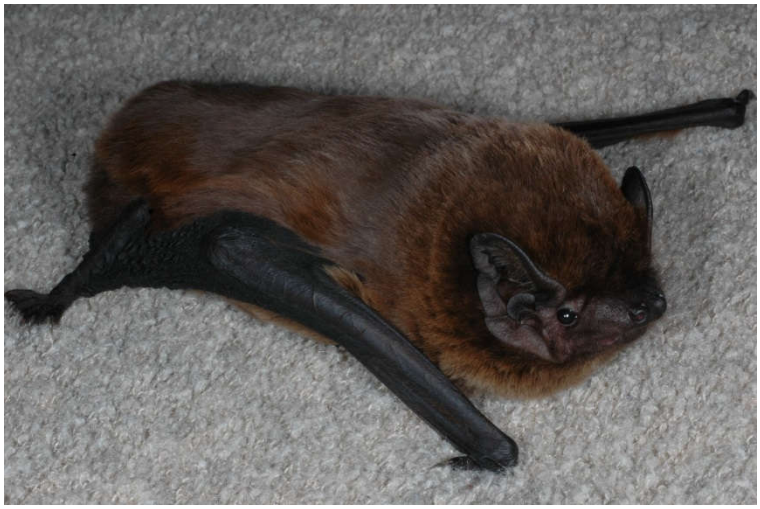
BAT SURVEYS AT THE PROPOSED SPRINGFIELD WIND FARM SITE AT MULLINAVAT, CO. KILKENNY TO ASSESS ITS POTENTIAL FOR BAT ROOSTING SITES AND FORAGING SITES



Leisler's Bat Copyright Phil Richardson

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SUMMARY

Site:	Proposed Springfield wind farm, Castlebanny and surrounding townlands, Mullinavat, Co. Kilkenny
Development:	Construction of c. 26 turbine wind farm mostly within and around conifer plantations at Castlebanny and surrounding townlands, Mullinavat, Co. Kilkenny
Grid Reference:	Approximate Grid Reference of central point S58873 31490; Discovery Map 76
Bat Species Present:	Soprano pipistrelle, Common pipistrelle, Leisler's bat, Natterer's bat, Brown Long-eared bat, Whiskered bat
Proposed Works:	Development consisting of the construction of c. 26 wind turbines, site access roads, hard standing areas, underground cabling and all ancillary site works
Report by:	Dr Caroline Shiel

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1. INTRODUCTION

A planning permission is being prepared to lodge with Kilkenny County Council for a c. 26 turbine wind farm at Castlebanny and surrounding townlands, Mullinavat, Co. Kilkenny. This proposed windfarm is sited mostly within the boundaries of Coillte-owned forests, but also extends to include some adjacent farmland.

I was contracted by Dr George Smith of Blackthorn Ecology to prepare a desktop study of the potential for bats on the site and to conduct winter, Spring, Summer and Autumn bat surveys to assess potential for roosting sites and foraging sites within the site boundary.

1.1 SITE LOCATION AND DESCRIPTION

The proposed site for these 26 wind turbines is mostly within forestry which includes the townlands of Castlecosker, Castlebanny, Mullenakill and Derrylacky. The site is approximately 7km long running from north to south and approximately 2km wide from west to east. The site is mostly contained within plantation forest but extends to include some farmland at the northwestern end (Kiltorcan townland) and northeastern end (Powerswood townland).

Most forestry plantations within the proposed Springfield Wind Farm site are managed by Coillte and include Castlebanny, Mullennakill, Kilvinoge, Castlecosker and Derrylacky properties. These forest properties are included within the Mullinavat Forest (KK05) management area in south Kilkenny, which includes other properties to the south-east of the proposed site. The total area of Mullinavat Forest is 1901 hectares. The main species include Sitka Spruce *Picea sitchensis*, Lodgepole pine *Pinus contorta*, Larch *Larix*, Fir *Abies* and Alder *Alnus glutinosa*. The majority of Mullinavat Forest is at the thinning stage and has not reached maturity.

1.2 DESIGNATED PROTECTED AREAS IN VICINITY

Only one Natura 2000 site could potentially be affected by the proposed project - River Barrow and River Nore SAC Site Code 002162.

The proposed site for Springfield Wind Farm is close to two tributaries of The River Nore. The River Arrigle flows in a northerly direction to join the River Nore upstream of Inistioge town. The Arrigle River lies c.1.3km to the east of the eastern boundary of the proposed site at its nearest point. The Arrigle River runs 1.5 – 2km distant along most of the eastern site boundary. A second tributary of the River Nore – the Little Arrigle River – lies approximately 3.5km to the northwest of the boundary of the proposed site and flows in a northerly direction to join the River Nore upstream of Thomastown. The River Nore itself lies c.7km to the east of the site at its nearest point. The River Nore and these two tributaries are included in the designation of River Barrow and River Nore SAC 002162. A section of the River Nore from Callan to c. 3km south of Inistioge is designated as a Special Protected Area for birds - River Nore SPA 004233.

There is also a small protected area c. 7km to the west of the proposed site – Hugginstown Fen SAC/NHA 000404.

There is one pNHA approximately 5.2km to the east of the eastern site boundary – Brownstown Wood pNHA (site code 000827). Brownstown Wood is a tract of oak woodland

situated on a low hill. It is very unusual in that the canopy consists almost exclusively of oak. This type of virtually pure oak forest is very rare in Ireland.

2. BATS AND WIND FARM DEVELOPMENTS

2.1 BAT SURVEY GUIDELINES

Bat Conservation Ireland has prepared guidelines for bat surveys in relation to wind turbine/wind farm developments (Bat Conservation Ireland, 2012). These guidelines were prepared to provide advice to the wind energy industry, ecologists and local planning authorities on the survey work required to understand and assess the use by bats of an area proposed for a wind energy development.

Bat Conservation Ireland recognises the importance of both protecting bat populations and the development of a sustainable renewable energy industry in Ireland. These guidelines are in line with UNEP/EUROBATS secretariat guidelines and other national guidance such as the Northern Ireland Environmental Agency, Bat Conservation Trust (England) and Natural England.

The overall aim of the guidelines is to ensure that bats, their roosts, feeding areas and flight paths are protected from any potentially adverse impacts posed by wind turbine/farm development through avoidance, mitigation and/or compensation measures as required by survey findings.

Recommendations should be made on a case by case basis by an ecologist with sufficient bat expertise when considering proposed development sites.

In January 2019 new guidelines for bat surveys at proposed wind turbine sites were produced - "*Bats and Onshore Wind Turbines Survey, Assessment & Mitigation*" by Scottish Natural Heritage, Natural England, Natural Resources Wales, Renewable UK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter and the Bat Conservation Trust. Neither the National Parks and Wildlife Service (NPWS) nor the Northern Ireland Environmental Agency (NIEA) were involved in the preparation of this document. Therefore, the applicability of this guidance in Ireland remains unclear. As of yet, NPWS have not endorsed these guidelines.

The new guidelines recommend remote monitoring be conducted on proposed sites for 10 consecutive nights in each of the active bat seasons – Spring, Summer and Autumn as a minimum requirement. It is recommended that these static detectors be placed on the exact sites of individual turbines. This would pose problems when the exact location of turbines has not been finalised. Also, where key-hole felling is required, the landscape pre- and post-felling would be totally different.

2.2 WIND TURBINES AND BATS

Studies to date in Europe and the USA (Kunz et al, 2007; Arnett et al, 2008, Rydell et al, 2010) have shown that bat mortality at wind turbines is a serious issue. Bats are known to be killed either through a fatal change in pressure within the lungs (barotrauma) when flying too close to the blades or through collision with rotor blades.

To date, nine resident bat species have been recorded in Ireland – Soprano pipistrelle *Pipistrellus pygmaeus*, Common pipistrelle *Pipistrellus pipistrellus*, Nathusius' pipistrelle

Pipistrellus nathusii, Brown long-eared bat *Plecotus auritus*, Leisler's bat *Nyctalus leisleri*, Lesser horseshoe bat *Rhinolophus hipposideros*, Daubenton's bat *Myotis daubentonii*, Natterer's bat *Myotis nattereri*, and Whiskered bat *Myotis mystacinus*. All of these species, except one, are normally low fliers <10m above ground level and therefore are considered to be at a lower risk from turbine impacts. However, one species – Leisler's bat *Nyctalus leisleri* is a fast, high-flying species and therefore most at risk from wind turbines. Pipistrelle species have been observed to investigate new turbine masts when they are erected in their environment. Data from European wind turbine related mortality includes high numbers of pipistrelle species. Leisler's bat is classified as a high risk species in relation to wind turbines as it is a high flier - often up to 100m - which travels considerable distances (up to 13.4km has been recorded in Ireland, Shiel et al, 1999) between roosts and foraging areas. The species has evolved for fast flight in excess of 40kmh and is less manoeuvrable as a consequence.

To date, there is no published results of a study of bat mortality from Irish wind turbines but the mortality rate is most likely similar to the UK and the rest of Europe. However, many of the European and American studies feature wind farms with significantly larger number of turbines which are sited along known bat migration routes where thousands of bats commute seasonally. Currently there is no evidence that mortality of bats occurs at the same scale in Ireland. Large scale bat migration is not known to occur in Ireland although bats may migrate considerable distances from roosting areas to swarming sites for mating purposes in autumn. Such swarming sites are often caves in upland areas.

2.3 LEGLISATION AND BATS

The serious decline in bat populations both in Ireland and across Europe has led to conservation measures and appropriate legislation being drawn up and implemented in an attempt to stabilise population numbers. It is estimated that bat populations across Europe have decreased by up to 60% in the last 30 years. As they are highly specialised animals, bats serve as biological indicators and are often amongst the first animal species to show signs of population change due to the activities of man. Destruction of roosts and foraging areas, coupled with the widespread use of pesticides, are the key reasons for the decline in numbers of bats in Ireland. Efforts should be made to retain known bat colonies and methods to lessen disturbance to these animals should be incorporated into any development.

Bats' dependency on insects has left them vulnerable to habitat destruction, land drainage, agricultural intensification and increased use of pesticides. Their reliance on buildings has also made them vulnerable to building repairs and the use of chemicals for timber treatment.

Roosting or hibernation sites in caves, mines, trees and disused buildings are also often lost to development.

Irish Legislation

Wildlife Act 1976 – In the Republic of Ireland, under Schedule 5 of the Wildlife Act 1976 all bats and their roosts are protected by law. It is an offence to disturb either without the appropriate licence. This Act was further strengthened by the Wildlife Amendment Act 2000.

E.U. Legislation

Under the Habitats Directive (92/43/EEC), each member state of the E.U. was requested to identify habitats of national importance and priority species of flora and fauna. These habitats are now designated as Special Areas of Conservation (SACs). In Ireland, all bat species are classified as Annex IV species under the Habitats Directive. Annex IV species are species in need of strict protection. In addition, the Lesser Horseshoe bat is an Annex II species, which are species requiring the designation of Special Areas of Conservation specifically for their protection.

As Annex IV species, all species of bat in Ireland are strictly protected under the Habitats Directive to include deliberate disturbance of these species, particularly during the periods of breeding, rearing and hibernation. It also specifies deterioration or destruction of breeding or resting places.

International Legislation

Ireland has ratified two international wildlife laws pertaining to bats

(a) The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1982) – part of this convention stipulates that all bat species and their habitats are to be conserved.
(b) The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, Enacted 1983). This was instigated to protect migrant species across all European boundaries.

3. INFORMATION ON BAT SPECIES FROM PROPOSED DEVELOPMENT SITE

Desktop study

A review of aerial photography and mapping of the area within a 10km radius of the proposed site was conducted to assess habitats and any features likely to be of high significance for bats. The area was assessed for potential roost sites, flight paths, and swarming or hibernation sites (caves – caving database www.ubss.org.uk/search_irish caves.php).

An assessment of the quality of the habitat at the proposed site and in the wider landscape was conducted. Coniferous forests generally do not provide bats with suitable roosting sites as these commercial trees tend to be felled before they are mature enough to have developed cracks and fissures in which bats can roost. This may change with the recent colonisation of the Greater Spotted Woodpecker *Dendrocopus major* in Ireland. In the UK and Europe many bat species roost in old woodpecker holes in coniferous forest.

Coniferous forest may provide foraging habitat for bats at times when insect levels peak in such plantations. Foraging bats tend to be confined to woodland clearings, woodland edges and tracks as commercial plantations are generally too dense to allow passage between individual trees. Sheltered areas within forestry allow accumulations of insects to build up. There are very few streams or ponds within the proposed wind farm site to provide aquatic insects for foraging bats.

The report *Landscape Conservation for Irish Bats and Species Specific Roosting Characteristics* (Lundy et al, 2011), using over 17,000 records from Bat Conservation

Ireland's database, analysed habitat and landscape associations for the 9 resident bat species in Ireland. Modelling species distributions offers an alternative to direct mapping, allowing the prediction of species current, future and past distributions. Results of the modelling analyses shows an overall negative association with coniferous forest with bats selecting broadleaf woodland and riparian habitats as favoured foraging sites. However, this does not mean that coniferous forestry is never used by bats. It may provide an important foraging source at certain times of the year.

In addition, analysis of these records has shown that the majority of bat species favour stone buildings with natural slate roofs as roosting sites. There are many of these buildings on all sides of the proposed site.

A search of Irish caves in Co. Kilkenny was conducted by consulting the University of Bristol Spelaeological Society's database of caves. There are 5 caves listed for Co. Kilkenny

- Dunmore Cave (S50940 64950) at 110m altitude. 300m of large calcited chambers and tunnels. National Monument. Bats listed as item of interest. Near Castlecomer.
- Holdensrath Cave (S47850 56350) at 85m altitude. 7 muddy rifts totalling 71m. W of Kilkenny city.
- Kellymount Cave (S64500 60200) at 100m altitude. Artificial tunnel to partly natural chamber. NE of Kilkenny city
- Kilbrickan Cave (S44800 44400). Sink and chamber. NE of Callan.
- Poll Chnoc an Spa (S34100 65800) 330m altitude. 40m deep pothole. East of Johnstown to NW of Kilkenny city.

Bats have been recorded swarming at Dunmore Cave near Castlecomer in Co. Kilkenny (Grid reference (S50940 64950). Research in recent years has shown Dunmore Cave to be an important swarming site for Myotis bats. None of these 5 caves are close enough to be affected by the proposed windfarm development.

Many potential roosting sites in buildings close to the proposed Springfield Wind Farm were identified from assessing maps and aerial photographs. These buildings were investigated further during the winter survey and subsequent surveys.

3.2 BAT CONSERVATION IRELAND DATABASE RECORDS

Due to the length of the proposed site database searches were conducted within 1km and 10km of the northernmost point (S593 360) and southernmost point (S596 283) of the site. There are no records of bat roosts within 1km of either point.

When the search is widened to 10km the results are as follows:

Within 10km of northernmost point –7 Roosts

Roost & Date of Record	**Grid Reference**	**Address**	**Species & No. of bats**
10m high tree stump (2006)	S583422	Mount Juliet Equestrian Centre, Thomastown	Unidentified bats (2)
Mount Juliet	S5502742291	Equestrian Centre	*Nyctalus leisleri (1)*

Roost & Date of Record	Grid Reference	Address	Species & No. of bats
(2006)			*Pipistrellus pygmaeus (2)* *Plecotus auritus (2)*
Ballyduff Mill (2002)	S608382	Thomastown, Co. Kilkenny	*Pipistrellus pipistrellus (2)* *Pipistrellus pygmaeus (2)* *Plecotus auritus (16)*
Cottage (2013)	S6309528439	Tullogher, Listerlin, Co. Kilkenny	*Pipistrellus pygmaeus (1)* *Plecotus auritus (1)*
Millstone Lodge (1999) – Building subsequently demolished	S6337	Cappagh Road, Inistioge	*Nyctalus leisleri (30)*
Private Residence (2010	S676352	Allen's Bridge, Coolnamuck, Clodiagh, Inistioge	*Pipistrellus pygmaeus (30)*
The Priory (2003) (2014)	S449426	Kells, Co. Kilkenny	*Nyctalus leisleri (7 in 2003)* *Pipistrellus pygmaeus (112)* *Plecotus auritus (41)*

The number in brackets given after the species is the number of individual bats counted in the roosts site.

Significant bat roosts have been recorded at Ballyduff Mill Thomastown – 16 brown long-eared bats, Millstone Lodge, Inistioge – 30 Leislers (but this building has been demolished), Allen's Bridge, Inistioge – 30 Soprano pipistrelles, and at The Priory in Kells - 7 Leislers, 112 Common pipistrelles and 41 Brown long-eared bats. No Leisler's bats have been recorded at The Priory in Kells since 2009

Given the distance of these roost sites from the proposed Springfield Wind Farm site these roosts will not be affected by wind farm development on this site. The only species capable of travelling long distances to forage is the fast-flying Leisler's bat and the only substantial roost (most likely maternity roost) which was recorded in 1999 at Cappagh Road, Inistioge, was subsequently demolished. It is likely that these bats moved to an alternative roost site in the vicinity of Inistioge.

Within 10km of southernmost Point –

Roosts (4)

These are 4 of the same roosts recorded within 10km of the northernmost point of the site – Ballyduff Mill Roost, Cottage Tullogher, Millstone Lodge and Private Residence Allen's Bridge.

Bat Detector Records

A search was conducted of the Bat Conservation Ireland database of bat detector records/transect records within 1km and 10km of both the northernmost and southernmost point of the site. These records were generated from two Bat Conservation Ireland monitoring programmes – the All-Ireland Daubenton's Bat Waterways Survey and the Car-Based Bat Monitoring Scheme.

No records were recorded within 1km of either point.

There are 3 transect records within 10km of the northernmost point of the site. These 3 records were generated from the Daubenton's Bat Waterways Survey. Daubenton's bat were recorded foraging at Ballyhinch Bridge (S5469643591), Dysart Bridge (S596393) and Kells Bridge (S4941543690).

There are 2 bat detector/transect records within 10km of the southernmost point of the site. Both records were generated from the Car Based Monitoring Programme.

The Transect at S67591895 (south of Glenmore, close to River Barrow) was monitored between 2004 and 2008. The highest number of bat passes recorded on this transect was 4 Leisler's bats and 4 Common pipistrelles. Transect at S546193 (nr Kilmacow) was also monitored between 2004 and 2008. The highest number of bat passes recorded on this transect was 2 Leislers bats and one Common pipistrelle. Both these sites are close to 10km from the southernmost point of the proposed Springfield Wind Farm.

There are no Natural Heritage Areas (NHAs), proposed NHAs (pNHAs) or SACs designated for bats within 10km of the proposed site.

3.3 BAT SURVEYS CONDUCTED ON WIND FARM SITES IN THE AREA

Ballymartin Windfarm

During the last 10 years 7 wind turbines have been constructed at Ballymartin and Smithstown townlands which are located approximately 3km south-east of the proposed Springfield Wind Farm. Mammal surveys were conducted but no rare or protected mammal species were found. Hedgerows, treelines and a small area of woodland within and around the site were considered to provide suitable foraging habitat for bats. No suitable roosting sites were located. No bat detector surveys were carried out but it was assumed that at least the widespread and generally abundant pipistrelle species used the site for feeding. It was also considered probable that Leisler's bat and Brown long-eared bat occurred on site and possibly other less common species.

In contrast, bird surveys were conducted on the site. Vantage Point watches were conducted between April and July 2010 and totalled 48 hours of observation.

