high	78.5-87	84	High	3
Nathusius' pipistrelle	Jun	20	Low	20-20	34	Low/ moderate	2
	Oct	6	Low	0	6	Low	1
Nyctalus	Apr	6	Low	6-6	6	Low	2
	May	6	Low	6-34	6	Low	3
	Jun	34	Low/ moderate	6-6	86	High	18
	Jul	6	Low	6-6	93	High	18
	Aug	34	Low/ moderate	6-6	65	Moderate/ high	9
	Sep	6	Low	6-6	47	Moderate	11
Myotis	Apr	27	Low/ moderate	69-78.5	98	High	12
	May	47	Moderate	69-78.5	99	High	68
	Jun	54	Moderate	69-78.5	92	High	25

Species/ Species Group	Month	Median Percentile	Activity Level	95 % CIs	Max Percentile	Activity Level	Nights Recorded
	Jul	34	Low/ moderate	69-78.5	97	High	23
	Aug	6	Low	6-32.5	59	Moderate	10
	Sep	47	Moderate	69-78.5	91	High	88
	Oct	34	Low/ moderate	69-78.5	80	Moderate /high	7
Brown long-eared	Apr	6	Low	6-20	6	Low	1
	May	6	Low	6-6	6	Low	5
	Jun	6	Low	6-20	6	Low	2
	Jul	6	Low	6-6	6	Low	2
	Aug	6	Low	0	6	Low	1
	Sep	6	Low	6-6	47	Moderate	15
	Oct	6	Low	0	6	Low	1

4.7.6 **Table TA_8.4.13** shows the key metrics for each species split by detector. For common pipistrelle, activity level (median) percentile varied between 7 and 88 and was highest at D3 (high) and lowest at D6, D7, D8, D9 and D10 (low). The maximum percentile was highest at D3, although high activity was also seen at D4, D5, D6 and D12. Median activity percentile for soprano pipistrelle varied between the 6th percentile (low) at D4, D7, D8, D9 and D11 and the 85th percentile (high) at D3. The maximum percentile was lowest at D11 (6th percentile, low activity) and highest at D3 and D5 (99th percentile, high activity), with high activity recorded at five of the 12 detectors. Nathusius' pipistrelle was only recorded at D3 and D6 and showed low activity at D6 and low/moderate activity at D3 for the median percentile and maximum percentile.

4.7.7 The median percentile for *Nyctalus* species ranged from 6 (at six of the detector locations) to 47 (moderate) at D1 and D5. Maximum percentiles ranged from 6 (low) at D2, D9 and D10 to high activity levels (93rd percentile) at D5. Median activity for *Myotis* species ranged from low (6th percentile) at six locations, to moderate/high (75th percentile) at D5. Maximum percentile ranged from low at D8 (6th percentile) to high at D3 and D5 (83rd and 99th percentile respectively).

4.7.8 The percentiles for median activity of brown long-eared bat were low at all locations other than D2 (34th percentile, low/moderate). The maximum percentiles were low at four of the locations, low/moderate at D2, D6 and D12 and moderate at D3 and D5.

Table TA_8.4.13 - Summary table showing key metrics for each species split by detector

Species/ Species Group	Detector	Median Percentile	Activity Level	95 % CIs	Max Percentile	Activity Level	Nights Recorded
Common pipistrelle	D1	47	Moderate	26.5-59	59	Moderate	5
	D2	34	Low/ moderate	20-44	54	Moderate	5
	D3	88	High	81-90	99	High	72
	D4	63	Moderate/ high	34-89	89	High	4
	D5	54	Moderate	36.5-54.5	90	High	43
	D6	6	Low	6-6	34	High	7
	D7	6	Low	6-6	47	Moderate	7
	D8	6	Low	6-6	6	Low	2
	D9	6	Low	6-20	34	Low/ moderate	8
	D10	6	Low	6-20	34	Low/ moderate	7
	D12	54	Moderate	30-65	95	High	16
Soprano pipistrelle	D1	34	Low/ moderate	34-60	82	High	11
	D2	34	Low/ moderate	20-41.5	77	Moderate/ high	19
	D3	85	High	78.5-87	99	High	70
	D4	6	Low	6-51	96	High	9
	D5	77	Moderate/ high	65.5-79	99	High	70
	D6	34	Moderate	30-50.5	78	Moderate/ high	22
	D7	6	Low	6-6	47	Moderate	12
	D8	6	Low	6-20	34	Low/ moderate	6
	D9	6	Low	6-30	54	Moderate	16
	D10	34	Low/ moderate	6-47	67	Moderate/ high	15
	D11	6	Low	6-6	6	Low	3
	D12	41	Moderate	34-56.5	98	High	32
Nathusius' pipistrelle	D3	20	Low	20-20	34	Low/ moderate	2
	D6	6	Low	0	6	Low	1
Nyctalus	D1	47	Moderate	6-54	54	Moderate	5
	D2	6	Low	0	6	Low	1
	D3	6	Low	6-34	62	Moderate/ high	12
	D4	20	Low	20-20	34	Low/ moderate	2
	D5	47	Moderate	20-69	93	High	16
	D6	6	Low	6-6	65	Moderate/ high	6
	D7	6	Low	6-26.5	47	Moderate	6
	D9	6	Low	6-6	6	Low	4
	D10	6	Low	6-6	6	Low	5