There are 9 resident species of bats in Ireland and as such they make up approximately one third of the 26 terrestrial mammal species native to Ireland. Therefore, it is considered that bats also warrant considerable survey effort.

3.4 BAT SPECIES PREDICTED TO BE ON SITE

From an examination of the habitat at the proposed Springfield Wind Farm site and results of other bat monitoring programmes in the general area (Car Based monitoring Programme, BATLAS project, All-Ireland Daubenton's Bat Waterways Scheme) it is possible to predict which species may be present on site. Soprano pipistrelles and common pipistrelles both have broad foraging niches and would be expected to forage on site at times when local insect populations peak. Leisler's bat would also be expected to use the site for foraging. Brown long-eared bats may also be present on site.

4. WINTER BAT SURVEY OF THE PROPOSED SPRINGFIELD WIND FARM SITE

4.1 SURVEY OF FORESTRY FOR ROOSTING/FORAGING POTENTIAL

A winter survey of the proposed plantation forests at the proposed Springfield Wind Farm site was conducted on 29th January 2017. It was possible to drive many of the forest tracks throughout the forest. The site consists of areas of mature forestry, semi-mature forestry, young plantations and clearfelled areas. Immature deciduous species, such as alder, line the perimeter of some of the plantations. There are no deciduous trees within the forest which are mature enough to provide roosting sites for bats in the form of cracks and crevices. Likewise, there is no roosting potential for bats in the coniferous species on site.

A range of photographs were taken at selected sites within the forest plantations in the proposed Springfield Wind Farm to include areas of mature forestry, young plantation and clear-felled areas.

Photo 1 – Central point/Point 1 – at Castlebanny townland entrance. Grid reference S58001 32192

Photo 2 – end of 1st track to west from central track heading north – Clear felled area. Point 4. Grid reference S577 336

Photo 3 – semi-mature beech tree at 1st track to east off central track (Point 5). No roosting potential for bats. Grid Reference S58307 31681

Photo 4 – immature plantation on 1st track to east Point 6. Grid reference 58873 31490

Photo 5 – Looking west from southern half of central track over pasture field. Point 9. Grid reference S58368 31185

Photo 6 – Junction with South Leinster way. Young plantation. Point 11. Grid reference 58894 29466.

4.2 SURVEY OF POTENTIAL ROOST SITES CLOSE TO THE PROPOSED SPRINGFIELD WIND FARM

Buildings close to the proposed Springfield Wind Farm were assessed to ascertain their suitability as bat roosting sites. No internal surveys of buildings were conducted as hibernating bats are extremely difficult to find in buildings as they tend to hibernate deep in crevices in stone walls, behind slates and roof timbers. The exception is the Lesser horseshoe bat which hangs openly during hibernation. Co. Kilkenny is outside the distribution range of this species which is mainly confined to counties of the western seaboard.

The local roads encircling the proposed Springfield Wind Farm were driven to identify any buildings with high potential as bat roosting sites. Numerous buildings were considered to have very high potential for bats – particularly as nursery roost sites where adult females congregate during the summer months to give birth and rear their young. Bats tend to favour stone buildings with natural slate roofs as nursery roost sites.

A range of photographs was taken of these buildings with high potential for bats –

Photo 7 – Group of old stone farm buildings with natural slate roofs at Castlebanny townland on entrance lane to the proposed Springfield Wind Farm. These buildings lie c.1.2 km to west of site boundary

Photo 8 – Long stone farm building with natural slate roof at Castlebanny townland (as above)

Photo 9 – Disused farmhouse and outbuildings at Castlebanny townland on entrance lane to the proposed Springfield Wind Farm

Photo 10 – Stone farm building at Glenpipe townland on eastern boundary of proposed site

Photo 11 – Two storey stone farm outbuilding with natural slate roof at Glenpipe townland

Photo 12 – Farmhouse with stone outbuildings at Mullenakill townland close to eastern boundary of site

Photo 13 - Stone outbuilding beside old graveyard at Kilvinoge townland c. 0.5 km east of site boundary

Photo 14 - Stone farm buildings on chapel road, Powerswood townland on north-east boundary of proposed site

Photo 15 – Dilapidated Farm buildings on Chapel road, Powerswood within proposed area of site

Photo 16 – Church building in Powerswood townland within proposed area of site

Photo 17 – Ballyconway Bridge - masonry bridge over tributary of Little Arrigle River situated c1.7km north of proposed site

Photo 18 - Long stone shed with natural slate roof at Derrynahinch townland c0.5km north west of proposed site boundary

Photo 19 – Two storey farmhouse in ruins at Castlebanny townland c1.7km west of site boundary.

Photo 20 – Stone structure (lime kiln) at Ballytarsna townland c. 2km west of site boundary

Photo 21 – Stone farm buildings at Ballytarsna townland c. 1.5km west of proposed site – stone ruins on Leinster Way

4.3 BAT DETECTOR SURVEY

A bat detector survey was conducted on 29th January 2017. This survey commenced at sunset and lasted 1.5 hours. The survey was conducted by slowing driving along the tracks within plantation forests at the proposed Springfield Wind Farm with a Pettersson D240X time expansion bat detector and Echometer Touch detector being held out through an open car window. Temperature at sunset (17.10) was 8C. Weather was overcast, calm and dry. No bat activity was detected within the forest. This is not surprising as bats are still in hibernation and only emerge to forage on exceptionally mild winter evenings when some insects may be on the wing.

4.4 RECOMMENDATIONS IN RELATION TO FURTHER SURVEYS

No bat surveys were conducted prior to the construction of the existing operational 7 turbine Ballymartin Wind Farm.

The proposed Springfield Wind Farm scheme consists of 26 turbines which is a substantial windfarm development.

(1) It is recommended that bat activity surveys are conducted in Spring, Summer and Autumn 2017 to investigate seasonal foraging activity by bats within the proposed Springfield Wind Farm.
(2) A number of stone buildings close to the proposed Springfield Wind Farm have been identified as having high potential for roosting bats, particularly nursery colonies. These buildings should be surveyed to establish if bats are present, identify the

species and establish flight paths from the roosts to investigate if they are using the proposed Springfield Wind Farm as a foraging site.

(3) The haul route to the proposed site for machinery and turbine components needs to be established to investigate which bridges will be traversed on route. It may be necessary to survey relevant masonry bridges for bats on the haul route. Such bridges may require strengthening prior to carrying such heavy vehicles.

Natural England Technical Information Note TIN051: Bats and Onshore Wind Turbines – Interim Report – This set of guidelines refers to specific guidelines for the UK. The Eurobats resolution proposes that the buffer zone around woodlands should be 200m, while this English document suggests a buffer of at least 50m, but provides a formula to calculate the minimum buffer zone required in relation to habitat features present in the landscape. To minimise risk to bat populations, a buffer zone of 50m around any treeline, hedgerow, woodland feature, into which no part of the turbine should intrude. Therefore 50m should be the minimum distance from the blade tip to the nearest habitat feature.

The following formula should be used:

Buffer distance = $\sqrt{(50 + b1)^2 – (hh – fh)^2}$

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

The potential risk from wind turbines is suggested as follows for the different bat species and bat groups found in the Republic of Ireland:

Low Risk	**Medium Risk**	**High Risk**
Myotis species	common pipistrelle	Leisler's bat
brown long-eared bat	soprano pipistrelle	Nathusius' pipistrelle
lesser horseshoe bats		

Wind turbines located in the open can impact on the high flying/aerial feeding bats such as Leisler's bat; and migratory bats such as Nathusius' pipistrelle. Wind turbines located too close to treelines and woodland can impact on edge-feeding species such as Soprano and Common pipistrelles.

Bat Conservation Ireland recommend that where an extension/alteration to an existing wind farm is proposed that the existing turbines are surveyed to determine any associated bat activity. The majority of existing wind farms in Ireland have had no baseline bat surveys conducted either as part of the planning process or post-construction of potential operational impacts. Bat surveys during the active bat season May-September would provide valuable data on bat usage of the entire Springfield wind farm site.

Searches for and recovery of bat corpses at the base of the existing turbines at Ballymartin Wind Farm and within the turbine blade throw area should be conducted.

5. SPRINGFIELD WINDFARM, KILKENNY ---- SPRING BAT SURVEYS

SPRING SURVEY 2017 (2nd, 3rd and 4th MAY 2017)

Spring bat surveys at the proposed Springfield Windfarm site were conducted by 3 separate methods – bat detector surveys at dusk and dawn, driven transects during the night, and by using static detectors placed in the field overnight.

Dusk and dawn bat detector surveys were conducted outside buildings considered to have high potential as bat roosting sites. These surveys were conducted using handheld bat detectors. Models of bat detector used included Pettersson D240X time expansion detector, Pettersson D200 Heterodyne detector and an Echometer Touch by Wildlife Acoustics attached to an iPad.

5.1 BAT DETECTOR SURVEYS

At dusk on 02/05/17 a bat detector survey was conducted at dusk at Eddie Dempsey's stone farm buildings (Grid Ref S584 323). A single Soprano pipistrelle and 3 Brown long-eared bats emerged from the westernmost building. One common pipistrelle was recorded on the lane and one Leisler's bat detected foraging briefly over the pasture fields.

On 03/05/17 a dawn bat detector survey was conducted at a set of stone ruins on the lane to northern telecommunications mast (S569 334). No bat activity was recorded but temperatures may have been too low at 5 °C.

5.2 DRIVEN TRANSECTS

After emergence surveys were completed at targeted buildings sections of the tracks within the proposed Springfield wind farm were driven. One surveyor drove slowly along the tracks and the other held a bat detector out the car window.

The first transect to be driven was south from Point 1 (Central Crossroads GPS S57941 32227) in forest to point where central track meets South Leinster Way (GPS – S58840 290506). Low levels of bat activity were recorded – Common pipistrelles and Soprano pipistrelles foraging on forestry track.

Transect from Point 1 to Farm buildings Castlebanny lane (GPS S56768 32283) – 2/3 Soprano pipistrelles, one Common pipistrelle and one Leisler's bat detected foraging on forestry track.

Transect from Farm buildings Castlebanny Lane to Derelict farmhouse on road (Grid Ref S56015 32598) – Two Common pipistrelles were recorded flying in front of farm building.

5.3 REMOTE MONITORING

On 02/05/17 two remote Songmeters (Songmeter SM2 & Songmeter SM4 models – Wildlife Acoustics) were deployed overnight within proposed Springfield wind farm – one mounted

on a tree at the central crossroads point (GPS S57946 32228 SM4) and the second at a clear felled area in the northern half of the forest (GPS S58046 32916 SM2).

Results: Central Crossroads – Constant bat activity throughout the night. Leisler's bat early on, then mainly Common pipistrelles, occasional Soprano pipistrelle, Brown long-eared and a single Natterer's bat (see Table 1 below)

Northern point in forest – faulty microphone on Songmeter SM2 – no recordings.

03/05/17 and 04/05/17 Songmeter SM4 was mounted on a tree at Point 10 in forest on southern section of central track (Grid Ref S58802 30134).

Songmeter 2 SM2 was placed on wall behind stone ruins on lane to northern mast – GPS S56883 33360

Results: Point 10 - 03/05/17 (34 calls) Mainly Common pipistrelle, occasional Leisler's and Soprano pipistrelle (See Table 2 below)

04/05/17 (3 calls) – Common and Soprano pipistrelles (see Table 3 below)

Stone ruins - faulty microphone on SM2 – no recordings.

REMOTE MONITORING – RESULTS

Date 3/5/17 – 4/5/17

Table 1 - Point 1 in proposed Springfield wind farm (Central Crossroads); GPS S57946 32228

Time	**Soprano Pipistrelle**	**Common Pipistrelle**	**Leisler's**	**Brown long-eared**	**Natterer's**
21.00-21.30		2	3		
21.30-22.00		10	3		
22.00-22.30	1	11	3	3	
22.30-23.00		10	3		
23.00-23.30		4			
23.30-00.00		11			
00.00-00.30	3	20			
00.30-01.00		47		2	3
01.00-01.30		28	1	5	
01.30-02.00		11	1	22	
02.00-02.30		30	3		

02.30-03.00	1	11	1		
03.00-03.30		21	2		
03.30-04.00		24		1	
04.00-04.30		10		2	
04.30-05.00		17		2	
Total Passes	**5**	**267**	**20**	**37**	**3**
% of Passes	**1.51%**	**80.42%**	**6.02%**	**11.14%**	**0.90%**

Over 80% of passes recorded were Common Pipistrelles. These bats are not roosting within the plantation forest as there are no suitable roost sites but are commuting to the forestry to forage. 11% of passes were Brown long-eared bats and 6% Leisler's bats. Leisler's bats were recorded passing over but did not remain to feed in the forest.

Date 3/5/17 – 4/5/17

Table 2 - Point 10 in the proposed Springfield wind farm (Southern section); GPS S58802 30134

Time	**Soprano Pipistrelle**	**Common Pipistrelle**	**Leisler's**	**Brown long-eared**	**Natterer's**
21.30-22.00		1			
22.00-22.30			1		
22.30-23.00		3			
23.00-23.30		12	3		
23.30-00.00			2		
00.00-00.30			1		
00.30-01.00		1			
01.00-01.30					
01.30-02.00			3		
02.00-02.30					
02.30-03.00					

03.00-03.30					
03.30-04.00					
04.00-04.30			1		
Total Passes		**17**	**11**	**0**	**0**
% of Passes		**60.71%**	**39.29%**		

Much lower levels of bat activity at this site in the southern section of the forestry. Only two species detected Common pipistrelle and Leisler's bat. Leisler's recordings indicated that bats were just passing over – not remaining on site to feed.

Date 4/5/17 – 5/5/17

Table 3 - Point 10 in the proposed Springfield wind farm (Southern section); GPS S58802 30134

Time	**Soprano Pipistrelle**	**Common Pipistrelle**	**Leisler's**	**Brown long-eared**	**Natterer's**
22.30-23.00	1	1			
23.00-23.30					
23.30-00.00	1		2		
Total Passes	**2**	**1**	**2**		
% of Passes					

Very low levels of bat activity recorded.

SPRING SURVEY TOTAL DETECTOR HOURS = 29 hours

[Dusk bat detector survey = 1.5 hours, Dawn bat detector survey = 1.5 hours]

[3 driven transects = 2 hours]

[Remote monitoring = 8 hours x 3 = 24 hours SM4]

5.4 PHOTOGRAPHS FROM SPRING BAT DETECTOR SURVEYS

Photo 22 - Eddie Dempsey's stone farm buildings (Grid Ref S58279 32302)

Photo 23 - Eddie Dempsey's stone farm buildings (Grid Ref 584 323)

Photo 24 - Eddie Dempsey's stone farm buildings (Grid Ref S58279 32302)

Photo 25 - Eddie Dempsey's stone farm buildings (Grid Ref S58279 32302)

Photo 26 - Derelict House for sale just north of Castlebanny lane (Grid Ref S56015 32598)

Photo 27 - Stone ruins on lane to northern mast (S56883 33360)

Photo 28 - Stone ruins on lane to northern mast (S56883 33360). Position of Songmeter SM2 is indicated on wall to rear of building

Photo 29 - Point 1 – Central crossroads in the plantation forest (GPS S57946 32228). Songmeter 4 mounted on conifer tree pointing towards track

Photo 30 - Point 1 – Central crossroads in the plantation forest (GPS S57946 32228). Songmeter 4 mounted on conifer tree pointing towards track

Photo 31 - Songmeter 2 at Northern point in forest clearing– (Grid ref S58046 32916) faulty microphone on SM2 – no recordings

Photo 32 - Songmeter 4 deployed at Point 10 mounted on willow tree (Grid ref S58802 30134)

Photo 33 - Close up of Songmeter 4 mounted at Point 10

5.5 SUMMARY OF SPRING BAT DETECTOR SURVEYS

During the spring bat detector surveys a small roost of Brown long-eared bats was recorded roosting in the stonework of Eddie Dempsey's ruined stone buildings at the centre of the site. 3 Brown long-eared bats were counted emerging at dusk on 2.5.17. An emergence count will be repeated at this site in May 2018.

Low levels of bat activity were detected within the proposed Springfield wind farm during driven transects of the southern half of the forest. Bats recorded were mainly Common pipistrelles with an occasional Leisler's bat.

Remote monitoring at Point 1 (central crossroads in site) revealed constant low levels of bat activity on the forest tracks throughout the night. Bats were mainly commuting but some feeding activity was recorded. Bats recorded were mainly Soprano and Common pipistrelles. Leisler's bat was detected mostly early in the night but also occasionally during the night. Some Brown long-eared bat and Natterer's bat activity was also recorded. A total of 5 bat species recorded.

Intermittent bat activity throughout the night was detected at Point 10 in the southern section of the forest. Calls were mainly Common pipistrelles, with the occasional Leisler's bat detected.

No bat roosts were detected in any trees within the proposed Springfield wind farm.

6. SPRINGFIELD WINDFARM, KILKENNY ---- SUMMER BAT SURVEYS

SUMMER SURVEY 2017 (7th and 8th July 2017)

Summer bat surveys at the proposed Springfield Windfarm site were conducted by 3 separate methods – Bat detector surveys at dusk and dawn, driven/walking transects during the night, and by using static detectors placed in the field overnight.

Dusk and dawn bat detector surveys were conducted outside buildings considered to have high potential as bat roosting sites. These surveys were conducted using handheld bat detectors. Models of bat detector used included Pettersson D240X time expansion detector, Pettersson D200 Heterodyne detector and an Echometer Touch by Wildlife Acoustics attached to an iPad.

6.1 BAT DETECTOR SURVEYS

DUSK SURVEY

Date = 07/07/17. Sunset = 21.52, Temp = 18 °C, Weather = Clear, calm & dry.

On 07/07/17 bat detector surveys conducted at dusk at two sets of farm buildings on Castlebanny Lane by two observers.

Northern farmyard (Grid Ref S56768 32283). Enclosed yard comprised of derelict farm house and fine stone outbuildings with slate roofs

Results – 2/3 Common pipistrelles, 2 Soprano pipistrelles foraging in yard and on lane but did not emerge from the farm buildings

Southern derelict house and Yard (Grid Ref S56697 32169) 1 Natterer's bat foraging on lane outside farmyard gate. Did not emerge from buildings. 1 Leisler's bat passed over heading east at 22.05.

DAWN SURVEY

Sunrise = 05.17, Temp = 12 °C, Weather = Clear, calm & dry

08/07/17 Dawn bat detector survey conducted at two properties in Coolroebeg Townland. Results – A roost of 30+ Whiskered bats *Myotis mystacinus* was recorded roosting in the roof of a two storey farmhouse (Grid reference S59333 34712). This is a very important maternity roost site of Whiskered bat which is Ireland's second rarest bat (Nathusius pipistrelle is the rarest in Rep. of Ireland).

A single Brown long-eared bat and a single Soprano pipistrelle were recorded entering the roof of a shed (Grid ref S593 348) at the next property to the north of the Whiskered bat roost.

DUSK SURVEY

Date = 08/07/17. Temp = 14 °C, Weather = Clear, calm & dry

08/07/17 A dusk bat detector survey was conducted at two properties by two surveyors – Derelict House at Kilvinoge Graveyard (Grid Ref S59237 33990) & Stone ruins in forestry (eastern side of site) – S58832 33156

Results: Derelict House at Kilvinoge Graveyard – No bats emerged

Stone ruins in forestry – No bats emerged

6.2 DRIVEN/WALKING TRANSECTS

07/07/17 – After dusk survey drove transect in forestry north from Point 1 at central crossroads GPS S57941 32227 to most northern assessable (in car) point on central track GPS S58108 34386. Low numbers of both Common pipistrelles and Soprano pipistrelles were detected foraging along the forestry tracks. An occasional Leisler's bat was recorded passing over but no sustained feeding recorded in forestry.

08/07/17 – After dusk survey at stone ruins in forestry a transect was walked from the ruins in forestry north and west to Kilvinoge graveyard (GPS S59265 34027) along an agricultural lane – 7-8 Whiskered bats were recorded foraging/commuting along lane. This is an important commuting/foraging site for Whiskered bats. Temperature = 14 °C at 00.00

6.3 REMOTE MONITORING

07/07/17 two remote Songmeters were deployed – Songmeter SM4 mounted at a height on the anemometer in the centre of the site (S58466 32177) and Songmeter SM2 at stone ruins on the South Leinster Way walking trail (S57286 29458). The Songmeter SM4 was left in position on the anemometer for 2 full nights.

Results: Anemometer 07/07/17 - 08/07/18– 16 calls – Single Leisler's bat calls were detected periodically throughout the night. This would indicate that these bats were passing through the site rather than staying to forage in the area of the anemometer. 5 calls of Brown long-eared bats were recorded. These bats must have been very close to the Songmeter as Brown long-eared bat calls are quiet and generally difficult to detect. It is possible that the bat(s) was investigating the mast or more likely picking insects off the mast. One Common pipistrelle was also detected (see Table 4 below).

Anemometer 08/07/17 – 09/07/18 Songmeter SM4 (8 calls). Results: Anemometer (8 calls) – Again mainly Leisler's bats recorded with one Brown long eared call and one Common pipistrelle call detected (see Table 5 below).

Ruin on South Leinster Way – continuous calls from 22.17 up until 00.58. Activity of both Common and Soprano pipistrelles. From 22.57 onwards regular calls of Brown long-eared bats were detected indicating that there may be a roost of Brown long-eared bats in these stone ruins (See Table 6 below). An emergence count will be conducted in May 2018.

SM2 – clearing on eastern side of forest in Cappagh Townland (Grid ref 591 330). Forest clearing – Microphone faulty. No recordings

REMOTE MONITORING – RESULTS

Date 7/7/17 – 8/7/17

Table 4 – Songmeter SM4 on anemometer GPS S58466 32177

Time	**Soprano Pipistrelle**	**Common Pipistrelle**	**Leisler's**	**Brown long-eared**	**Natterer's**
22.00-22.30			1		
22.30-23.00			1		
23.00-23.30			1	1	
23.30-00.00			1	1	
00.00-00.30		1		2	
00.30-01.00					
01.00-01.30					
01.30-02.00			1		
02.00-02.30			1		
02.30-03.00			1	1	
03.00-03.30			1		
03.30-04.00					
04.00-04.30			2		
Total Passes	**0**	**1**	**10**	**5**	
% of Passes		**6.25%**	**62.50%**	**31.25%**	

Overall bat activity in the vicinity of the anemometer was very low. Over 60% of passes recorded were Leisler's but this represents only 10 passes. Leisler's bats did not remain in the area to forage. They were commuting.

The 5 Brown long-eared calls are interesting. Brown long-eared bats would not be expected to be in such an open area or so high up. It is most likely that they were gleaning insects from the anemometer.

Table 5 - 8/7/17-9/7/17 – Songmeter SM4 on anemometer

Time	**Soprano Pipistrelle**	**Common Pipistrelle**	**Leisler's**	**Brown long-eared**	**Natterer's**
23.00-23.30			2	1	
23.30-00.00			1		
00.00-00.30					
00.30-01.00					
01.00-01.30					
01.30-02.00					
02.00-02.30					
02.30-03.00					
03.00-03.30		1	4		
Total Passes	**0**	**1**	**7**	**1**	
% of Passes		**11.11%**	**77.77%**	**11.11%**	

Very low bat activity recorded from anemometer. Again, Leisler's bats were commuting, not feeding

Table 6 - 7/7/17-8/7/17 Stone ruins – South Leinster Way. GPS

Time	Soprano Pipistrelle	Common Pipistrelle	Leisler's	Brown long-eared	Natterer's
22.00-22.30	1	21		10	
22.30-23.00		15		10	
23.00-23.30		41		3	
23.30-00.00		115			
00.00-00.30		86			
00.30-01.00	5	33		2	
Total Passes	**6**	**311**	**0**	**25**	**0**
% of Passes	**1.75%**	**90.94%**	**0**	**7.31%**	**0**

Songmeter stopped working at 01.00. Numbers of passes of Common pipistrelles would indicate that there is a roost of this species nearby. Emergence count will be conducted in May 2018.

TOTAL NO. OF SURVEY HOURS SUMMER BAT SURVEYS = 30 HOURS

Dusk/Dawn bat detector surveys = 9 hrs

Driven/walking transect duration = 2hours

Duration of Overnight Remote Monitoring = 19hrs

6.4 PHOTOGRAPHS FROM SUMMER SURVEYS

Photo 34 - Northern farmyard on Castlebanny Lane (Grid Ref S56754 32266) comprising derelict farmhouse and stone outbuildings with slate roofs. View from Castlebanny Lane.

Photo 35 - Northern farmyard on Castlebanny Lane (Grid Ref S56754 32266)

Photo 36 - Southern farm yard on Castlebanny Lane (Grid Ref S56696 32186) comprising derelict house and Yard. View from Castlebanny Lane.

Photo 37 - Southern farm yard on Castlebanny Lane (Grid Ref S56696 32186) comprising derelict house and yard. View from entrance gate.

Photo 38 - Two storey farmhouse at Coolroebeg Townland with maternity roost of 30+ Whiskered bats GPS S59333 34712

Photo 39 - Two storey farmhouse at Coolroebeg Townland. The exit point from the roost space in the attic is indicated.

Photo 40 - Shed in Coolroebeg Townland (Grid ref S593 348). A single Brown long-eared bat and a single Soprano pipistrelle entered the roof space at dawn

Photo 41 - Derelict building Kilvinoge Graveyard (Grid Ref S59237 33990). No bats emerged

Photo 42 - Anemometer in pasture field at centre of the site (S58466 32177)

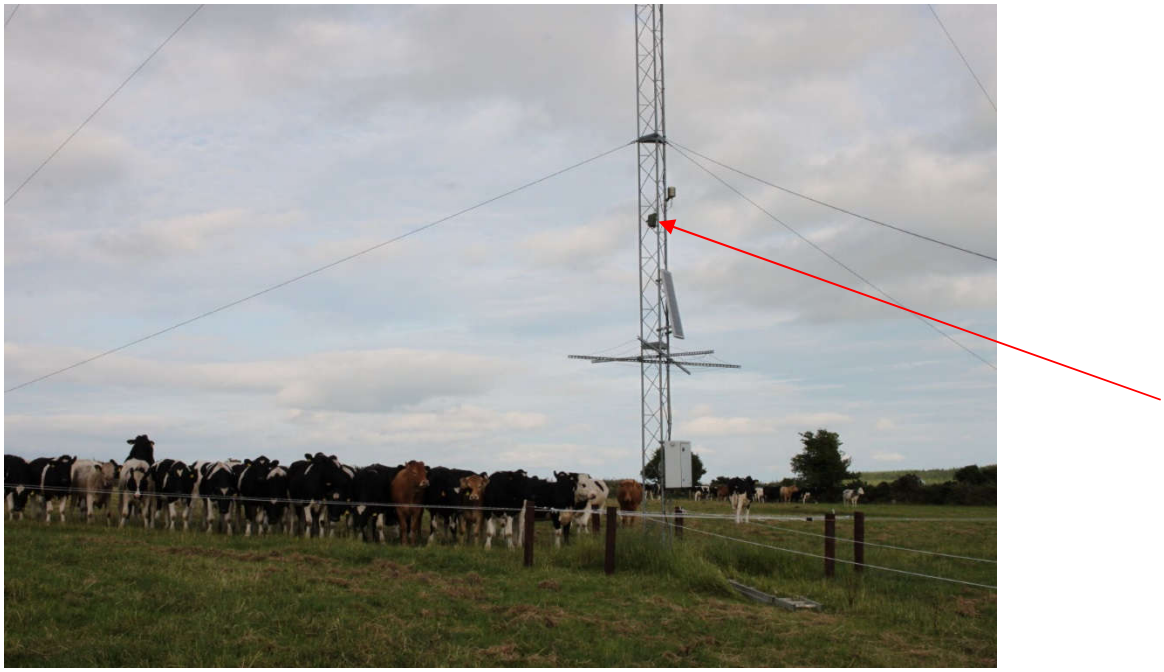

Photo 43 - Songmeter SM4 in position on anemometer

Photo 44 - Stone ruins on South Leinster Way (Grid ref S57286 29458)

Photo 45 - Stone ruins on South Leinster Way (Grid ref S57286 29458) showing Songmeter SM2 in position on stone wall facing buildings

Photo 46 - Clearing on eastern side of forest in Cappagh Townland (Grid ref S591 330)

Photo 47 - Songmeter SM2 in position at forest clearing Cappagh Townland

6.5 SUMMARY OF SUMMER BAT DETECTOR SURVEY

During the July summer bat detector surveys, a very important roost of Whiskered bats *Myotis mystacinus* was found in the roof space of a two storey farmhouse in Coolroebeg townland to the east of the proposed windfarm site. At least 30 bats were recorded returning to this roost at dawn. An emergence count will be conducted at this site in May 2018 to get an accurate count of the roost. Whiskered bats were found to use the agricultural lanes to the east of the roost site and east of Kilvinoge Graveyard for commuting/foraging (From Grid Ref S58832 33156 running north and east to old graveyard at Kilvinoge). These lanes require further survey effort to determine the extent they are used by Whiskered bats. This survey work will be conducted with detectors in May 2018.

A single Brown long-eared bat and a single Soprano pipistrelle were recorded roosting in the roof of an agricultural shed also in Coolroebeg Townland.

Low levels of bat activity were detected within plantation forests during driven transects of the northern half of the forest. Bats recorded were mainly Common pipistrelles with an occasional Soprano pipistrelle. No bat roosts were detected in any trees within the plantation forest.

Remote monitoring was conducted at a height by mounting a Songmeter 4 on an anemometer at the centre of the site. This anemometer was situated in pasture fields with grazing cattle. Single Leisler's bat calls were detected periodically throughout the night. This would indicate that these bats were passing through the site rather than staying to forage in the area of the anemometer. Wind turbines are known to pose the greatest threat to Leisler's bats in Ireland due to the height they fly at. During these 2 nights in July only low levels of activity of Leisler's bats was detected indicating that there are no significant roosts in the vicinity. Leisler's bats are known to specialise on Yellow dung flies *Scathophaga stercoraria* caught over pasture fields during the lactation period. No sustained foraging by Leisler's bats was detected in the vicinity of these pasture fields. Several calls of Brown long-eared bats and a single Common pipistrelle were also recorded.

It is highly likely that there is a roost of Soprano pipistrelles in the stone ruined buildings on the South Leinster Way. A lot of activity was detected at dusk in the vicinity of these buildings. The status of this roost will be assessed in May 2018.

7. SPRINGFIELD WINDFARM, KILKENNY - SUMMER BAT SURVEYS (Extra areas)

17th and 18th AUGUST 2017

Summer Survey 2 was conducted to assess extra proposed land take to the east and south-east of the original proposed site.

These additional summer bat surveys at the proposed Springfield Windfarm site were conducted by 3 separate methods – Bat detector surveys at dusk and dawn, driven/walking transects during the night and by using static detectors placed in the field overnight.

Dusk and dawn bat detector surveys were conducted outside buildings considered to have high potential as bat roosting sites. These surveys were conducted using handheld bat detectors. Models of bat detector used included Pettersson D240X time expansion detector, Pettersson D200 Heterodyne detector and an Echometer Touch by Wildlife Acoustics attached to an iPad.

7.1. BAT DETECTOR SURVEYS

DUSK SURVEY

Date = 17/08/17. Sunset = 21.26, Temp = 13C, Weather = Clear, calm & dry. Heavy shower 22.30.

On 17/08/17 bat detector surveys were conducted at dusk at Mullally's farmyard in Cappagh townland - two stone sheds and farmhouse – Grid reference S59426 32275. The stone sheds and farmhouse are surrounded by modern agricultural sheds. The dusk bat detector surveys were conducted by two observers covering different buildings on site (see photographs).

Results – No bats emerged from the stone sheds or farmhouse. A single Soprano pipistrelle was recorded flying in one of the large modern sheds. A single Common pipistrelle was recoded foraging over the garden and road. A single Whiskered bat was recorded commuting along the road in front of the house travelling from north to south.

DAWN SURVEY

Temp = 9 C, Weather = Clear, calm & dry

On 18/08/17 dawn bat detector surveys were conducted at two properties – one just north of Castlebanny Lane at a derelict two storey house for sale (Grid Reference S56030 32592). Results – One Common pipistrelle was recorded foraging in yard but did not enter house at dawn.

18/08/17 – Long stone shed with slate roof north of Kiltorcan racing track at Derrynahinch Townland (Grid Reference S55662 36251).

Results - 3-4 Brown long-eared bats were recorded swarming at the southern gable of the building just before dawn. These bats entered a crack in the stonework of the southern gable wall.

This roost will to be counted in May 2018.

DUSK SURVEY

Date = 18/08/17. Sunset = 21.29. Temp = 12 C, Weather = Partially overcast, calm & dry

On 18/08/17 dusk bat detector surveys were conducted at two properties by two surveyors – St Mollin's Cottage (Grid Ref S59317 32922)

Results: St Molin's Cottage – No bats emerged from building

18/08/17 – Long stone shed with slate roof north of Kiltorcan racing track – Derrynahinch Townland (Grid Reference S55662 36251) – Results: Only 1 Brown long-eared bat emerged.

DAWN SURVEY

19/08/17 – a bat detector survey was conducted at ruins on southern lane in Derrylacky townland (Grid Ref S59179 28552) – extra area to south of site. No bat activity was recorded at dawn.

7.2 DRIVEN/WALKING TRANSECTS

17/08/17 – After the dusk survey at Mullally's farmhouse was completed a walking transect of the fields north east of the farmyard as far as the River Arrigle was undertaken. Approximate length of transect = 2km.

Results – No Leisler's bats were detected over the pasture fields. Numerous Common and Soprano pipistrelles were detected foraging and commuting along the hedgerows.

18/08/17 – After the dusk survey at St Mollin's Cottage was completed a transect was driven north, up Chapel Lane to Derrynahinch townland. Approximate length of transect = 7km

Results - Soprano and Common pips detected on Chapel Lane. Also a lot of Soprano pipistrelle activity at Ballyconway Bridge (Grid Ref S573 369)

Driven transect of Derrylackey Lane. Approximate length of transect = 2km

Results: Low level activity of both Common and Soprano pipistrelles was detected along the lane (1 Soprano pipistrelle + 1 Common pipistrelle)

7.3 REMOTE MONITORING

On 17/08/17 Songmeter SM4 mounted at a hedgerow to east of Mullally's farmyard (Grid ref 598 324) until 22.10, then moved to lane beside Arrigle River (Grid Ref S602 331).

Results: From 21.14 onwards continuous activity of Soprano and Common pipistrelles was recorded. Only two Brown long-eared bats and a single Natterer's bat were recorded. A total of 21 Leisler's calls were recorded during the night out of a total of 396 calls. Leisler's bats were commuting through the site. No evidence of sustained foraging in the area was detected. See Table 7 below for full results

On 18/08/17 a Songmeter SM4 was placed on a lane in the extra land take area west of St. Mollin's Cottage under a mature oak tree (Grid Ref S59516 32663)

Results: From 21.14 onwards continuous activity of Common and Soprano pipistrelles. 11 Natterer calls were detected during the night. This wooded laneway habitat is very suitable for Natterer's bats. Only 3 Leisler's were detected overnight at 21.55, 23.58, 05.18 and all bats were commuting. Total number of calls recorded = 930. See Table 8 below for full set of results

Table 7 - 17/08/17 – Songmeter 4 at hedgerow, then Arrigle River in extra survey area

Time	**Soprano Pipistrelle**	**Common Pipistrelle**	**Leisler's**	**Brown long-eared**	**Natterer's**
21.00-21.30	57	6	1	2	
21.30-22.00	34	9	3	3	
22.00-22.30	Moving Songmeter to Arrigle River				
22.30-23.00		1	3		
23.00-23.30		2	4		
23.30-00.00	3	2			
00.00-00.30	1	25	4		
00.30-01.00	2	22	2		
01.00-01.30	6	12	3		
01.30-02.00	3	19	1		
02.00-02.30	1	24	3		
02.30-03.00		21	3		
03.00-03.30		19			
03.30-04.00		21			
04.00-04.30	1	17			
04.30-05.00		28			1
5.00-5.30	1	25			
Total Passes	**109**	**253**	**27**	**5**	**1**
% of Passes	**27.59%**	**64.05%**	**6.84%**	**1.27%**	**0.25%**

A lot of Soprano pipistrelle activity shortly after dusk but later in night the most frequently recorded species was Common pipistrelle. Some Brown long-eared bats were detected shortly after sunset. Low levels of activity of Leisler's bats was recorded throughout the night. Some foraging activity of Leisler's bat was recorded at the Arrigle River.

Table 8 - 18/08/17-19/08/17 Lane to forestry opposite St Mollin's cottage GPS S59317 32922 at base of mature oak

Time	**Soprano Pipistrelle**	**Common Pipistrelle**	**Leisler's**	**Brown long-eared**	**Natterer's**
21.00-21.30	3	44			1
21.30-22.00	47	28	1		
22.00-22.30	40	23			
22.30-23.00	25	58			2
23.00-23.30	40	18			
23.30-00.00	52	22	1		
00.00-00.30	38	46			
00.30-01.00	33	52			1
01.00-01.30	18	18			1
01.30-02.00	8	8			1
02.00-02.30	32	18			
02.30-03.00	16	14			1
03.00-03.30	7	5			4
03.30-04.00	5	35			
04.00-04.30	10	78			
04.30-05.00	8	62			
05.00-05.30	28	28	1		
05.30-06.00		22			
Total Passes	**410**	**579**	**3**	**0**	**11**
% of Passes	**40.88%**	**57.73%**	**0.3%**	**0**	**1.1%**

Relatively high levels of activity of Soprano and Common pipistrelles were recorded throughout the night. Intermittent activity of Natterer's bat was also detected throughout the night.

TOTAL NO. OF SURVEY HOURS = 29 HOURS

[2 Dusk/dawn bat detector surveys = 10.5 hours

[Walking/Driven transect duration = 2 hours,

[Duration of Overnight Remote Monitoring = 16 hours]

A bat survey of the masonry bridge on Arrigle River at Grid Ref S 607 322 was also conducted. It is a single arch masonry structure. The stonework of the arch is untreated but no roosting bats were recorded in the stonework.

7.4 PHOTOGRAPHS FROM SUMMER SURVEY 2

Photo 48 - Dusk survey conducted at two stone outbuildings at Mullaly's farmyard, Cappagh Townland. Grid reference S59426 32275. The second stone building with slate roof is indicated. No bats emerged from these buildings.

Photo 49 - Dawn survey conducted at derelict farmhouse for sale just north of Castlebanny Lane. (Grid Reference S56030 32592). No bats emerged.