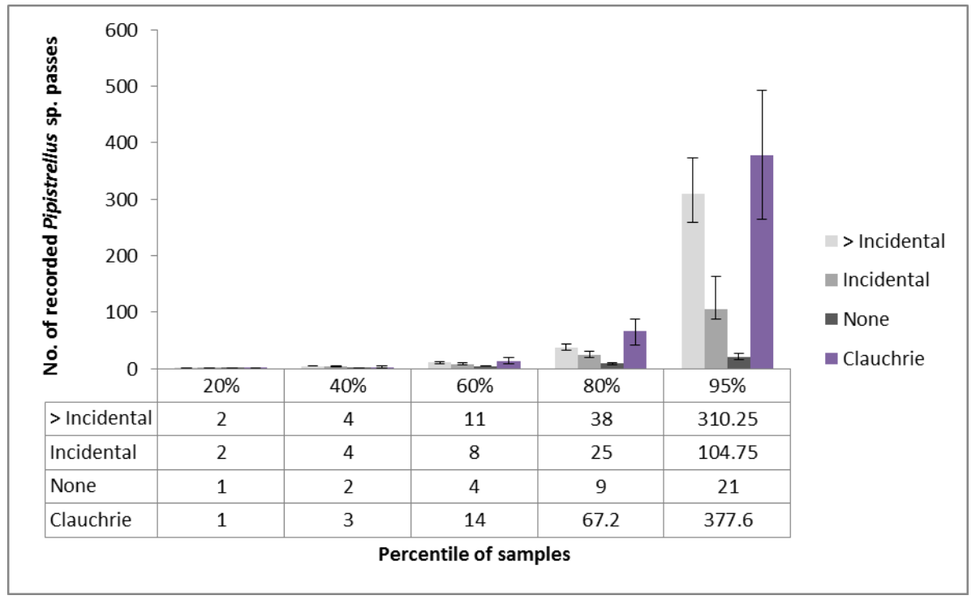
Species/ Species Group	Detector	Median Percentile	Activity Level	95 % CIs	Max Percentile	Activity Level	Nights Recorded
	D12	20	Low	6-34	54	Moderate	4
Myotis	D1	6	Low	6-32.5	59	Moderate	6
	D2	34	Low/ moderate	20-47	65	Moderate/ high	13
	D3	54	Moderate	39.5-57	83	High	59
	D4	6	Low	6-6	34	Low/ moderate	9
	D5	75	Moderate/ high	69-78.5	99	High	77
	D6	6	Low	6-20	47	Moderate	17
	D7	6	Low	6-6	34	Low/ moderate	7
	D8	6	Low	6-6	6	Low	5
	D9	6	Low	6-6	34	Low/ moderate	3
	D10	34	Low/ moderate	20-34	34	Low/ moderate	10
	D11	34	Low/ moderate	6-40.5	67	Moderate/ high	13
	D12	34	Low/ moderate	20-46.5	67	Moderate/ high	14
Brown long-eared	D1	6	Low	0	6	Low	1
	D2	34	Low/ moderate	0	34	Low/ moderate	1
	D3	6	Low	6-20	47	Moderate	9
	D4	6	Low	0	6	Low	1
	D5	6	Low	6-6	47	Moderate	7
	D6	6	Low	6-6	34	Low/ moderate	3
	D9	6	Low	0	6	Low	1
	D10	6	Low	0	6	Low	1
	D12	6	Low	6-6	34	Low/ moderate	3

4.8 Data Compared to SPR Reference Range

4.8.1 **Figure TA_8.4.7** shows the number of pipistrelle bat passes (soprano and common pipistrelle combined) per location per night at different percentiles compared to the same values derived from operational projects with different categories of bat fatality. From these data it is seen that the bat activity at the proposed Development may generate a fatality rate between zero and incidental at the 20th and 40th percentile, although at the 60th, 80th and 95th percentiles the predicted fatality rate is greater than incidental.

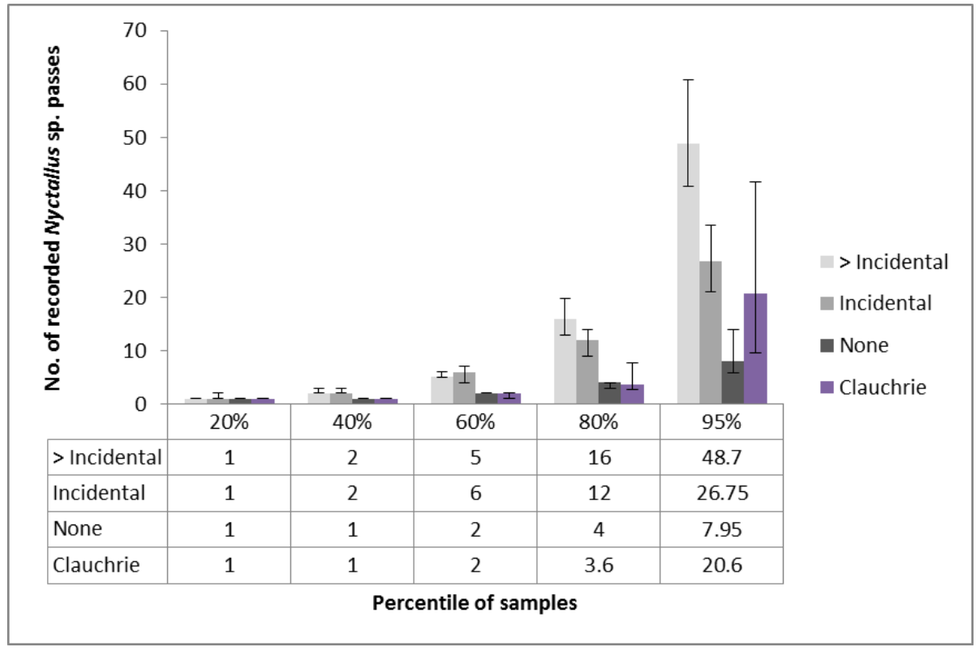
4.8.2 **Figure TA_8.4.8** shows the number of *Nyctalus* species bat passes per location per night at different percentiles compared to the same values derived from operational projects with different categories of bat fatality. From these data it is expected that the bat activity at the proposed Development will generate a zero fatality rate as the activity level falls below the zero benchmarks at four of the five percentiles.

Figure TA_8.4.7 - Number of pipistrelle bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality.



	20%	40%	60%	80%	95%
> Incidental	2	4	11	38	310.25
Incidental	2	4	8	25	104.75
None	1	2	4	9	21
Clauchrie	1	3	14	67.2	377.6

Figure TA_8.4.8 - Number of *Nyctalus* species bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality.

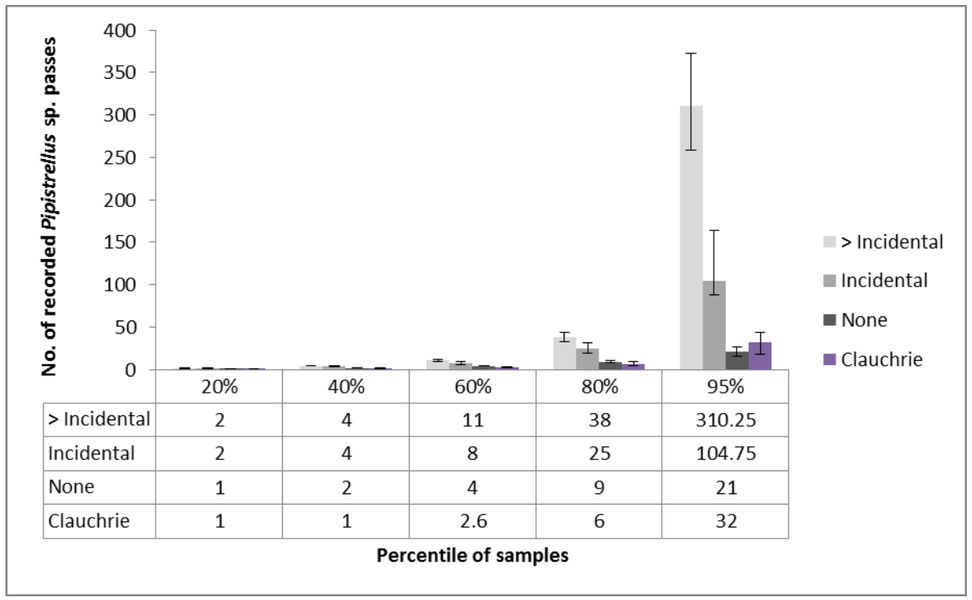


	20%	40%	60%	80%	95%
> Incidental	1	2	5	16	48.7
Incidental	1	2	6	12	26.75
None	1	1	2	4	7.95
Clauchrie	1	1	2	3.6	20.6

4.8.3 **Figure TA_8.4.9** shows, when removing the passes recorded at D3 and D5, the number of pipistrelle bat passes (soprano and common pipistrelle combined) per location per night at different percentiles compared to the same values derived from operational projects with different categories of bat fatality. It can be seen that removing the activity recorded at locations where turbines will not be sited (i.e. D3 and D5) lowers the number of bat passes greatly and the fatality rate generated reduces to between zero and incidental at the 95th percentile, and equivalent to zero at the other five percentiles.

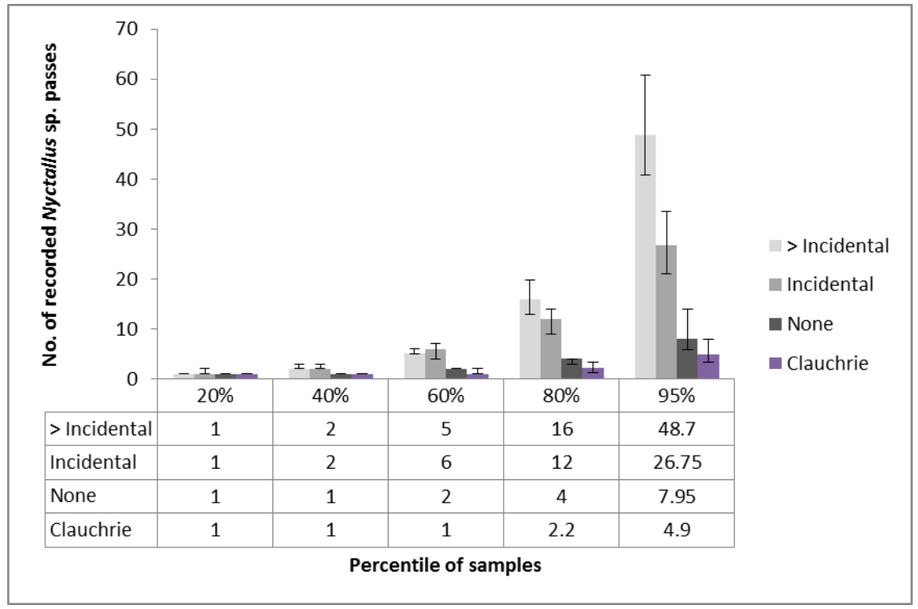
4.8.4 **Figure TA_8.4.10** shows, when removing the passes recorded at D3 and D5, the number of *Nyctalus* species bat passes per location per night at different percentiles compared to the same values derived from operational projects with different categories of bat fatality. As was seen for pipistrelle species, removing the activity recorded at locations where turbines will not be sited (i.e. D3 and D5) lowers the number of bat passes and the fatality rate generated falls to zero at each percentile.