Photo 50 - Dawn survey conducted at long stone shed at Derrynahinch townland. (Grid Reference S55662 36251). 3-4 Brown long-eared bats recorded swarming at dawn

Photo 51- St Mollin's Cottage. (Grid Ref S59317 32922). Dusk survey conducted. No bats emerged.

Photo 52 - Dawn survey conducted at derelict cottage Derrylackey Lane. (Grid Ref S59179 28552). No bats returned at dawn

Photo 53 - Pasture fields to east of site looking east towards Arrgile River – extra proposed land take at Cappagh townland – walking transects - no Leisler's bats detected. Common and Soprano pipistrelles detected foraging along hedgerows

Photo 54 - Pasture fields to east of site looking west towards Springfield Forest – extra proposed land take at Cappagh townland – walking transects - no Leisler's bats detected. Common and Soprano pipistrelles detected foraging along hedgerows

Photo 55 - Songmeter SM4 mounted on Ash tree on laneway at Arrgile River in extra proposed land take area. (Grid Ref S602 331).

Photo 56 - Lane opposite St Mollin's Cottage. Songmeter mounted at base of Oak tree. Grid Ref S59516 32663)

Photo 57 - Songmeter mounted at base of Oak tree projecting onto lane

Photo 58 - Single arch masonry bridge on Arrigle River at Grid Ref S 607 322. No bats roosting in structure

Photo 59 - Two storey house on Castlebanny lane with roost of Soprano pipistrelles. This roost will be counted in May 2018. Grid Reference S569 321

8. SPRINGFIELD WINDFARM, KILKENNY ---- AUTUMN BAT SURVEYS

AUTUMN SURVEY – 23rd/24th October 2017

These autumn bat surveys at the proposed Springfield Windfarm site were conducted by 3 separate methods – Bat detector surveys at dusk and dawn, walking transects during the night and by using static detectors placed in the field overnight.

Dusk and dawn bat detector surveys were conducted outside buildings considered to have high potential as bat roosting sites. These surveys were conducted using handheld bat detectors. Models of bat detector used included Pettersson D240X time expansion detector, Pettersson D200 Heterodyne detector and an Echometer Touch by Wildlife Acoustics attached to an iPad.

8.1 BAT DETECTOR SURVEY

DUSK SURVEY

Date = 23/10/17. Sunset = 18.10, Temp = 13C, Weather = Clear, calm & dry.

23/10/17 A bat detector survey was conducted at dusk at the church on Chapel Hill

Results – One Soprano pipistrelle emerged from the roof of the church at 18.30 and was recorded foraging continuously in the vicinity of the church grounds

DAWN SURVEY

Too cold for dawn bat detector survey. Temp = 6C

8.2 WALKING TRANSECTS

23/10/17 – After dusk survey at church on Chapel Hill a walking transect of Chapel Hill Road was undertaken.

Results –Several Common and Soprano pipistrelles were detected foraging around farmyards at the eastern end of Chapel Hill. Length of transect = c. 1.5km

Followed by walking transect in Powerswood conifer plantation. Transect length c. 1.5km

Results – Several soprano pipistrelles were recorded on forestry tracks at the eastern edge of the forest behind farm buildings.

8.3 REMOTE MONITORING

On 23/10/17 one Songmeter was placed at the ruined stone farm building on Castlecosker Lane (S573 352) Results: A lot of Brown long-eared bat activity recorded intermittently throughout night. These were the highest levels of Brown long-eared bat activity recorded in the entire study area. It is likely there is a roost in the stone ruin. An emergence count will be conducted in May 2018. Soprano and Common pipistrelles were also detected in good numbers. A large percentage of the calls were social calls which is to be expected at this time of the year during the mating season. An occasional Leisler's bat passed over the site.

On 23/10/18 a Songmeter at placed at the farmyard in Kiltorcan Townland (S569 344)

Results: A total of 735 calls recorded from 18.40 to 07.43. Large numbers of both Common and Soprano pipistrelles were recorded with a high percentage of calls being social calls. Occasional Brown long eared bats were recorded from 22.34 onwards throughout night.

REMOTE MONITORING - RESULTS

Table 9 - 23/10/18-24/10/18 Farm buildings Kiltorcan Lane GPS S569 344

Time	**Soprano Pipistrelle**	**Common Pipistrelle**	**Leisler's**	**Brown long-eared**	**Natterer's**
18.30-19.00	5	12		2	
19.00-19.30	10	10			
19.30-20.00	20	10			
20.00-20.30	30	20			
20.30-21.00	35	9			
21.00-21.30	30	5			
21.30-22.00	35	2			
22.00-22.30	18	2			
22.30-23.00	6	6		1	
23.00-23.30	9	9		1	
23.30-00.00	7	6		3	
00.00-00.30	10	2		3	

00.30-01.00	14	11			
01.00-01.30	11	4			
01.30-02.00	2	2			
02.00-02.30					
02.30-03.00	3				
03.00-03.30					
03.30-04.00	6	6			
04.00-04.30	12	2			
04.30-05.00		3			
05.00-05.30	6	5			
05.30-06.00	34	30		1	
06.00-06.30	60	24			
06.30-07.00	60	20		1	
07.00-07.30	50	28		2	
07.30-08.00	13	5		2	
Total Passes	**486**	**233**	**0**	**16**	**0**
% of Passes	**66.12%**	**31.70%**	**0**	**2.18**	**0**

Table 10 - 23/10/18-24/10/18 - Stone ruins Castlecosker Lane GPS S57 3352

Time	**Soprano Pipistrelle**	**Common Pipistrelle**	**Leisler's**	**Brown long-eared**	**Natterer's**
18.30-19.00	4		2	10	
19.00-19.30	8	10		8	
19.30-20.00	8	9		48	
20.00-20.30	12			3	
20.30-21.00	20	3		2	
21.00-21.30	28	8		4	1
21.30-22.00	17	11	2	9	

22.00-22.30	10	10	1	12	
22.30-23.00	3	4		10	
23.00-23.30				1	
23.30-00.00	1	1		2	
00.00-00.30		14			
00.30-01.00	7	12		4	
01.00-01.30	5	10		6	
01.30-02.00	38	50			
	Last call 01.59				
Total Passes	**161**	**142**	**5**	**119**	**1**
% of Passes	**37.62%**	**33.18%**	**1.17%**	**27.80%**	**0.23%**

TOTAL NO. OF SURVEY HOURS = 23.5 HOURS

Dusk bat detector surveys = 1.5 hours

Walking transects duration = 2 hr,

Duration of Overnight Remote Monitoring = 20hrs]

8.4 PHOTOGRAPHS FROM AUTUMN BAT SURVEYS

Church on Chapel Hill – one Soprano pipistrelle emerged from under the slates at dusk

Conifer Plantation at Powerswood. A walking transect was conducted here at dusk on

Ruined stone farm building on Castlecosker Lane. A lot of activity of Brown long eared bats was recorded on a remote bat detector in the vicinity of this building. It most likely contains a roost of Brown long-eared bats. An emergence count will be conducted in May 2108.

Farmyard at Kiltorcan Lane. The position of the Songmeter is indicated. A lot of activity of Soprano pipistrelles and Common pipistrelles was detected here. There may be a roost in the farm buildings. Emergence count will be conducted in May 2018.

SUMMARY OF AUTUMN BAT DETECTOR SURVEY

During the Autumn bat detector survey a single Soprano pipistrelle emerged from under the slates of the roof of the church on Chapel Hill. Numerous slates had been blown off the roof in a recent storm which may have allowed the bat to access the roof. An emergence count will be conducted in May 2018 to record the number of bats in this roost.

Several Soprano and Common pipistrelles were recorded foraging and commuting along Chapel Hill road during the walking transect. Several Soprano pipistrelles were recorded foraging along forestry tracts in Powerswood Forest mainly at its eastern edge.

Remote monitoring: Good numbers of Brown long-eared bats were recorded in the vicinity of the ruined stone farm outbuilding on the lane at Castlecosker. It is most likely that there is a roost in the stone ruin. An emergence/dawn count will be conducted in May 2018.

High numbers of both Common and Soprano pipistrelles were recorded in the vicinity of the farmyard at Kiltorcan townland. These farm buildings will be checked for bat roosts in May 2018.

9. EMERGENCE COUNTS CONDUCTED AT BAT ROOSTS DISCOVERED DURING BAT SURVEYS OF SPRINGFIELD WIND FARM SITE – MAY 2018

A number of bat roosts were discovered during fieldwork conducted on the proposed Springfield Windfarm site. No roosts were recorded within the forest itself as commercial coniferous plantations generally do not provide suitable roosting sites for bats. All of the bat roosts were recorded in buildings.

Emergence counts were conducted at dusk from outside targeted buildings. Bat detectors used included Pettersson D240X, Petterrson D200, and Echometer Touch models. Surveys commenced 20 minutes before sunset on evenings with favourable weather conditions.

Date 27/06/18 - Dusk

Site: Whiskered Roost Coolroebeg GPS S59333 34712 (Dusk)

In 2017, approximately 30 Whiskered bats were recorded at dawn entering the roof of the house through a gap under the slates at the northern edge of the roof. In 2018, approximately 15 Whiskered bats were recorded emerging through numerous gaps in the slates on the front elevation of the house. This building contains an important roost of Whiskered bats.

Site: Long stone shed Derrynahinch GPS S55663 36253 (Dusk)

No bats recorded emerging from shed in 2018 but this building was confirmed as a Brown long-eared bat roost in 2017.

Date 28/06/18 - Dawn

Ruins on Castlecosker lane - Ruined house GPS S57307 35222 + Stone shed GPS S57379 35352 + Haybarn GPS S57398 35365 (Dawn)

Ruined house – no bats,

Stone shed – c.8 Brown Long-eared bats returned to roost

10 Whiskered bats returned to roost in old hay barn beside stone shed. They were recorded roosting behind a metal beam on the northern gable end of the shed. The stone ruin contains an important roost of Brown long-eared bats and the hay barn contains an important roost of Whiskered bats.

Date 28/06/18 - Dusk

Site: Stone Sheds at S58279 32302 (Eddie Dempsey)

Results: Up to 15 Natterer's bats emerged from the westernmost building. The bats are roosting in a crevice in an internal wall of the building. They flew inside the ruins of the building for approx. 20 mins before emerging. 3-4 Brown long-eared bats were recorded flying within northernmost building. It is most likely that they emerged from a crevice in an internal wall of the building but the exact location was not established.

28/06/18 - Dusk

Site: Stone Ruins on South Leinster Way at S57292 29466 (Dusk)

No bats were recorded emerging from any of the buildings.

28/06/18 - Dusk

Site: Modern House Castlebanny Lane (John O' Mahony) GPS S569 321

Over 300 Soprano pipistrelles emerged from two points on separate gables of house. This is an important roost of Soprano pipistrelle bats.

29/06/18 - Dawn

Site: Farm buildings Kiltorcan Lane (opposite racing track) GPS S56885 34452 (Dawn)

A lot of pipistrelle activity in yard but no confirmed roost site

29/06/18 - Dawn

Site Derelict House for sale just North of Castlebanny lane GPS S56019 32592

No bats at dawn

10. SUMMER BAT SURVEYS – MAY 2018

10.1 TRANSECTS DRIVEN IN MULLINAVAT FOREST

Transects were driven within plantation forestry in the proposed Springfield wind farm on both 27/06/18 and 28/06/18. Transects were driven from central crossroads in forestry south to intersection with South Leinster Way track and north to S58046 32916. Low levels of foraging activity of both Soprano pipistrelles and Common pipistrelles were detected on main forestry track to north and south of central crossroads.

Only occasional Leisler's bat calls were detected except at an area that had recently been felled close to the Castlebanny lane entrance. At this location several Leisler's were recorded foraging continuously up until midnight on both nights. Approximate grid reference of recently felled area – S573 322. This increase in activity at recently felled areas has been documented previously in coniferous plantations in Scotland where foraging activity of both pipistrelles and Leisler's bats increased in areas that had been recently felled. The increase in foraging activity is thought to be linked to increased insect activity at disturbed ground likely due to hatching midges.

Kirkpatrick, Lucinda et al. 2017 *Responses of bats to clear fell harvesting in Sitka Spruce plantations and implications for wind turbine installation*. Forest Ecology and Management, Amsterdam.

10.2 REMOTE MONITORING

A Songmeter 4 was attached at height to the anemometer on 27/06/18 and ran for a total of two nights.

REMOTE MONITORING ON ANEMOMETER – 2 NIGHTS MAY 2018

Table 11 - 27/06/18 – 28/06/18

Time	**Soprano Pipistrelle**	**Common Pipistrelle**	**Leisler's**	**Brown long-eared**	**Natterer's**
22.00-22.30	1		1		
22.30-23.00			1		
23.00-23.30					
23.30-00.00			1		
00.00-00.30					
00.30-01.00	1				
01.00-01.30		1	2		
01.30-02.00		1	1		
02.00-02.30		2	3		

02.30-03.00		2			
03.00-03.30			1		
03.30-04.00			1		
04.00-04.30			1		
Last call 04.10					
Total Passes	**2**	**6**	**12**	**0**	**0**
% of Passes	**10%**	**30%**	**60%**	**0**	**0**

Low level of bat activity recorded at anemometer. Leisler's bats passing over. No evidence of sustained feeding.

Table 12 - 28/06/18 – 29/06/18

Time	**Soprano Pipistrelle**	**Common Pipistrelle**	**Leisler's**	**Brown long-eared**	**Natterer's**
23.00-23.30	1		1		
23.30-00.00					
00.00-00.30					
00.30-01.00			1	1	
01.00-01.30			1		
01.30-02.00			1		
02.00-02.30				1	
02.30-03.00					
03.00-03.30	1				
03.30-04.00	1		3	2	
04.00-04.30			1		
Last call 04.11					

Total Passes	**3**		**8**	**4**	
% of Passes	**20%**		**53.33%**	**26.66%**	

Again, low levels of bat activity recorded at anemometer. Leisler's bats passing over. No evidence of sustained feeding.

Brown Long-eared bats recorded in vicinity of mast – presumably picking insects off mast structure.

11.GENERAL IMPRESSIONS OF BAT ACTIVITY ON SITE

Six species of bat were recorded on site – Common pipistrelle, Soprano pipistrelle, Brown long-eared, Natterer's, Whiskered and Leisler's bat. Wind turbines pose the highest risk to the high flying Leisler's bat, followed by the pipistrelles. Most recordings of Leisler's bats indicated that they were commuting through the site. However, they were recorded foraging over the Arrigle River in August 2017, which is to be expected, as Leisler's bats frequently forage over waterbodies. In May 2018 Leisler's bats were recorded foraging continuously over a section of recently felled forest close to Castlebanny Lane.

Soprano and Common pipistrelles were recorded in relatively low numbers throughout plantation forestry with foraging concentrated along forestry tracks.

No bat roosts were recorded in trees within the forestry. Several important bat roosts were recorded in buildings close to the forest. Bats have to commute from these buildings to the forestry. Forest tracks, agricultural lanes and hedgerows are used as commuting routes by all species on site except Leisler's bat - which does not rely on landscape features for navigation.

Additional transect work is needed on the lanes to the west of the Whiskered roost at Coolroebeg townland and the Whiskered roost in the hay barn on Castlecosker Lane.

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BAT ACTIVITY SURVEYS USING STATIC DETECTORS AT THE SITE OF THE PROPOSED CASTLEBANNY WINDFARM IN SUMMER 2019, AUTUMN 2019, SPRING 2020 AND SUMMER 2020

Report Prepared for

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CONTENTS

1. SUMMARY

Bat activity surveys, using static detectors (Songmeters from Wildlife Acoustics), were conducted in Summer 2019 (10 nights), Autumn 2019 (13 nights), Spring 2020 (10 nights) and Summer 2020 (10 nights) at the proposed site of Castlebanny Wind Farm, using methodology and data analysis techniques as outlined in the new guidance document on conducting bat surveys at proposed wind farm sites (Scottish Natural Heritage *et al*., 2019).

In 2019, the proposed development consisted of 24 turbines, with 12 turbines sited within Mullinavat Forest, 7 sited at forestry edge adjoining pasture fields and 5 in pasture fields. 13 survey points were selected to cover the range of bat foraging habitats available on site.

Prior to the Spring 2020 survey, the number of turbines was reduced from 24 to 21 and all of the turbines (except one, Turbine 2) had moved to new locations. 13 survey points were selected to reflect the new layout and cover the range of bat foraging habitats in the vicinity of the proposed turbine sites including forestry tracks (7), Pasture fields (3) and forestry edge adjoining pasture fields (3). Five of the 13 survey points used in the Summer and Autumn 2019 acoustic surveys were used again in the Spring 2020 Survey (Survey Points D, M, K, C, L). The remaining 8 survey points were in new locations selected to reflect the new layout of the turbines (Survey Points N, O, P, Q, R, S, T, U). For the Summer 2020 survey, 9 of the 13 sites surveyed in Spring 2020 were selected to be resurveyed.

Bat calls recorded at each survey point were analysed using Kaleidoscope software from Wildlife Acoustics. A total of 21,802 calls were analysed in the Summer 2019 survey period, 17,064 calls in the Autumn 2019 survey period, 27,654 calls in Spring 2020 survey period and 6,027 calls in Summer 2020 survey period. These results were fed into the *Ecobat* program which gives a measure of relative bat activity in the form of a percentile rank. *Ecoba*t classified activity for each species at each survey point as High, Moderate to High, Moderate, Low to Moderate or Low. The percentile rank of the four Irish species with a high risk of collision (Leisler's bat, Nathusius' pipistrelle, Soprano pipistrelle and Common pipistrelle) were assessed as outlined in the new 2019 guidelines.

In both 2019 survey periods, the three most frequently recorded species were Common pipistrelle, Soprano pipistrelle, and Leisler's bat (in descending order), which mirrors the estimated populations of these three species in Ireland. In both 2019 survey periods, the general trend was for activity of every bat species to be higher in the Summer survey period than in the Autumn survey period (except for two survey points). In both 2020 survey periods, the three most frequently recorded species were Common pipistrelle, Leisler's bat and Soprano pipistrelle (in descending order). Activity levels of all three species was very much higher in Spring 2020 than in Summer 2020.

Using the formulas outlined in the 2019 guidelines, the project size of 21 turbines is classified as **Medium** and Habitat risk classified as **Moderate.** Using these parameters, the Initial Risk Assessment for the proposed Castlebanny wind farm comes out as **Medium Risk = 3.** Finally, the Overall Site Risk Assessment for each high-risk species was calculated (Low 0-4, Medium 5-12, High 15-25).

Common pipistrelle scored an overall risk assessment score of **15** (**High Risk**) at 10 out of 16 survey sites surveyed in 2020 for final turbine positions. Soprano pipistrelles scored an overall risk assessment score of 15 (**High Risk**) at 3 out of 16 sites. These sites included

forestry tracks and pasture sites, indicating that both species are present in high numbers throughout the site. Buffer zones around each turbine will be necessary to discourage pipistrelles approaching turbines.