Figure TA_8.4.9 - Number of pipistrelle bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality - removing data from D3 and D5.



	20%	40%	60%	80%	95%
> Incidental	2	4	11	38	310.25
Incidental	2	4	8	25	104.75
None	1	2	4	9	21
Clauchrie	1	1	2.6	6	32

Figure TA_8.4.10 - Number of Nyctalus species bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality - removing data from D3 and D5.

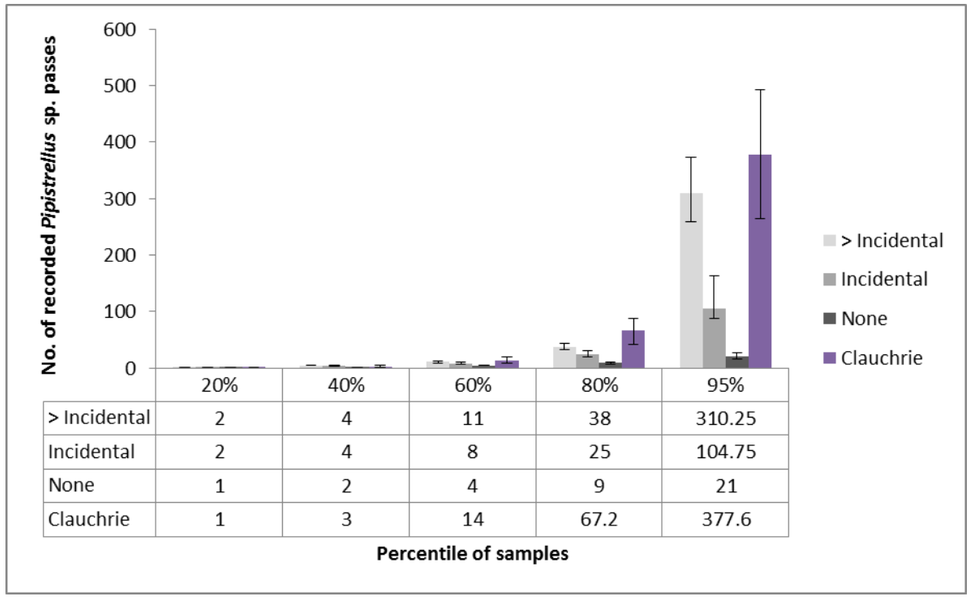


	20%	40%	60%	80%	95%
> Incidental	1	2	5	16	48.7
Incidental	1	2	6	12	26.75
None	1	1	2	4	7.95
Clauchrie	1	1	1	2.2	4.9

4.8.5 As a turbine will be located to the west of D5 (although not directly at D5), this position was compared on its own to the reference range. **Figure TA_8.4.11** shows the number of pipistrelle bat passes (soprano and common pipistrelle combined) per location per night at different percentiles compared to the same values derived from operational projects with different categories of bat fatality. From these data it is seen that the bat activity at the D5 may generate a fatality rate of greater than incidental (at all but the 95th percentile).

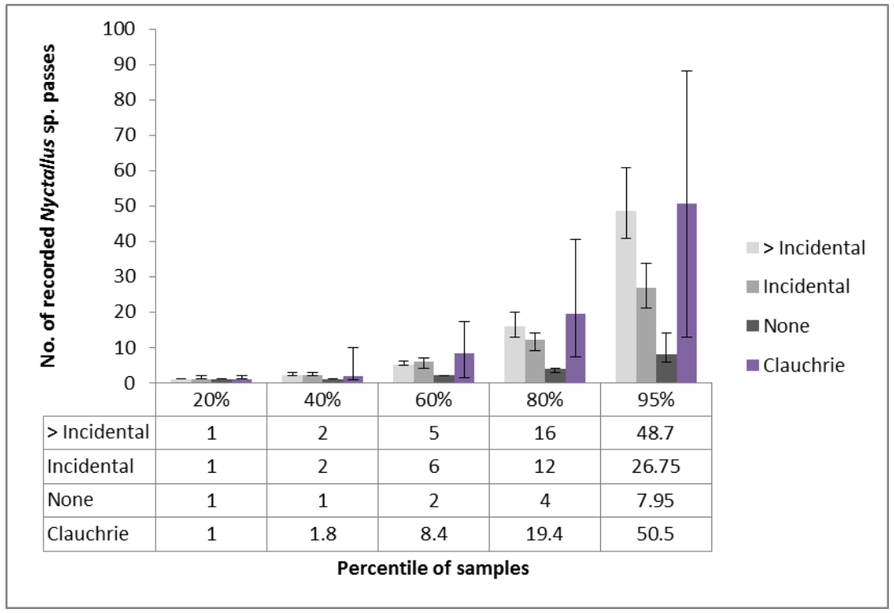
4.8.6 **Figure TA_8.4.12** shows the number of *Nyctalus* species bat passes at D5 per night at different percentiles compared to the same values derived from operational projects with different categories of bat fatality. From these data it is seen that the predicted fatality rate at the upper three percentiles is greater than incidental while the fatality rate at the lower two percentiles is between incidental and greater than incidental.

Figure TA_8.4.11 - Number of pipistrelle bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality - D5 only.



	20%	40%	60%	80%	95%
> Incidental	2	4	11	38	310.25
Incidental	2	4	8	25	104.75
None	1	2	4	9	21
Clauchrie	1	3	14	67.2	377.6

Figure TA_8.4.12 - Number of *Nyctalus* species bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality - D5 only.



	20%	40%	60%	80%	95%
> Incidental	1	2	5	16	48.7
Incidental	1	2	6	12	26.75
None	1	1	2	4	7.95
Clauchrie	1	1.8	8.4	19.4	50.5

4.9 Assessment of Potential Risk

4.9.1 Only high collision risk species (common, soprano and Nathusius' pipistrelle and *Nyctalus* species) are included within the impact assessment. Low risk species (*Myotis* species and brown long-eared bat) have low collision risk, so the impact of the development on the local bat population would likely be negligible.

4.9.2 The Site has been assessed as having moderate habitat risk, as there is a building within the Site with moderate roost potential (Little Shalloch) and three residential properties 1 km outwith the Site boundary. The foraging habitat is of low-moderate quality and there are linear features such as burns, tracks and woodland edge connecting the Site with the wider landscape. It is proposed to install 18 turbines of 200 m ground to blade tip height and so the project size has been assessed as medium. Therefore, the site risk level has been assessed as medium (3), in line with **Table TA_8.4.5**.

4.9.3 Using **Table TA_8.4.6** which multiplies site risk (medium, 3) against Ecobat activity category, the overall level of risk for each species across the whole Site, and per detector and per month can be examined (**Table TA_8.4.14**). Both the median and maximum levels of activity were used so as to calculate the typical Site risk level, and the maximum Site risk level.

4.9.4 The overall risk level for all high risk species ranged from low (green) to high (red). At a whole site level, the median risk was medium for common and soprano pipistrelles and low for Nathusius' pipistrelle and *Nyctalus* species. The maximum whole site risk was high for common pipistrelle, soprano pipistrelle and *Nyctalus* species, and medium for Nathusius' pipistrelle.

4.9.5 When considered per month, the median risk to common and soprano pipistrelle was medium for all months (except April for soprano pipistrelle which was low risk). The median risk for Nathusius' pipistrelle in both recorded months was low. For *Nyctalus* bats the median risk was low for four months of the survey and medium for June and August. The maximum risk for common and soprano pipistrelle was high for all months except for October for common pipistrelle (medium) and April for soprano pipistrelle (medium). Nathusius' pipistrelle showed low maximum risk on October and medium maximum risk in June. The maximum risk level for *Nyctalus* species varied from low in April and May, to high in June and July, and medium in August and September.

4.9.6 When looking at detector location, the median risk for common pipistrelle varied from low at D6 to D10, and was medium at the other locations with the exception of D3 where risk was high. The median risk for soprano pipistrelle was low (at five locations), medium (at six locations) and high at D3. For Nathusius' pipistrelle the median risk at both detector locations was low, while the maximum risk was medium. *Nyctalus* species had a median risk of low at eight locations and medium risk at two (there were two locations where *Nyctalus* bats were not recorded). The maximum risk for common pipistrelle was high at D3, D4, D5 and D6 and medium for the other locations except D8 which was low risk. The maximum risk for soprano was high at D1 and D3, D4 and D5, and medium at the other locations except D11 which was low risk. The risk to *Nyctalus* species was high at D5, medium at six of the locations and low at D2, D9 and D10.

Table TA_8.4.14 - Overall risk assessment of high risk species for the site and per month and per dectector location

Species / Species Group	Location	Median Risk	Maximum Risk	Month	Median Risk	Maximum Risk
Common pipistrelle	Whole site	9	15	April	12	15
	D1	9	9	May	12	15
	D2	6	9	June	9	15
	D3	15	15	July	9	15
	D4	12	15	August	9	15
	D5	9	15	September	9	15
	D6	3	15	October	12	12

Species / Species Group	Location	Median Risk	Maximum Risk	Month	Median Risk	Maximum Risk
	D7	3	9			
	D8	3	3			
	D9	3	6			
	D10	3	6			
	D12	9	15			
Soprano pipistrelle	Whole site	9	15	April	3	12
	D1	6	15	May	9	15
	D2	6	12	June	12	15
	D3	15	15	July	12	15
	D4	3	15	August	9	15
	D5	12	15	September	12	15
	D6	9	12	October	12	15
	D7	3	9			
	D8	3	6			
	D9	3	9			
	D10	6	12			
	D11	3	3			
	D12	9	15			
Nathusius' pipistrelle	Whole site	3	6	June	3	6
	D3	3	6	October	3	3
	D6	3	3			
Nyctalus	Whole site	3	15	April	3	3
	D1	9	9	May	3	3
	D2	3	3	June	6	15
	D3	3	12	July	3	15
	D4	3	6	August	6	12
	D5	9	15	September	3	9
	D6	3	12			
	D7	3	9			
	D9	3	3			
	D10	3	3			
	D12	3	9			