Leisler's bat scored an overall risk assessment score of **15 (High Risk)** at 7 sites – B (Turbine 12), C (Between Turbines 7 & 9) , G (close to Turbine 21), I (close to Turbine 19), K (Turbine 6), R (Turbine 16) and U (Turbine 20). These represent 3 pasture sites, 3 forestry sites and 1 forestry edge/pasture site). Leisler's bats an overall risk assessment score of **12 (Medium Risk**) at 11 survey points – B (Turbine 12) , D (Turbine 2), G (Turbine 21), I (Turbine 19), L (Turbine 18), M (Bet. Turbines 3 & 4, N (Turbine 1), O (Turbine 5), P (Turbine 10), Q (Turbine 13), T (Turbine 21). These represent 4 pasture sites, 4 forestry sites and 3 forestry edge/pasture sites).

High activity levels/ High collision risk for Leisler's bats was highest for Pasture sites in Summer and Autumn 2019 but highest for Forestry sites in the Spring 2020 survey. Numbers of calls in Summer 2020 were very low compared to the other three seasons, rendering it difficult to assess habitat preferences for this period. It is thought this low bat activity may be due to unfavourable weather conditions in July 2020.

Low activity levels were recorded at all survey points for Nathusius' pipistrelle (overall risk assessment score **3, Low Risk)**, except at Point A where in summer 2019, activity was assessed as Moderate-High (overall risk assessment score **12, Moderate Risk**) and activity in Autumn 2019 as Moderate (overall risk assessment score **9, Moderate Risk).** Survey point A was located on a central track in conifer plantation (running east-west) which leads to a group of stone farm buildings. It is possible that either a single Nathusius' pipistrelle, or a very small number are roosting in these buildings.

In 2020, Nathusius' pipistrelle was recorded at Turbine 2 at Moderate/High activity level in Spring 2020 and at Moderate levels at Turbine 13 in Summer 2020 and Turbine 16 in Spring 2020 and Summer 2020.

Mitigation measures are recommended for the proposed Castlebanny Wind Farm –

- Buffer zones of 50m from blade tip to nearest forestry/treeline/hedgerow to be implemented around all turbines on site.

- Where turbines are sited in pasture fields, all hedgerows are to be removed from the base of the turbine to 50m from the turbine blade tip.

- Bat casualties at wind farms can be reduced by pitching the blades out of the wind (feathering) to reduce rotation speeds below 2 rpm while idling. The reduction in speed resulting from feathering compared with normal idling may reduce fatality rate by up to 50%. As this option does not result in any loss of output, as best practice, it is recommended whenever it is practically possible and there remains uncertainty over the risk posed to bats. It can be applied at any site with a blade pitch control system.

- Six turbines have been recorded as having a High collision risk for Leisler's bats in at least one of the four survey seasons. Feathering is recommended for all these turbine sites. Curtailment may be recommended if these turbines still prove to be a risk during post construction monitoring surveys.
  .
- There is to be no disturbance of the mature agricultural lanes running from Kilvinoge graveyard towards the eastern side of the Castlebanny Wind Farm site. These lanes are important commuting routes and foraging sites for Whiskered bat. An important new roost of this rarer Irish bat species was recorded in the vicinity. In 2020, a maternity roost of Natterer's bat was recorded in a ruined farmyard in Kilvinoge. These bats are also likely to use the laneways for commuting purposes.

- Post-construction monitoring to assess bat activity and search for corpses is recommended for all 6 turbines found to have a high collision risk for Leisler's bat. Under the revised turbine layout these are Turbines 6, 12, 16, 19, 20 and 21.

2. BIOGRAPHY OF AUTHOR

Caroline Shiel holds a B.Sc degree and Ph.D in zoology from University College Galway (now NUIG). Her B.Sc thesis was on the analysis of diet of four species of Irish bat. Her Ph.D. thesis was on Leisler's bat *Nyctalus leisleri*. This research was published as scientific papers in the *Journal of Zoology*, London. She has 30 years' experience as a consulting ecologist who conducts both commercial surveys and research projects on bats. She is currently a Director and Vice-Chairperson of Bat Conservation Ireland.

3. INTRODUCTION

A range of bat surveys have been previously conducted at the Castlebanny site including a desk top survey (February 2017), seasonal bat detector surveys/ roost surveys (2017) and roost emergence surveys (2018). Bat detector surveys included both transects (driving & walking) and some static monitoring. Static monitoring was also conducted at height from the site anemometer on two nights in July 2017 and on two nights in June 2018. These surveys are described in the report *Bat Surveys at the Proposed Springfield Wind Farm Site at Mullinavat, Co. Kilkenny to Assess its Potential for Bat Roosting Sites and Foraging Sites* (March 2019).

In January 2019, a new guidance document *Bats and Onshore wind Turbines: Survey, Assessment and Mitigation* was published by Scottish Natural Heritage, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity, the University of Exeter and the Bat Conservation Trust.

This document replaced previous guidance from Natural England and Chapter 10 of the Bat Conservation Trust publication "*Bat Surveys: Good Practice Guidelines*" (2nd edition), (Hundt, 2012). A document pertaining to Ireland was published by Bat Conservation Ireland in 2012 "Wind Turbine/Wind Farm Development – Bat Survey Guidelines".

As a result of the publication of these new guidelines in early 2019, a request was made to conduct static monitoring at the Castlebanny site in line with the methodology outlined in the document. The 2019 guidelines hugely increased the level of acoustic monitoring recommended for proposed windfarm sites.

4. AIMS OF THE SURVEY

The aims of the present survey were to bring the methodology for conducting static bat detector surveys in line with current guidelines and to conduct seasonal static surveys (Summer, Autumn & Spring) at the proposed Castlebanny wind farm site.

The new windfarm guidelines states that multiple nights of surveying are required to determine accurately species presence and distribution within a site and to correctly categorise the relative level of activity for each species. Pre-application surveys should take place over a full season of bat activity. The minimum level of pre-application survey required using static detectors is 10 nights in each of: Spring (April-May), Summer (June -mid August) and Autumn (mid August-October). Ideally surveys should aim for 10 consecutive nights where weather conditions allow.

When developments have more than 10 turbines, detectors should be placed within the developable area at 10 potential turbine locations, plus a third of additional potential turbine sites. Beyond the initial 10 detectors placed at proposed turbine sites the remainder should be distributed based on the availability of different habitat types. At key-holed woodland/plantation sites (such as Castlebanny forest) the habitat available for bats will change dramatically between pre-construction and construction. Automated survey locations should therefore also include open areas including existing nearby rides/clearings in the forestry, to provide an indication of how bats may adapt to and use the new habitat created through turbine construction.

Monitoring at height should be conducted if there is an anemometer/meteorological mast on site.

5. METHODOLOGY

5.1 (2019 Surveys)

At the time of the Summer and Autumn 2019 surveys, the proposal was for the construction of 24 turbines, with 12 sited within Castlebanny Forest, 7 sited at forestry edge/ pasture and 5 in pasture fields surrounding the forest. Habitat maps marking the proposed locations of wind turbines were provided. Based on these maps 13 survey points was selected to cover the range of bat foraging habitats in the vicinity of the proposed turbine sites including forestry tracks (5 sites), pasture fields (6 sites) and forestry edge adjoining pasture (2 sites) as shown below in Table 1

Table 1 – List of survey sites selected to monitor activity at proposed turbine sites in Summer survey 2019 and Autumn survey 2019 and to cover the range of bat habitat on site (based on the positioning of the proposed wind turbines in early 2019)

SURVEY POINT	TURBINE SITE NO.	IG GRID REFERENCE	LATITUDE/LONGITUDE	HABITAT
A	Between 9 & 11	S58192 32269	52.43911N, -7.14492W	Forestry track
B	Between 10 & 24	S58481 32420	52.44056N, -7.14083W	Pasture
C	Between 6 & 8	S58359 31142	52.42909N, -7.14277W	Forestry track
D	At Turbine 1	S59585 29712	52.41603N, -7.12485W	Forestry edge/Pasture
E	At Turbine 7	S59164 31575	52.43296N, -7.13083W	Pasture
F	Close to Turbine 14	S58493 33501	52.45015N, -7.14027W	Forestry edge/Pasture
G	At Turbine 23	S56886 34291	52.45737N, -7.16416W	Pasture
H	At Turbine 19	S57187 33349	52.44951N, -7.15991W	Pasture
I	Between 18 & 21	S57455 33750	52.45250N, -7.1555W	Pasture
J	At Turbine 22	S57378 34708	52.46458N, -7.15722W	Pasture
K	Close to Turbine 5	S59428 31101	52.42848N, -7.12694W	Forestry track
L	Close to Turbine 17	S58141 34299	52.45974N, -7.14527W	Forestry track
M	SW corner of site	S58839 29804	52.41689N, -7.13584W	Forestry track

Survey points marked in red were surveyed again in Spring 2020

The Summer 2019 survey was conducted from 30.07.19 to 09.08.19. Ten Songmeter 4 and two Songmeter 2 bat detectors (Wildlife Acoustics) were deployed on site at survey points A-M on 29.07.19 and ran until 09.08.19 when they were collected. They were set to commence recording half an hour before sunset and finish half an hour after sunrise to ensure that bat species that emerge early in the evening and return to roosts late, such as Leisler's bat, were recorded.

The Autumn 2019 survey was conducted from 17.09.19 to 29.09.19. Three detectors were deployed in the field on 16.09.19 and the remaining 10 detectors on the following day 17.09.19. Detectors were mounted in the same positions as for the Summer 2019 survey. In addition to the 12 detectors deployed for the Summer 2019 survey, one additional Songmeter was used for the Autumn survey and was placed at an additional survey point (Point M) at the SW corner of the site.

Weather data were taken from Met Eireann website for each of the nights that the detectors were recording so that any nights with adverse weather conditions could be left out of analysis. Detailed weather data were also available from the anemometer on site.

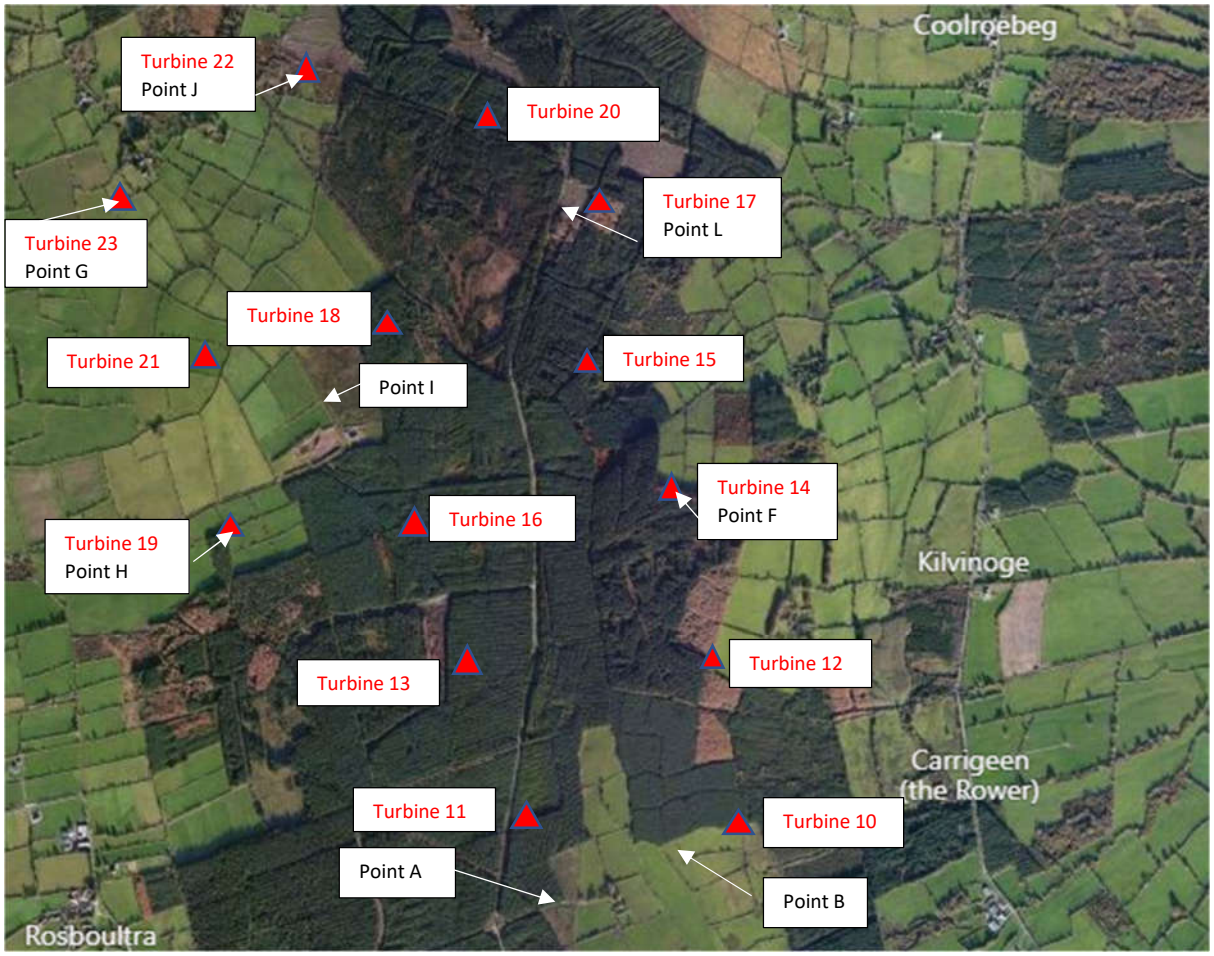

Figure 1 – Northern half of Castlebanny windfarm site showing proposed locations of Turbines (red triangle) and positions of static detectors (Survey Points A – M)

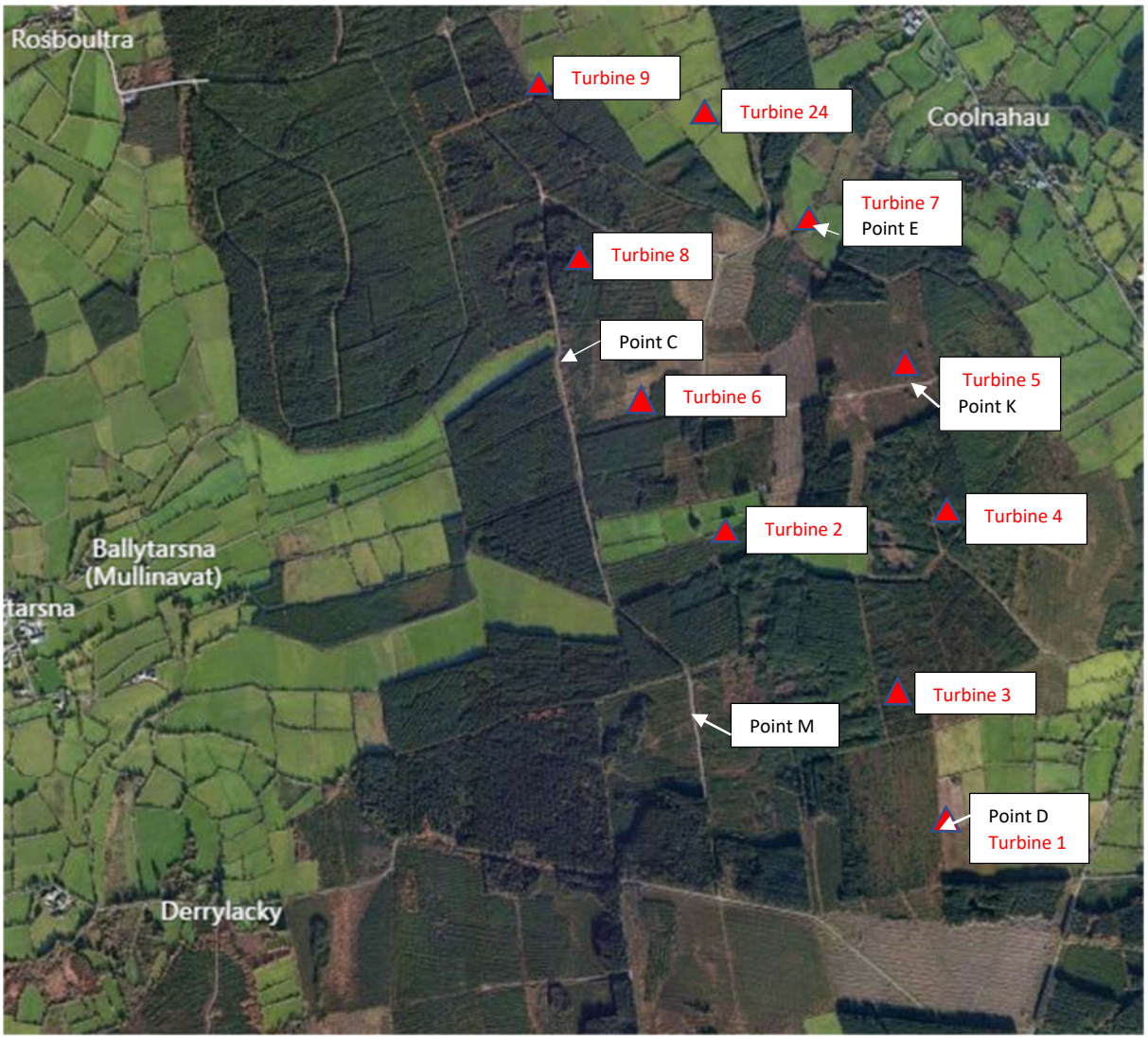

Figure 2 – Southern half of Castlebanny windfarm site showing proposed locations of Turbines (red triangle) and positions of static detectors (Survey Points A – M)

5.2 (2020 Surveys)

Prior to the Spring 2020 survey, the number of turbines had been reduced from 24 to 21 and all of the turbines (except one – Turbine 2) had moved to new locations. 13 survey points were selected to reflect the new layout and to cover the range of bat foraging habitats in the vicinity of the proposed turbine sites including forestry tracks (7), Pasture fields (3) and forestry edge adjoining pasture fields (3). Five of the 13 survey points used in the Summer and Autumn 2019 acoustic surveys were used again in the Spring and Summer 2020 Survey (Survey Points C, D, K, L, M). The remaining 8 survey points were in new locations selected to reflect the new layout of the turbines (Survey Points N, O, P, Q, R, S, T, U). Table 2

Table 2 – List of survey sites selected to monitor activity at proposed turbine sites in Spring Survey 2020 and Summer Survey 2020 and to cover the range of bat habitat on site (based on the positioning of the proposed wind turbines in early 2020)

SURVEY POINT	TURBINE SITE NO.	IG GRID REFERENCE	LATITUDE/LONGITUDE	HABITAT
C	Between 7 & 9	S58359 31142	52.42909N, -7.14277W	Forestry track
D	At Turbine 2	S59585 29712	52.41603N, -7.12485W	Forestry edge/Pasture
K	Just north of Turbine 6	S59428 31101 S59441 31087?	52.42848N, -7.12694W	Forestry track
L	West of Turbine 18	S58141 34299	52.45974N, -7.14527W	Forestry track
M	Between 3 & 4	S58839 29804	52.41689N, -7.13584W	Forestry track
N	Close to Turbine 1	S58522 28879	52.408609, -7.140654W	Forestry Track
O	At Turbine 5	S58537 30278	52.421180, -7.140190W	Forestry edge/Pasture
P	At Turbine 10	S58731 31996	52.436598, - 7.13703W	Pasture
Q	Close to Turbine 13	S57628 32400	52.440346, -7.15318W	Forestry Track
R	At Turbine 16	S58511 33691	52.451853, -7.13997W	Forestry edge/Pasture
S	At Turbine 19	S57408 34054	52.455232, -7.15613W	Pasture
T	At Turbine 21	S57044 34453	52.458856, -7.16142W	Pasture/edge of eucalyptus plantation
U	Just south of Turbine 20	S57800 34781	52.461286, -4.14935W	Forestry

Survey points marked in red were previously surveyed in 2019.

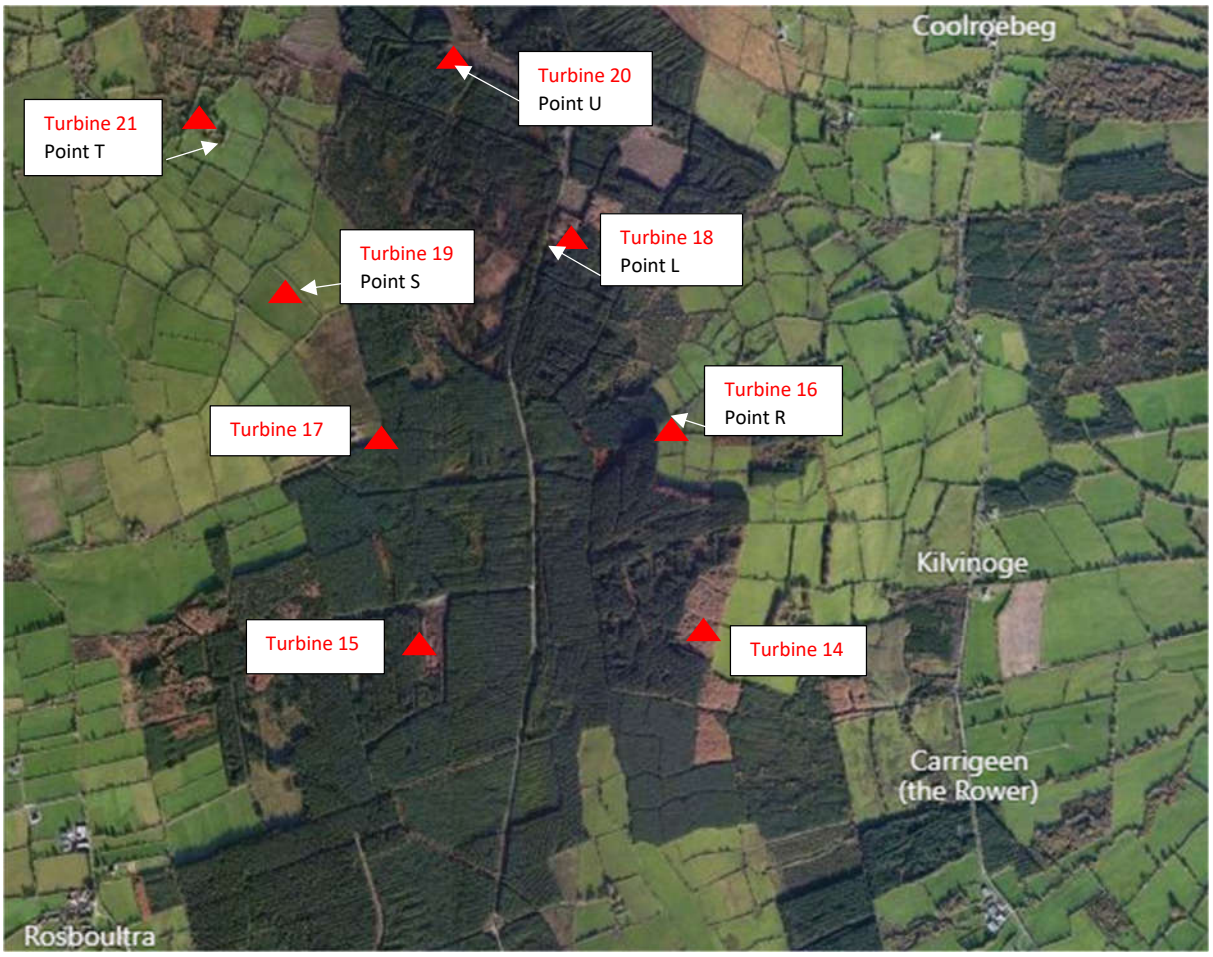

Figure 3 – Northern half of Castlebanny windfarm site showing final locations of Turbines (red triangle) and positions of static detectors (Survey Points L, R, S, T, U) used in Spring 2020 Survey

Only Points R, S, T & U were surveyed in Summer 2020 survey

Figure 4 – Central section of Castlebanny windfarm site showing final locations of Turbines (red triangles) and positions of static detectors (Survey Points P & Q) used in Spring 2020 Survey

Points P and Q were surveyed in the Summer 2020 Survey

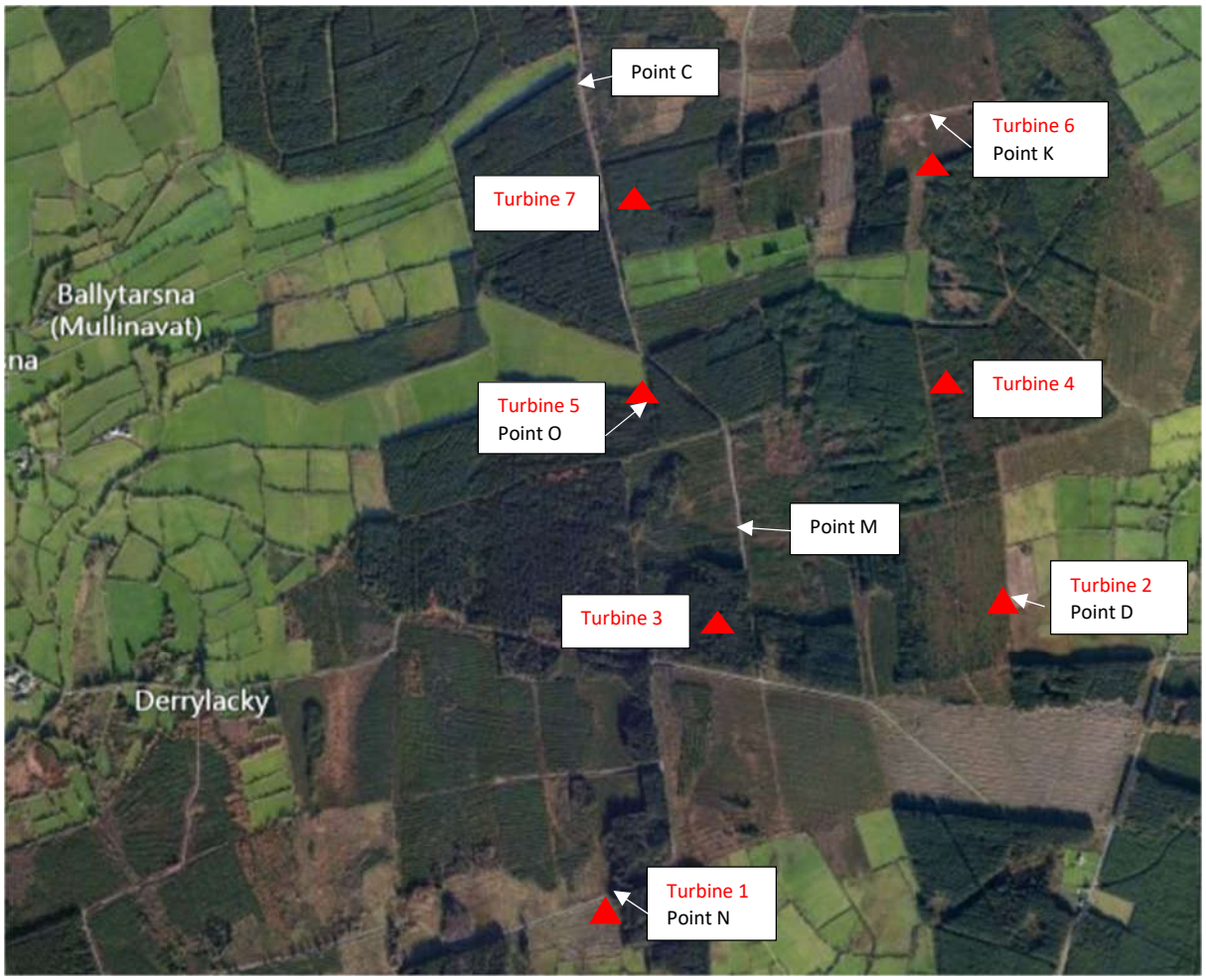

Figure 5 – Southern section of Castlebanny windfarm site showing final locations of Turbines (red triangles) and positions of static detectors (Survey Points C, D, K, M, N, O) used in Spring 2020 Survey.

Only Survey Points D, N and O were surveyed in the Summer 2020 Survey

6. ANALYSIS OF DATA AND RESULTS

The National Bats and Wind Turbines (Matthews *et al*. 2016) study found that low bat activity at operational sites is useful in identifying sites with low risk of mortality, but it found no conclusive link between moderate and high bat activity and risk of mortality. Currently, there is no other means of assessing the potential risk posed by a new wind farm apart from assessing bat activity on site. Therefore, quantifying the levels of bat activity at proposed wind farm sites is considered to be a useful proxy when assessing collision risk.

The calls recorded at each survey point on site were downloaded and analysed using Kaleidoscope software from Wildlife Acoustics. Ms Barbara McInerney, Carney, Sligo conducted the call analysis. Data analysed included total number of bat passes per night, and the number of passes of each species. These results were fed into the analysis tool *Ecobat* (www.ecobat.org.uk) hosted by The Mammal Society, UK which gives a measure of relative bat activity. *Ecobat* compares data entered by the user, with bat survey information collected from similar areas (confined to within 100km of Castlebanny), at the same time of the year and in comparable weather conditions. *Ecobat* generates a percentile rank for each night of activity and provides a numerical way of interpreting the levels of bat activity recorded on site (Table 2). *Ecobat* is currently the most objective method of assessing bat activity.

Table 3 – Percentile Score and categorised level of bat activity

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

The detailed results of the analysis of data from each of the 13 survey points (Points A-U) for Summer 2019 survey period, Autumn 2019 survey period, Spring 2020 survey period and Summer 2020 survey period are presented in *Tables A.1 – A.47* in the Appendix of this report. These tables show the no. of passes per night per bat species, the percentile calculated from the Ecobat analysis tool and the categorised level of bat activity. Results showing High levels and Moderate to High levels of activity for a species are highlighted in the tables.

The results from *Tables A.1 – A.47* are summarised in Tables 4 – 24 below which detail the overall activity level for each species during the Summer 2019, Autumn 2019, Spring 2020 and Summer 2020 survey periods. Species with a high risk of collision are indicated in red.

In Ireland, these species are Leisler's bat, Nathusius' pipistrelle, Soprano pipistrelle and Common pipistrelle. This assessment of vulnerability is based on the behaviour and flight characteristics of a species. Vulnerability to collision is likely to depend on location of turbines in relation to bat activity. Bat activity, and hence risks, are rarely uniform across a site but good coverage of detectors across a site will help in assessing which potential turbine locations present greater risk.

TABLE 4 - SURVEY POINT A

SITE – On lane between Turbine 9 and Turbine 11; Grid Reference S58192 32269

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SUMMER 2019	8	Common Pipistrelle (344 passes)	Nathusius' pipistrelle (15 passes)	Leisler's (7 passes)	Brown long-eared (3 passes)	Natterer's (0 passes)
		Soprano pipistrelle (103 passes)		Whiskered (9 passes)		Daubenton's (0 passes)
AUTUMN 2019	8	Soprano pipistrelle (96 passes)	Whiskered (8 passes)	Nathusius' pipistrelle (2 passes)	Leisler's (1 pass)	Brown long-eared (0 passes)
		Common pipistrelle (101 passes)			Natterer's (1 pass)	
					Daubenton's (1 pass)	

Summer 2019 Total no. of calls over 10 nights = 4,973

Autumn 2019 Total no. of calls over 13 nights = 4,079

The 4 high-risk species are highlighted in red

No. in brackets below species in table is median number of passes per night for survey period

Photo 1 - Survey Point A on forestry track. The position of the Songmeter is illustrated

Photo 2 - showing microphone of Songmeter 4 attached to wire fence at Point A. The detector is hidden in the grass below

TABLE 5 - SURVEY POINT B

SITE – On small tree in pasture fields behind Dempsey's Ruins, between Turbines 10 & 24; Grid Reference S58481 32420

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SUMMER 2019	8	Common Pipistrelle (274 passes)	Leisler's (24 passes)		Brown long-eared (2 passes)	Natterer's (0 passes)
		Soprano pipistrelle (94 passes)			Nathusius' pipistrelle (2 passes)	
					Whiskered (1 pass)	
					Daubenton's (1 pass)	
AUTUMN 2019	8	Leisler's (36 passes)	Soprano pipistrelle (13 passes)	Common pipistrelle (7 passes)	Brown long-eared (1 pass)	Natterer's (0 passes)
					Whiskered (1 pass)	Nathusius' pipistrelle (0 passes)
						Daubenton's (0 passes)

Summer 2019 Total no. of calls over 10 nights = 4,741

Autumn 2019 Total no. of calls over 9 nights = 996

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 3 - Survey Point B – microphone mounted high on immature ash on boundary of pasture field

TABLE 6 - SURVEY POINT C

SITE – Edge of main forest track on post below track, between Turbines 6 & 8 (2019 positions); between Turbines 7 & 9 (2020 positions) Grid Reference S58359 31142

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SUMMER 2019	6	Common Pipistrelle (256 passes)	Soprano pipistrelle (23 passes)	Leisler's (9 passes)		Daubenton's (0 passes)
						Nathusius' pipistrelle (0 passes)
						Whiskered (0 passes)
AUTUMN 2019	5		Soprano pipistrelle (2 passes)			Leisler's (0 passes)
			Common pipistrelle (2 passes)			Whiskered (0 passes)
						Brown long-eared (0 passes)
SPRING 2020	4	Leisler's (147 passes)	Common Pipistrelle (52 passes)			Soprano pipistrelle (2 passes)
						Nathusius's pipistrelle (1 pass)

Summer 2019 Total no. of calls over 10 nights = 3,032

Autumn 2019 Total no. of calls over 13 nights = 167

Spring 2020 Total no. of calls over 10 nights = 2,289

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 4 - Survey Point C – Songmeter mounted on wooden stake beside forestry track

TABLE 7 - SURVEY POINT D

SITE – Edge of plantation/pasture at Turbine 1 (2019 positions); Turbine 2 (2020 positions) Grid Reference S59585 29712

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SUMMER 2019	6		Common Pipistrelle (19 passes)	Leisler's (4 passes)		Natterer's (0 passes)
				Soprano pipistrelle (8 passes)		Whiskered (0 passes)
						Brown long-eared (0 passes)
AUTUMN 2019	4		Common pipistrelle (4 passes)			Nathusius' pipistrelle (0 passes)
			Soprano pipistrelle (5 passes)			Leisler's (0 pass)
SPRING 2020	7	Common pipistrelle (429 passes)	Leisler's (70 passes)			Whiskered (0 passes)
			Soprano pipistrelle (70 passes)			Natterer's (0 passes)
			Nathusius's pipistrelle (20 passes)			Daubenton's (3 passes)
SUMMER 2020	4			Leisler's (3.5 calls)	Common pipistrelle (2 calls)	Soprano pipistrelle (0 calls)
						Nathusius's pipistrelle (0 calls)

Summer 2019 Total no. of calls over 10 nights = 741 (low)

Autumn 2019 Total no. of calls over 8 nights = 453

Spring 2020 Total no. of calls over 5 nights = 3,975 (very high)

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 5 – Survey Point D showing Songmeter mounted on post at Forestry edge/Pasture

Photo 6 – Survey Point D – view north along Forestry edge/Pasture with grazing cattle

TABLE 8 - SURVEY POINT E

SITE – Up track behind grey barn on rowan at Turbine 7 (2019 positions); Grid Reference S59164 31575

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SUMMER 2019	8		Common Pipistrelle (39 passes)	Leisler's (7 passes)	Whiskered (1 pass)	Natterer's (0 passes)
				Soprano pipistrelle (36 passes)		Nathusius' pipistrelle (0 passes)
						Daubenton's (0 passes)
						Brown long-eared (1 pass)
AUTUMN 2019	4	Soprano pipistrelle (57 passes)	Leisler's (5 passes)		Daubenton's (1 pass)	
		Common pipistrelle (101 passes)				

Summer 2019 Total no. of calls over 10 nights = 1,033

Autumn 2019 Total no. of calls over 2 nights (cattle damage) = 324

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 7 – Survey Point E. Microphone of Songmeter 4 mounted high in immature rowan tree in pasture

TABLE 9 - SURVEY POINT F

SITE – Up long lane plantation edge/pasture close to Turbine 14 (2019 positions) ; Grid Reference S58493 33501

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SUMMER 2019	8		Common Pipistrelle (38 passes)		Whiskered (1 pass)	Natterer's (0 passes)
			Leisler's (12 passes)			Nathusius' pipistrelle (0 passes)
			Soprano pipistrelle (17 passes)			Daubenton's (0 passes)
						Brown long-eared (2 passes)
AUTUMN 2019	6		Soprano pipistrelle (5 passes)	Leisler's (1 pass)		Brown long-eared (0 passes)
			Common pipistrelle (3 passes)			Whiskered (0 passes)
						Natterer's (0 passes)

Summer 2019 Total no. of calls over 10 nights = 1,189

Autumn 2019 Total no. of calls over 13 nights = 408

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 8 – Survey Point F showing microphone mounted on wire at Forestry edge/Pasture

TABLE 10 - SURVEY POINT G

SITE – Kiltorcan lane behind cottage and sheds at Turbine 23 (2019 positions) ; Grid Reference S56886 34291

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SUMMER 2019	6	Common Pipistrelle (58 passes)	Leisler's (40 passes)	Soprano pipistrelle (20 passes)		Brown long-eared (0 passes)
						Nathusius' pipistrelle (0 passes)
						Whiskered (0 passes)
AUTUMN 2019	8	Soprano pipistrelle (25 passes)	Brown long-eared (3 passes)			Daubenton's (0 pass)
		Common pipistrelle (187 passes)				Nathusius' pipistrelle (0 passes)
		Leisler's (118 passes)				Whiskered (0 passes)
						Natterer's (0 pass)

Summer 2019 Total no. of calls over 10 nights = 1,513

Autumn 2019 Total no. of calls over 13 nights = 5,086 (big increase)

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 9 – Survey Point G showing microphone mounted on post in corner of pasture field

TABLE 11 - SURVEY POINT H

SITE – At trough in field on lane to mast at Turbine 19 (2019 positions); Grid Reference S57187 33449

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SUMMER 2019	8		Leisler's (19 passes)	Soprano pipistrelle (10 passes)		Brown long-eared (0 passes)
			Common Pipistrelle (29 passes)			Nathusius' pipistrelle (0 passes)
						Whiskered (0 passes)
						Natterer's (0 passes)
						Daubenton's (0 passes)
AUTUMN 2019	5	Common pipistrelle (31 passes)	Soprano pipistrelle (5 passes)	Brown long-eared (1 pass)		Daubenton's (0 pass)
			Leisler's (7 pass)			

Summer 2019 Total no. of calls over 10 nights = 687

Autumn 2019 Total no. of calls over 13 nights = 519

The 4 high-risk species are highlighted in red

No. in brackets below species in table is median number of passes per night for survey period

Photo 10 – Survey Point H showing microphone mounted on wooden post beside cattle trough in pasture

TABLE 12 - SURVEY POINT I

SITE – At electric fence on lane to mast between Turbine 18 and Turbine 21 (2019 positions); Grid Reference S57455 33750