5 Discussion

5.1 Roosting

5.1.1 When establishing the conservation needs of bats there are three important aspects that should be considered when making changes to the local habitat or features. These are roosting sites, foraging areas and commuting/navigational corridors or features (Entwistle *et al.*, 2001).

5.1.2 Throughout the year, during periods of inactivity, all bats require safe and sheltered roosting sites. They will use different roosts at different times of the year. Roosts were located within Little Shalloch used by soprano pipistrelle, *Myotis* or brown long-eared bat and an unidentified (non-echolocating) species which may be common pipistrelle. It is likely to be *Myotis* bats roosting there as the median percentile at D3 indicated moderate activity as opposed low activity from brown long-eared bats at D3. The median activity level at D3 for both common and soprano pipistrelle was high, confirming that bats were active there throughout the survey season. The rates of bat activity at D3 are likely to be overinflated due to the presence of the roosts in Little Shalloch, and it should be remembered that the recordings obtained represent number of bat passes rather than number of bats.

5.1.3 The closest proposed turbine to Little Shalloch (T1) is over 1 km away and there is no infrastructure proposed to pass by the structure, therefore any bats roosting in the building will not be impacted by the development. As such, no further bat surveys of Little Shalloch are recommended.

5.1.4 There were no other roosting features within the Site, although within approximately 1 km to the south, outwith the Site boundary, are three residential dwellings which were not included within the survey effort. These dwellings could contain bat roosts and therefore could be a source of bats entering the Site. The closest detector locations to these properties were D2 and D6. However, the bat activity at D2 was low or low/moderate, and low at D6 for all species other than soprano pipistrelle, which showed moderate levels of activity. This indicates that even if roosts are located nearby, bats may have dispersed so that they are not passing by this location in great numbers. North of D6 was D5, located by Loch Scalloch, where activity of *Myotis* bats and soprano pipistrelle was moderate/high and common pipistrelle and *Nyctalus* species showed moderate activity. Again, these bats could have originated from the properties outwith the south boundary.

5.2 Foraging and Commuting

5.2.1 All bats within the UK require large amounts of insect food in order to survive and they require linear features (e.g. woodland edge, tree lines, waterways etc.) in order to orientate themselves in the dark and to act as commuting corridors between their roosts and their foraging areas. This is especially true for smaller species and a gap in a linear feature as little as 10m may act as a barrier to movement (Entwistle *et al.*, 2001). Such linear features can also provide a degree of protection from potential predators and from adverse weather. There are features within and close to the Site which can be used by foraging bats including tracks, woodland edge and water courses.

5.2.2 As would be expected, bat activity was lower at detectors located in open areas of habitat, and higher where detectors were located closer to edge features (which may provide more sheltered feeding opportunities and be used to aid navigation) and open water which provides excellent foraging opportunities. Median activity at D5 which was located on the south shore of Loch Scalloch was moderate/high for *Myotis* species and soprano pipistrelle, and common pipistrelle and *Nyctalus* species displayed moderate activity. The loch is therefore an important foraging resource for bats in the Site. The closest turbine to Loch Scalloch is T4, to be positioned approximately 185 m to the west on the peak of a hill. The infrastructure route for the turbine is from the south, so there is no access route planned closer to the loch.

5.2.3 In total over 23,000 bat passes were recorded during the survey period although bats were only recorded on 101 nights out of 1,002 nights of detector deployment. Although activity was increased at the aforementioned locations, there were many nights where no bats were recorded and thus it can be concluded that activity as a whole at the site is low.

5.3 Impact Assessment

5.3.1 The impact assessment has provided an overall risk for median and maximum bat activity by multiplying site risk with Ecobat activity category. The median percentile and subsequent activity level will be used for assessment rather than the maximum as it is a more representative measure. Because bats were only recorded on 10 % of the deployment nights, using the maximum percentile and activity level will skew the results even further than has been done by omitting the zero nights of data. The median risk for the three pipistrelle species across the whole site was medium, and the whole site risk for *Nyctalus* species was low. High levels of risk were seen for soprano

and common pipistrelle at D3 although as discussed above there will be no works within 1 km of D3 and Little Shalloch and so these species will not be impacted.

5.3.2 This low risk can also be demonstrated by comparing the activity at the Site and known bat fatality at operational SPR sites. When looking at the detectors sited where the turbines will be located (i.e. removing D3 and D5), the predicted fatality rate is between zero and incidental (less than two bats per turbine per year) for *Pipistrellus* and equivalent to zero for *Nyctalus* species. However, the woodland will be keyholed to allow siting of T4, and it is not apparent how bats are reaching the loch, which means there is potential risk of collision with T4 as bats commute to the water. The comparison of activity at D5 with operational sites from SPR data shows the fatality risk is considered greater than incidental for *Pipistrellus* species and between incidental and greater than incidental for *Nyctalus* bats.