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SUMMER 2019	7		Leisler's (17 passes)	Soprano pipistrelle (7 passes)	Whiskered (1 passes)	Brown long-eared (0 passes)
				Common Pipistrelle (9 passes)		Nathusius' pipistrelle (0 passes)
						Daubenton's (0 passes)
AUTUMN 2019	5		Soprano pipistrelle (5 passes)			Brown long-eared (1 pass)
		Leisler's (36 pass)	Common pipistrelle (7 passes)			Nathusius' pipistrelle (0 passes)

Summer 2019 Total no. of calls over 10 nights = 656

Autumn 2019 Total no. of calls over 6 nights = 392

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 11 – Survey Point I. Microphone on post in pasture

TABLE 13 - SURVEY POINT J

SITE – Long northern lane past whiskered shed and ruins at Turbine 22 (2019 positions); Grid Reference S57378 34708

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SUMMER 2019	8	Common Pipistrelle (35 passes)	Leisler's (11 passes)			Brown long-eared (0 passes)
			Soprano pipistrelle (17 passes)			Nathusius' pipistrelle (0 passes)
						Daubenton's (0 passes)
						Whiskered (0 passes)
						Natterer's (0 passes)
AUTUMN 2019	7	Common pipistrelle (17 passes)	Soprano pipistrelle (10 passes)	Whiskered (1 pass)		Natterer's (0 passes)
		Leisler's (11 passes)	Brown long-eared (2 passes)			Daubenton's (0 passes)

Summer 2019 Total no. of calls over 10 nights = 813

Autumn 2019 Total no. of calls over 13 nights = 687

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 12 – Survey Point J. Microphone mounted in hedgerow tree in pasture

TABLE 14 - SURVEY POINT K

SITE – On forestry track to south on split post south of Turbine 5 (2019 position); north of Turbine 6 (2020 position) Grid Reference S59441 31087

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SUMMER 2019	6	Common Pipistrelle (65 passes)	Soprano pipistrelle (21 passes)	Leisler's (9 passes)		Brown long-eared (0 passes)
						Whiskered (0 passes)
						Daubenton's (0 passes)
AUTUMN 2019	5					Nathusius' pipistrelle (0 passes)
						Brown long-eared (0 passes)
						Leisler's (0 passes)
						Common pipistrelle (0 passes)
						Soprano pipistrelle (0 passes)
SPRING 2020	6	Leisler's (153.5 calls)			Nathusius's pipistrelle (6 passes)	Soprano pipistrelle (0 passes)
		Common pipistrelle (296.5 calls)				Daubenton's (0 passes)
						Brown long-eared (0 passes)

Summer 2019 Total no. of calls over 10 nights = 1,588

Autumn 2019 Total no. of calls over 13 nights = 91

Spring 2020 Total no. of calls over 10 nights = 5,811 (very high)

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period

Photo 13 – Survey Point K – microphone mounted on post at edge of track in southern section of Castlebanny forest

TABLE 15 - SURVEY POINT L

SITE – Most northern point on forest track close to Turbine 17; Grid Reference S58141 34299

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SUMMER 2019	6		Common Pipistrelle (22 passes)	Leisler's (6 passes)		Brown long-eared (0 passes)
				Soprano pipistrelle (5 passes)		Natterer's (0 passes)
						Nathusius' pipistrelle (0 passes)
AUTUMN 2019	6	Common pipistrelle (219 passes)	Leisler's (2 passes)		Whiskered (1 pass)	Nathusius' pipistrelle (0 passes)
		Soprano pipistrelle (109 passes)			Brown long-eared (1 pass)	
SPRING 2020	**6**		Leisler's (36 passes)	Common pipistrelle (21.5 passes)		Soprano pipistrelle (0 passes)
						Nathusius's pipistrelle (0 passes)
						Daubenton's (0 passes)
						Brown long-eared (0 passes)

Summer 2019 Total no. of calls over 10 nights = 836

Autumn 2019 Total no. of calls over 8 nights = 3,368 (big increase)

Spring 2020 Total no. of calls over 10 nights = 788

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 14 – Survey Point L – Songmeter mounted on post at edge of track close to most northerly point on forestry track

TABLE 16 - SURVEY POINT M

SITE – On southern central track (south west corner of site); Grid Reference S58845 29791

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
AUTUMN 2019	5	Common pipistrelle (8 passes)	Soprano pipistrelle (2 passes)			Leisler's (0 passes)
						Whiskered (0 passes)
						Brown long-eared (0 passes)
SPRING 2020	7		Leisler's (48 passes)			Soprano pipistrelle (0 passes)
			Common pipistrelle (32 passes)			Nathusius's pipistrelle (0 passes)
						Whiskered (0 passes)
						Daubenton's (0 passes)
						Brown long-eared (0 passes)

Autumn 2019 Total no. of calls over 13 nights = 494

Spring 2020 Total no. of calls over 10 nights = 1,267

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 15 – Survey Point M – edge of forestry track at south west corner of forest

TABLE 17 - SURVEY POINT N

SITE – Southernmost point on site v close to Turbine 1; Grid Reference S58522 28879

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SPRING 2020	7		Leisler's (81 passes)	Common pipistrelle (13 passes)		Soprano pipistrelle (0 passes)
						Nathusius's pipistrelle (0 passes)
						Whiskered (0 passes)
						Daubenton's (0 passes)
						Brown long-eared (0 passes)
SUMMER 2020	6	Common pipistrelle (72.5 passes)	Leisler's (18.5 passes)	Soprano pipistrelle (4.5 passes)		Nathusius's pipistrelle (0 passes)
						Whiskered (0 passes)
						Daubenton's (0 passes)

Spring 2020 Total no. of calls over 10 nights = 1,482

Summer 2020 Total no. of calls over 10 nights = 1,135

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period

Photo 16 - Site of Turbine 1. The position of the Songmeter is indicated at Survey Point N

TABLE 18 - SURVEY POINT O

SITE – Corner of pasture field to west of site at Turbine 5; GPS S58537 30278

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SPRING 2020	7			Leisler's (10 passes)		Soprano pipistrelle (0.5 passes)
				Common pipistrelle (19.5 passes)		Nathusius's pipistrelle (0 passes)
						Whiskered (0 passes)
						Daubenton's
						Brown long-eared (0 passes)
SUMMER 2020	5		Leisler's (13 passes)		Soprano pipistrelle (3.5 passes)	Nathusius's pipistrelle (0 passes)
			Common pipistrelle (10.5 passes)			Whiskered (0 passes)

Spring 2020 Total no. of calls over 10 nights = 1,597

Summer 2020 Total no. of calls over 10 nights = 420

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 17 – site of Turbine 5. Position of Survey Point O is indicated.

TABLE 19 - SURVEY POINT P

SITE – Pasture fields south of anemometer at Turbine 10; GPS S58731 31996

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SPRING 2020	6		Leisler's (28.5 passes)		Common pipistrelle (4 passes)	Nathusius's pipistrelle (0 passes)
					Soprano pipistrelle (2.5 passes)	Whiskered (0 passes)
						Daubenton's (0 passes)
SUMMER 2020	4			Common pipistrelle (6 passes)	Leisler's (2 passes)	Soprano pipistrelle (0 Passes)
Brown long-eared ?						(8 passes)

Spring 2020 Total no. of calls over 10 nights = 413

Summer 2020 Total no. of calls over 4 nights = 137 (Cattle pulled down microphone)

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

*This survey point in one field south of the Brown long-eared roost in the stone ruins.

Photo 18 - looking across field to site of Turbine 10. Position of Survey Point P is indicated

TABLE 20 - SURVEY POINT Q

SITE – In forestry close to Turbine 13. GPS 57628 32400

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SPRING 2020	7			Leisler's (11.5 passes)	Nathusius's pipistrelle (2 passes)	Whiskered (0 passes)
				Common pipistrelle (23 passes)		Daubenton's (0 passes)
				Soprano pipistrelle (15 passes)		
						Brown long eared (0.5 passes)
SUMMER 2020	6	Common pipistrelle (220 passes)	Leisler's (17 passes)	Nathusius's pipistrelle (43 passes)		Whiskered (0 passes)
			Soprano pipistrelle (69.5 passes)			Daubenton's (0 passes)

Spring 2020 Total no. of calls over 10 nights = 1,107

Summer 2020 Total no. of calls over 10 nights = 2,972

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 19 - Looking East to site of Turbine 13

Photo 20 – microphone in position at Site Q

TABLE 21 - SURVEY POINT R

SITE – Forestry edge/pasture to east of site at Turbine 16; Grid reference S58511 33691

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SPRING 2020	8	Leisler's (176 passes)			Soprano pipistrelle (7 passes)	Whiskered (0 passes)
		Common pipistrelle (260 passes)				Natterer's (0 passes)
				Nathusius's pipistrelle (9.5 passes)		Daubenton's (0 passes)
						Brown long-eared (1 pass)
SUMMER 2020	8	Common pipistrelle (38 passes)		Leisler's (5 passes)		Whiskered (0 passes)
				Soprano pipistrelle (4 passes)		Natterer's (0 passes)
				Nathusius pipistrelle (3.5 passes)		Daubenton's (0 passes)
						Brown long-eared (0.5 passes)
						(

Spring 2020 Total no. of calls over 10 nights = 4,644

Summer 2020 Total no. of calls over 10 nights = 598

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Moderate activity for Nathusius's pipistrelle in both survey seasons would indicate a roost closeby – most likely ruined farm buildings at GPS S588 338

Photo 21 – Songmeter in position on fence post at site of Turbine 16. Survey Point R

TABLE 22 - SURVEY POINT S

SITE – Pasture on west site of site at Turbine 19; GPS S57408 34054

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SPRING 2020	6			Leisler's (14 passes)	Common pipistrelle (2 passes)	Soprano pipistrelle (1 pass)
						Nathusius's pipistrelle (1 pass)
						Whiskered (0 passes)
						Daubenton's (0 passes)
SUMMER 2020				Leisler's (9 passes)	Common pipistrelle (1.5)	Soprano pipistrelle (0 passes)
					Brown long eared (2.5 passes	Natterer's (0 passes)

Spring 2020 Total no. of calls over 10 nights = 459

Summer 2020 Total no. of calls over 10 nights = 213

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 22 – Position of Songmeter at Site of Turbine 19 in pasture fields. Survey Point S

TABLE 23 - SURVEY POINT T

SITE – Pasture fields/eucalyptus plantation at Kiltorcan at Turbine 21; GPS S57044 34453

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SPRING 2020	7		Leisler's (82.5 passes)		Soprano pipistrelle (4.5 passes)	Nathusius's pipistrelle (1 pass)
			Common pipistrelle (36.5 passes)			Whiskered (0 passes)
						Daubenton's (0 passes)
						Brown long-eared (1 pass)
SUMMER 2020	6		Leisler's (10.5 passes)		Soprano pipistrelle (0.5 passes)	Nathusius's pipistrelle (0 passes)
			Common pipistrelle (15 passes)			
Whiskered (0.5 passes)						

Spring 2020 Total no. of calls over 10 nights = 2,214

Summer 2020 Total no. of calls over 10 nights = 379

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 23 – site of Turbine 23 – in eucalyptus plantation behind hedgerow. Position of Songmeter is indicated

TABLE 24 - SURVEY POINT U

SITE – Most northerly point close to Turbine 20; GPS S57861 34733

SURVEY PERIOD	NO. OF SPECIES	HIGH ACTIVITY	MODERATE-HIGH ACTIVITY	MODERATE ACTIVITY	MODERATE-LOW ACTIVITY	LOW ACTIVITY
SPRING 2020	5	Leisler's (138 passes)			Common pipistrelle (9.5 passes)	Soprano pipistrelle (1 pass)
						Nathusius's pipistrelle (0 passes)
						Brown long-eared (0 passes)
SUMMER 2020	5			Leisler's (4.5 passes)	Common pipistrelle (1 pass)	Soprano pipistrelle (0 passes)
						Whiskered (0 passes)
						Daubenton's (0 passes)

Spring 2020 Total no. of calls over 10 nights = 1,618

Summer 2020 Total no. of calls over 10 nights = 81

The 4 high-risk species are highlighted in red.

No. in brackets below species in table is median number of passes per night for survey period.

Photo 24 - Site of Turbine 20. Songmeter microphone mounted on conifer

6.1 SUMMARY OF RESULTS

The total number of calls recorded and analysed at the 12 survey points in Summer 2019 was 21,802 calls, Autumn 2019 period 17,064 calls, Spring 2020 26,758 calls and Summer 2020 6,027 calls. This gives a combined total number of 71,646 passes for all seasons. A breakdown of the number of calls recorded at each point over the four survey periods is given in Table 25. In 2019, the trend was for significantly more calls to be recorded in Summer period than in the Autumn period. There were two exceptions as shown in Table 25 below. However, the highest number of calls for all four seasons was in Spring 2020.

Table 25 - Breakdown of the number of calls recorded at each point over both survey periods

Survey Point	No. of Calls	Survey Period	No. of Nights
A	4,973	Summer 2019	10
A	4,079	Autumn 2019	13
B	4,741	Summer 2019	10
B	996	Autumn 2019	9
C	3,032	Summer 2019	10
C	167	Autumn 2019	13
C	2,289	Spring 2020	10
D	741	Summer 2019	10
D	453	Autumn 2019	8
D	3,975	Spring 2020	5
D	92	Summer 2020	10
E	1,033	Summer 2019	10
E	324	Autumn 2019	2*
F	1,189	Summer 2019	10
F	408	Autumn 2019	13
G	1,513	Summer 2019	10
G	5,086	Autumn 2019	13
H	687	Summer 2019	10
H	519	Autumn 2019	13
I	656	Summer 2019	10
I	392	Autumn 2019	6*
J	813	Summer 2019	10
J	687	Autumn 2019	13
K	1,588	Summer 2019	10
K	91	Autumn 2019	13
K	4,910	Spring 2020	10
L	836	Summer 2019	10
L	3,368	Autumn 2019	8
L	778	Spring 2020	10
M	494	Autumn 2019	13
M	1,267	Spring 2020	10
N	1,482	Spring 2020	10
N	1,135	Summer 2020	10
O	1,597	Spring 2020	10
O	420	Summer 2020	10

Survey Point	No. of Calls	Survey Period	No. of Nights
P	413	Spring 2020	10
P	137	Summer 2020	4*
Q	1,107	Spring 2020	10
Q	2,972	Summer 2020	10
R	4,644	Spring 2020	10
R	598	Summer 2020	10
S	459	Spring 2020	10
S	213	Summer 2020	10
T	2,214	Spring 2020	10
T	379	Summer 2020	10
U	1,618	Spring 2020	10
U	81	Summer 2020	10
Total	**71,646.00**		

*2 nights in Autumn at Survey Point E – due to damage of microphone by cattle, 6 nights Autumn Period Survey Point I was due to a faulty detector. 4 nights survey point P – cattle damage

Table 26 – Rankings of top 3 / 4 species at each survey point

Survey Point	Summer 2019	No. of passes	Autumn 2019	No. of passes	Habitat
A	Common pip	3,361 (10)	Common pip	2,270 (13)	Forestry track
	Soprano pip	1,076	Soprano pip	1,489	
	Whiskered	276	Whiskered	210	
	Nathusius' pip	179	Nathusius' pip	56	
B	Common pip	3,022 (10)	Leisler's	420 (8)	Pasture
	Soprano pip	1,239	Common pip	420	
	Leisler's	398	Soprano pip	110	
	Nathusius' pip	36	Nathusius' pip	20	
C	Common pip	2,646 (10)	Common pip	107 (13)	Forestry track
	Soprano pip	266	Soprano pip	55	
	Leisler's	112	Leisler's	2	
	SPRING 2020	**No. of Passes**			
C	Leisler's	1733 (10)			
	Common pip	483			
	Soprano pip	40			
	SUMMER 2019		**AUTUMN 2019**		
D	Common pip	439 (10)	Common pip	347 (8)	Forestry edge/pasture
	Soprano pip	181	Soprano pip	87	
	Leisler's	115	Leisler's	11	

Survey Point	Summer 2019	No. of passes	Autumn 2019	No. of passes	Habitat
	SPRING 2020		**SUMMER 2020**		
	Common pip	2869 (5)	Leisler's	58 (10)	
	Leisler's	532	Common pip	28	
	Soprano pip	446	Soprano pip	5	
E	Common pip	504 (10)	Common pip	201 (2)	Pasture
	Soprano pip	413	Soprano pip	113	
	Leisler's	91	Leisler's	9	
F	Common pip	619 (10)	Soprano pip	217 (13)	Forestry edge/pasture
	Soprano pip	265	Common pip	117	
	Leisler's	233	Whiskered	45	
G	Common pip	844 (10)	Common pip	2,514 (13)	Pasture
	Leisler's	374	Leisler's	2,075	
	Soprano pip	284	Soprano pip	445	
H	Common pip	289 (10)	Common pip	218 (10)	Pasture
	Leisler's	272	Leisler's	202	
	Soprano pip	108	Soprano pip	89	
I	Common pip	365 (10)	Leisler's	212 (6)	Pasture
	Leisler's	168	Common pip	119	
	Soprano pip	106	Soprano pip	55	
J	Common pip	410 (10)	Common pip	287 (13)	Pasture
	Soprano pip	243	Soprano pip	166	
	Leisler's	144	Leisler's	162	
	SUMMER 2019		**AUTUMN 2019**		
K	Common pip	1,021 (10)	Common pip	66 (13)	Forestry track
	Soprano pip	456	Soprano pip	11	
	Leisler's	106	Leisler's	11	
	SPRING 2020				
	Common pip	4000 (10)			
	Leisler's	1742			
	Nathusius's pip	60			
	SUMMER 2019		**AUTUMN 2019**		
L	Common pip	572 (10)	Common pip	1,919 (8)	Forestry track
	Soprano pip	165	Soprano pip	1,395	
	Leisler's	89	Leisler's	17	
	SPRING 2020				

Survey Point	Summer 2019	No. of passes	Autumn 2019	No. of passes	Habitat
	Leisler's	488 (10)			
	Common pip	270			
	Soprano pip	10			
			AUTUMN 2019		
M			Common pip	352 (13)	Forestry track
			Soprano pip	125	
			Whiskered	7	
			Brown long eared	7	
	SPRING 2020				
	Leisler's	783 (10)			
	Common pip	464			
	Soprano pip	11			
N	**SPRING 2020**		**SUMMER 2020**		
	Leisler's	911 (10)	Common pip	700 (10)	
	Common pip	502	Soprano pip	269	
	Soprano pip	49	Leisler's	156	
O	**SPRING 2020**		**SUMMER 2020**		
	Common pip	1207 (10)	Common pip	178 (10)	
	Soprano pip	260	Leisler's	116	
	Leisler's	113	Soprano pip	115	
P	**SPRING 2020**		**SUMMER 2020**		
	Leisler's	295 (10)	Common pip	65 (4)	
	Common pip	81	Brown Longeared	55	
	Soprano pip	25	Leisler's	16	
Q	**SPRING 2020**		**SUMMER 2020**		
	Common pip	474 (10)	Common pip	2540 (10)	
	Soprano pip	341	Soprano pip	206	
	Leisler's	236	Leisler's	172	
R	**SPRING 2020**		**SUMMER 2020**		
	Common pip	2600 (10)	Common pip	366 (10)	
	Leisler's	1841	Leisler's	106	
	Nathusius's pip	121	Soprano pip	57	
S	**SPRING 2020**		**SUMMER 2020**		
	Leisler's	338 (10)	Leisler's	86 (10)	
	Common pip	93	Brown longeared	62	
	Soprano pip	15	Common pip	61	

Survey Point	Summer 2019	No. of passes	Autumn 2019	No. of passes	Habitat
T	**SPRING 2020**		**SUMMER 2020**		
	Leisler's	1282 (10)	Common pip	208	
	Common pip	789	Leisler's	113	
	Soprano pip	64	Whiskered	29	
U	**SPRING 2020**		**SUMMER 2020**		
	Leisler's	1517 (10)	Leisler's	62 (10)	
	Common pip	77	Common pip	15	
	Soprano pip	14	Soprano pip	4	

The number in brackets after 'No. of passes' is the number of nights of recordings for each period. Figures in red show large increase in no. of passes between Summer and Autumn periods.