5.4 Mitigation and Compensation

5.4.1 The mitigation hierarchy states that a development must aim to avoid significant effects from the outset, and this means considerations made from an early stage of the project. If this cannot be achieved, the impacts must be mitigated.

5.4.2 When the detector locations were chosen they were located close to the proposed turbine locations and although some were not at turbines, or some of the turbines were not paired with a detector, bat activity was still sampled from across the Site and in a range of habitats.

5.4.3 The windfarm should be designed to allow the locations of the turbines to be situated well away from trees, forestry and water features to minimise the risk to bats. The survey guidelines (SNH, 2019a) suggests a minimum buffer of 50 m from rotor swept area to feature (e.g. woodland edge). It is noted that a buffer such as this may not be effective mitigation for high flying species such as noctule and Leisler's bats, although these species were not recorded at high activity levels in the survey programme. Three of the turbines are located in open habitat (T7 is 93 m away from woodland edge, T10 is 102 m away from woodland edge and T13 is 390 m away from woodland edge) but all of the rest will require keyholing of the surrounding woodland. The formula used to calculate the distance (b) from the edge of the habitat feature and the centre of tower is:

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

where bl = blade length, hh = hub height, fh = feature height (all in m).

5.4.4 At Clauchrie the hub height of the proposed turbines is 125 m and blade length 75 m, and if the woodland edge the turbine will be adjacent to is 20 m, the buffer distance will be 68 m.

5.4.5 Conservation considerations include reducing the impact of lighting during construction of the wind farm site. Limiting lighting to allow for some dark periods will also reduce the impact upon foraging bats. Whilst the site is under construction lights should be switched off during the night. Task lighting during the construction phase and any permanent lighting for maintenance works should be directed away from any of the identified commuting and foraging routes (i.e. woodland edges and water courses) to avoid unnecessary disturbance to bats.

5.4.6 Temporal analysis of activity (median risk) revealed little in the way of seasonal patterns of activity. The risk for common pipistrelle was medium throughout the survey period, as it was for soprano pipistrelle (with the exception of April where risk was low). Nathusius' pipistrelle show low risk for the two months it was recorded and *Nyctalus* bat showed low risk for four of the six months of the survey period. With this in mind, no seasonal mitigation is being recommended.

5.4.7 Due to the potential risk to bats due to the positioning of T4 to the west of Loch Scalloch, and the higher levels of activity seen at D5 on the south side of the loch it would be prudent to implement mitigation. The mitigation measures will comprise curtailment of the operation of T4 while it is idling i.e. below the cut-in wind speed at which electricity generation occurs. The mitigation measure will be implemented at T4 between the months of April to October between sunset and sunrise each year for the lifetime of the proposed Development unless monitoring results necessitate a change. Monitoring involving acoustic surveying and carcass detection will also be carried out.

6 References

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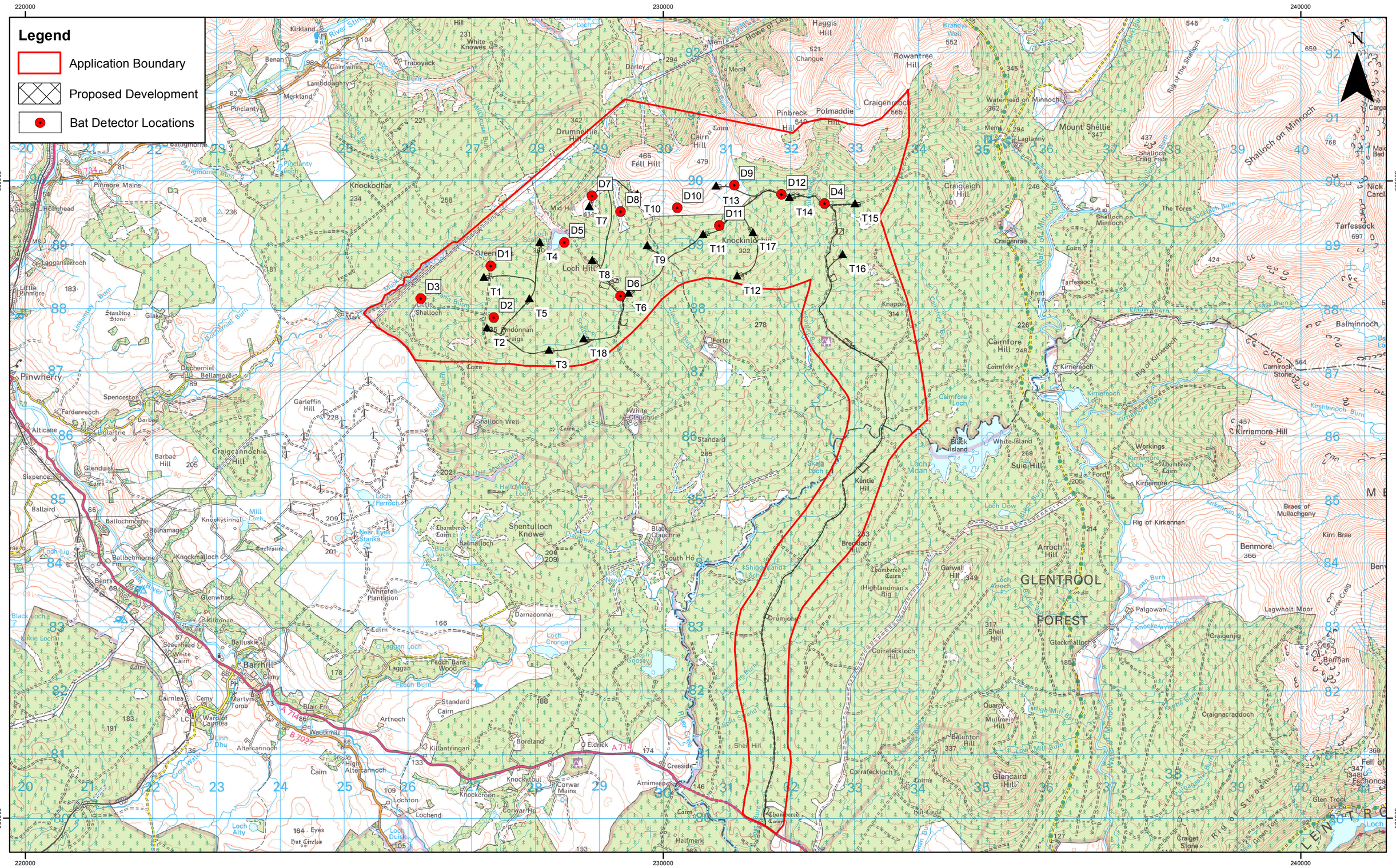
Figures



SCOTTISHPOWER RENEWABLES

Rev	Date	By	Comment
A	13/11/19	AG	First Issue.

1:55,000
Scale @ A3

0 1.5 3 Km

Clauchrie Windfarm

EIA Report

Bat Report: Site Plan

Drg No	EDI_1263_EIAR
Rev	A
Date	09/12/19
Figure	TA8.4.1

Datum: OSGB36
Projection: TM

Annex A

Site Name	Date	Survey Type	Sunset	OS Grid Ref	Temperature °C	Surveyor(s) (Location Ref)
Little Shalloch, Clauchrie	19/08/2019	Dusk	20:44	NX 2619 8816	12	H. Campbell (S1)
Survey Timespan		**Precipitation**	**Cloud Cover**	**Moon Phase**	**Wind (F)**	M. Anderson (S2)
20mins before sunset until 90mins after sunset		Intermittent rain	100%	Waning Gibbous	1-4	
Surveyor	**Time**	**Species**	**Max Number of Individual Bats Present**	**Bat Passes** (Max of 5 per single bat)	**Behaviour**	**Additional Notes**
Survey Start Time	**20:24**					
S1	20:45	Soprano pipistrelle	1	1	Roosting	Precise roosting location unknown (south-eastern elevation, between the porch and eastern corner).
	20:48	Unknown species	1	1	Roosting	Non-echolocating, precise emergence location unknown (south-eastern elevation, between the porch and eastern corner).
	20:52	Unknown species	1	1	Roosting	Non-echolocating, precise emergence location unknown (south-eastern elevation, between the porch and eastern corner).
	20:56	Unknown species	1	1	Roosting	Emerged from under slate above the window (Roost 1). Non-echolocating.
	21:49	Soprano pipistrelle	1	1	Roosting	Bat entered under slate above the window (Roost 2).
	22:06	Soprano pipistrelle	1	1	Roosting	Bat entered in gap within wooden frame of window (Roost 3).
S2		No bats were observed emerging from the building from this surveyor position.				
Survey End Time	**22:14**					
Total Survey Time (mins)	**110**	**Overall Roosting Totals**	**6**	**6**		

Results Summary and Conclusions: Six roosting bats were observed emerging and re-entering in three different locations. Low levels of bat activity were recorded within the site, with commuting and foraging pipistrelles.

Site Name	Date	Survey Type	Sunrise	OS Grid Ref	Temperature °C	Surveyor(s) (Location Ref)
Little Shalloch, Clauchrie	03/09/2019	Dawn	06:27	NX 2619 8816	14	R. Keen (S1)
Survey Timespan		**Precipitation**	**Cloud Cover**	**Moon Phase**	**Wind (F)**	R. Hignett (S2)
70mins before sunrise until 15mins after sunrise		Light drizzle	100%	Waxing Crescent	1	
Surveyor	**Time**	**Species**	**Max Number of Individual Bats Present**	**Bat Passes** (Max of 5 per single bat)	**Behaviour**	**Additional Notes**
Survey Start Time	**05:17**					
S1	05:56	poss. BLE/Myotis	1	5	Roosting	Entered a roost underneath the roof slate on the south-eastern elevation (Roost 4).
	06:10	Soprano pipistrelle	1	5	Roosting	Entered Roost 3 in gap within wooden frame of window.
	06:16	Soprano pipistrelle	1	3	Roosting	Entered Roost 3.
	06:23	Soprano pipistrelle	1	5	Roosting	Entered Roost 3.
S2		No bats were observed entering the building from this surveyor position.				
Survey End Time	**06:47**					
Total Survey Time (mins)	**85**	**Overall Roosting Totals**	**4**	**18**		

Results Summary and Conclusions: four roosting bats were observed during the survey, with three soprano pipistrelles entering Roost 3 and one possible brown long-eared bat/*Myotis* sp. bat entering Roost 4.

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