6.2 INTREPTETING THE RESULTS (as described in new guidelines)

Estimating the vulnerability of bat populations to wind farms is based on three factors

6.2.1 Relative abundance
6.2.2 Collision Risk
6.2.3 Bat activity recorded at the site

6.2.1 Relative Abundance

The Common pipistrelle is the most abundant bat species in Ireland. It is widespread throughout Ireland but its distribution is biased towards the south and east of the country. The population is thought to be increasing slightly (Roche et al. 2014). The Soprano pipistrelle is the second most frequently recorded bat species in Ireland. It is the most widespread species in Ireland. The population is also thought to be increasing based on results of the Car-based Bat Monitoring in Ireland scheme run by Bat Conservation Ireland.

Nathusius' pipistrelle was first recorded in Northern Ireland in the mid 1990's and was confirmed as a resident species when breeding roosts were found close to Lough Neagh. No maternity colony has yet been confirmed from Republic of Ireland. Nathusius' pipistrelle generally forages over natural wetlands and waterbodies. In Europe, this species undertakes long migrations between summer breeding sites and winter hibernation sites. The population is low but is considered to be stable. Lundy *et al*. (2010) predicted an increase in numbers of Nathusius' pipistrelle with increased ambient air temperatures associated with climate change.

Leisler's bat is Ireland's largest bat species. It is the third most frequently recorded bat in Ireland. Ireland is the stronghold of the species in Europe. Their preferred foraging habitats are over pasture and areas of freshwater (Shiel et al., 1999). Leisler's bat is considered to be the Irish species most at risk of collision with turbines. This is due to the height they typically fly at and their tendency to forage in open spaces.

6.2.2 Collision Risk

Calculating which bat species are potentially vulnerable to collision is based on physical and behavioural characteristics (and also based on evidence of casualty rates in UK and rest of

Europe). These characteristics have been categorised in Appendix 3 of the new windfarm Guidelines (2019) using parameters such as habitat preference, echolocation characteristics, wing shape, flight speed, flight behaviour & use of landscape, hunting techniques and migration. High risk species are those species that generally prefer to use open habitat, have long-range low-frequency echolocation calls, are aerial hawkers, have fast flight, can commute across open landscape, and are long range migrants in some parts of their range.

In Ireland, species with a high risk of collision are Leisler's bat, Nathusius' pipistrelle, Soprano pipistrelle and Common pipistrelle. In previous Natural England TIN051 guidance, both Common and Soprano pipistrelles were assessed as being Medium risk species. However, based on the evidence from the National Bats and Wind Turbines study (Matthews *et al.* 2016) and Eurobats data, they have been re-assessed as High risk, even though some of the factors associated with high risk species do not apply.

This assessment of vulnerability is based on the behaviour and flight characteristics of a species. Vulnerability to collision is likely to depend on location of turbines in relation to bat activity. Bat activity and hence risks are rarely uniform across a site but good coverage of detectors across a site will help in assessing which potential turbine locations present greater risk.

6.2.3 Bat activity Recorded on Site

Table 27 (taken from the new guidelines) uses this measure of collision risk, in combination with relative abundance, to indicate the potential vulnerability of populations of British bat species. The overall potential vulnerability of bat populations is identified as low (yellow), medium (orange) or high (red).

Combining the level of potential vulnerability identified in Table 27 with bat activity recorded at the site can help inform the assessment of potential risk and guide the decision - making process in relation to the mitigation options.

Table 27 – Relative abundance weighted against collision risk

	Ireland		**Collision Risk**	
		Low Collision Risk	**Medium Collision Risk**	**High Collision Risk**
Relative abundance	Common Species			Common pipistrelle Soprano pipistrelle Leisler's bat
	Rarer Species	Brown long-eared bat Daubenton's bat Natterer's bat Lesser horseshoe bat		
	Rarest species	Whiskered bat		Nathusius' pipistrelle

Using Table 2 from Guidelines (for Wales) but adapted for Ireland by excluding species that do not occur here

The IUCN (International Union for Conservation of Nature) Red List of Threatened Species was founded in 1964, and is the world's most comprehensive inventory of the global conservation status of biological species. It uses a set of criteria to evaluate the extinction risk of thousands of species. It is recognised as the most authoritative guide to the status of biological diversity.

The Red Data List for Ireland was updated in 2019 (Marnell et al., 2019). All nine species of bats resident in Ireland were assessed as being of "Least Concern". Common and Soprano pipistrelles are assessed as being widespread and very common in Ireland. The population of both species is thought to be increasing based on the results of on-going monitoring programmes run by Bat Conservation Ireland.

In the previous Red Data list (2009) Leisler's bat was assessed as being "Near Threatened". However, in the 2019 list Leisler's bat has moved to of "Least Concern". The car-based monitoring programme run by Bat Conservation Ireland has shown a continuing population increase in Ireland (Roche et al, 2014). It is considered to be probably the third most common bat in Ireland, after Common and Soprano pipistrelles. Ireland is the stronghold of the world's population of Leisler's bat with 20-25% of the world's population in Ireland. Wind farm developments are listed as a threat to this species in Ireland's Red List.

Nathusius' pipistrelle is also classified as "Least Concern". This species was first recorded in Ireland in 1996. The estimated number of individuals remains low at 3,000-5,000 animals. Badly sited wind farms are listed as a threat given its migratory nature.

In the recent Article 17 Report from Ireland to the EU (2019), which reports on individual habitat and species assessments of Conservation Status, the overall status of both Common and Soprano pipistrelles is given as "Favourable" and improving. The overall status of Nathusius' pipistrelle is "Unknown" as currently there is no monitoring programme in place for this species. Leisler's bat is given an overall status of "Favourable" as monitoring over the last 12 years indicates an increasing trend.

Favourable Conservation Status

As one of the factors determining Favourable Conservation Status of a species is geographic range, negative impacts that effectively eliminate a species from a site at the edge of its known range can affect its conservation status, even if the number of casualties at a wind farm site is minor, in relation to the total population size Therefore a local impact can translate into one of national or international significance if it occurs at the edge of its range or impacts on a rare species, e.g. Nathusius' pipistrelle.

6.3 ASSESSING POTENTIAL RISK

The mitigation hierarchy indicates that development planning should first seek to avoid significant effects. Where this is not possible, effects must be adequately mitigated.

Bat activity and the presence of high- risk species are not the only factors determining the most appropriate form of mitigation at a site; however, site-based risk factors are also important and must be incorporated within the decision making process. The following

Tables 28A and 28B illustrate the factors to consider when assessing potential risks to bats and present a two-stage process to enable this.

Table 28A (Stage 1) gives an indication of potential site risk based on a consideration of habitat and development-related features.

6.3.1. Initial Site Risk Assessment

The **Project Size** for the proposed Castlebanny Windfarm site is classified as **MEDIUM** – and described in the SNH Guidelines as

- "Larger developments (between 10 and 40 turbines).
- May have other wind developments within 5km.
- Comprising turbines 50-100m in height".

The **Habitat Risk** is classified as **MODERATE –** described in the 2019 guidelines as

- **"**Buildings, trees or other structures with moderate-high potential as roost sites on or near site.
- Habitat could be used extensively by foraging bats.
- Site is connected to the wider landscape by linear features such as scrub, treelines and streams".

Table 28A – Initial site risk assessment

Site Risk Level (1-5)	**Project Size**			
Habitat Risk		**Small**	**Medium**	**Large**
	Low	1	2	3
	Moderate	2	**3**	4
	High	3	4	5

Key: Green (1-2) – low/lowest site risk; Amber (3) – medium site risk, Red (4-5) – high/highest site risk

Using these parameters in Table 28A, Castlebanny wind farm site scores as "**3**"

in the initial site risk assessment.

6.3.2. Overall Site Risk Assessment

Table 28B – Stage 2 – Overall Risk Assessment

Site Risk level from Table 28A	Ecobat Activity Category					
	Nil (0)	Low (1)	Low-moderate (2)	Moderate (3)	Moderate – High (4)	High (5)
Lowest (1)	0	1	2	3	4	5
Low (2)	0	2	4	6	8	10
Medium (3)	0	3	6	9	12	15
High (4)	0	4	8	12	15	18
Highest (5)	0	5	10	15	20	25

The scores in Table 28B are a product of multiplying site risk level (**3** for Castlebanny Windfarm) and the Ecobat activity category. The activity categories equate to those given in Table 2 above for high collision risk species. Nil (0) means no bat activity was recorded across the whole site in the pre-construction phase. However, there remains the possibility that the construction of turbines and its associated changes in habitat could attract bats into the vicinity.

Overall Assessment

Low (green) **0-4**

Medium (amber) **5-12**

High (red) **15-25**

It is important to have an understanding of both 'typical' and unusually high levels of bat activity at a site so that potentially important peaks in activity are not overlooked. It is recommended that the highest *Ecobat* activity category and the most frequent activity category (i.e. the median) are assessed separately in Table 20B and presented in the overall risk assessment

The highest *Ecobat* activity category was calculated using the median for each species at each survey point (Taken from Tables *A.1 – A.25* in Appendix).

Table 29 - Overall risk assessment for each survey point in the four survey seasons (Summer 2019, Autumn 2019, Spring 2020 and Summer 2020.

SURVEY POINT	HIGH ACTIVITY OVERALL RISK ASSESSMENT = 15	MOD-HIGH ACTIVITY OVERALL RISK ASSESSMENT = 12
A (bet Turbines 9 & 11 in 2019) Point not used in 2020	Common pip – Summer 2019 Common pip – Autumn 2019 Soprano pip – Summer 2019 Soprano pip – Autumn 2019	Nath pip – Summer 2019
B (bet Turbines 10 & 24 in 2019) Point not used in 2020 but is beside Turbine 12 in 2020	Common pip – Summer 2019 Soprano pip – Summer 2019 Leisler's – Autumn 2019	Leisler's – Summer 2019 Soprano pip – Autumn 2019
C - Bet Turbines 7 & 9 in 2020	Common pip – Summer 2019 Leisler's - Spring 2020	Soprano pip - Summer 2019 Soprano pip – Autumn 2019 Common pip – Autumn 2019 Common pip - Spring 2020
D - at Turbine 2 in 2020	Common pip - Spring 2020	Common pip – Summer 2019 Common pip – Autumn 2019 Leisler's - Spring 2020 Soprano pip – Autumn 2019 Soprano pip -Spring 2020 Nath pip - Spring 2020
E (at Turbine 7 in 2019) Point not used in 2020	Common pip – Autumn 2019 Soprano pip- Autumn 2019	Common pip – Summer 2019
F (At Turbine 14 in 2019) Point not used in 2020		Common pip – Summer 2019 Common pip – Autumn 2019 Soprano pip – Summer 2019 Soprano pip – Autumn 2019 Leisler's – Summer 2019
G (at Turbine 23 in 2019) Point not used in 2020 but close to Turbine 21 (Point T in 2020)	Common pip – Summer 2019 Common pip – Autumn 2019 Soprano pip – Autumn 2019 Leisler's – Autumn 2019	Leisler's – Summer 2019
H (at Turbine 19 in 2019) Point not used in 2020	Common pip – Autumn 2019	Common pip - Summer 2019 Leisler's - Summer 2019 Leisler's – Autumn 2019 Soprano pip – Autumn 2019
I (bet Turbine 18 & 21 in 2019) Point not used in 2020 but close to Turbine 19 (Point S in 2020)	Leisler's – Autumn 2019	Leisler's – Summer 2019 Common pip – Autumn 2019 Soprano pip – Autumn 2019
J (At Turbine 22 in 2019) Point not used in 2020	Common pip – Summer 2019 Leisler's – Autumn 2019	Leisler's – Summer 2019 Soprano pip – Summer 2019 Soprano pip Autumn 2019
K (at Turbine 5 in 2019) **At Turbine 6 in 2020**	Common pip – Summer 2019 Leisler's – Spring 2020	Soprano pip - Summer 2019

	Comm pip–Spring 2020	
L (at Turbine 17 in 2019) **Turbine 18 in 2020**	Common pip – Summer 2019 Common pip – Autumn 2019 Soprano pip – Autumn 2019	Leisler's – Autumn 2019 Leisler's - Spring 2020
M (Bet Turbines 1 &2 in 2019) **Bet Turbine 3 & 4 in 2020**	Common pip – Autumn 2019	Soprano pip – Autumn 2019 Leisler's - Spring 2020 Common pip - Spring 2020
N at Turbine 1	Comm pip - Summer 2020	Leisler's - Spring 2020 Leisler's - Summer 2020
O at Turbine 5		Leisler's - Summer 2020 Common pip - Summer 2020
P at Turbine 10		Leisler's - Spring 2020
Q at Turbine 13	Comm pip - Summer 2020	Leisler's - Summer 2020
R at Turbine 16	Leisler's - Spring 2020 Com pip - Spring 2020 Com pip - Summer 2020	
S at Turbine 19		
T at Turbine 21		Leisler's - Spring 2020 Comm pip - Spring 2020 Leisler's - Summer 2020 Comm pip - Summer 2020
U at Turbine 20	Leisler's - Spring 2020	

Survey Points highlighted in orange indicate points that are relevant to final turbine positions in 2020. Survey Points highlighted in green were not resurveyed in 2020 but are relevant to the final turbine positions.

Common pipistrelle scored an overall risk assessment score of **15** (**High Risk**) at 10 out of 16 survey sites surveyed in 2020 for final turbine positions. Soprano pipistrelles scored an overall risk assessment score of 15 (**High Risk**) at 3 out of 16 sites. These sites included forestry tracks and pasture sites, indicating that both species are present in high numbers throughout the site. Buffer zones around each turbine will be necessary to discourage pipistrelles approaching turbines.

Leisler's bat scored an overall risk assessment score of **15 (High Risk)** at 7 sites – B (Turbine 12), C (Between Turbines 7 & 9) , G (close to Turbine 21), I (close to Turbine 19), K (Turbine 6), R (Turbine 16) and U (Turbine 20). These represent 3 pasture sites, 3 forestry sites and 1 forestry edge/pasture site). Leisler's bats an overall risk assessment score of **12 (Medium Risk**) at 11 survey points – B (Turbine 12) , D (Turbine 2), G (Turbine 21), I (Turbine 19), L (Turbine 18), M (Bet. Turbines 3 & 4, N (Turbine 1), O (Turbine 5), P (Turbine 10), Q (Turbine 13), T (Turbine 21). These represent 4 pasture sites, 4 forestry sites and 3 forestry edge/pasture sites).

Low activity levels were recorded at all survey points for Nathusius' pipistrelle (overall risk assessment score **3, Low Risk)**, except at Point A where in summer 2019, activity was assessed as Moderate-High (overall risk assessment score **12, Moderate Risk**) and activity in Autumn 2019 as Moderate (overall risk assessment score **9, Moderate Risk).** Survey point A

was located on a central track in conifer plantation (running east-west) which leads to a group of stone farm buildings. It is possible that either a single Nathusius' pipistrelle, or a very small number are roosting in these buildings.

In 2020, Nathusius' pipistrelle was recorded at Turbine 2 at Moderate/High activity level in Spring 2020 and at Moderate levels at Turbine 13 in summer 2020 and Turbine 16 in Spring 2020 and Summer 2020.

6.3.3. Activity of Leisler's bat

Leisler's bat scored an overall risk assessment score of **15 (High Risk)** at 7 sites – B (Turbine 12), C (Between Turbines 7 & 9) , G (close to Turbine 21), I (close to Turbine 19), K (Turbine 6), R (Turbine 16) and U (Turbine 20). These represent 3 pasture sites, 3 forestry sites and 1 forestry edge/pasture site). Leisler's bats an overall risk assessment score of **12 (Medium Risk**) at 11 survey points – B (Turbine 12) , D (Turbine 2), G (Turbine 21), I (Turbine 19), L (Turbine 18), M (Bet. Turbines 3 & 4, N (Turbine 1), O (Turbine 5), P (Turbine 10), Q (Turbine 13), T (Turbine 21). These represent 4 pasture sites, 4 forestry sites and 3 forestry edge/pasture sites).

The highest number of passes was recorded at Point G (2,075 passes over 13 nights) in Autumn 2019. Generally, more calls were detected in Summer 2019 than in Autumn 2019 except at Survey Point G (now close to Turbine 21). This area consists of pasture fields to the rear of an uninhabited cottage with numerous agricultural sheds at Kiltorcan townland. At this survey point there was a very large increase in calls from Summer 2019 to Autumn 2019 (Summer 374 calls, Median = 37.4; Autumn 2,075 calls, Median = 159.6). This increase in Leisler's activity may be due to mating during this Autumn season.

In 2020, the highest numbers of passes recorded over 10 nights for Leisler's bat were all recorded in the Spring survey season. The highest number of calls was at Turbine 16 (1,841 calls), followed by Turbine 6 (1,742 calls), Bet. Turbine 7 & 9 (1,733 calls), Turbine 21 (1,282 calls) and Turbine 20 (1,517 calls).

In Summer 2020 the number of calls recorded dramatically decreased. The highest number of calls recorded over 10 nights in Summer 2020 were at Turbine 13 (172 calls), Turbine 1 (156 calls), Turbine 5 (116 calls), Turbine 21 (113 calls) and Turbine 16 (106 calls)

The weather conditions in Summer 2019 were very favourable during the survey period. The summer 2019 survey period ran from 30.07.19 to 08.08.19, representing 10 consecutive nights of favourable weather conditions.

The weather conditions in Summer 2020 were very mixed. The Summer 2020 survey commenced on 29.06.20 and ran until 12.07/19 and dates were not consecutive due to the elimination of data collected on nights with adverse weather conditions.

Also, the Summer 2020 survey was conducted a month earlier than Summer 2019.

Table 30 - Level of overall risk to Leisler's bat at each of the final turbine locations, including data from 2019 where relevant (for Turbines 12, 19 & 21 shaded green))

TURBINE NO.	OVERALL RISK ASSESSMENT SCORE	SURVEY PERIOD	HABITAT	SURVEY POINT
1	12	Spring 2020 Summer 2020	Forestry track	N
2	12	Spring 2020	Forestry edge/Pasture	D
3 & 4	12	Spring 2020	Forestry track	M
5	12	Summer 2020	Woodland edge/ Pasture	O
6	15	Spring 2020	Forestry track	K
7 & 9	15	Spring 2020	Forestry track	C
8	No specific data		In forestry	
10	12	Spring 2020	Pasture	P
11	No specific data		In forestry	
12	15 12	Autumn 2019 Summer 2019	Pasture	B
13	12	Summer 2020	Forestry track	Q
14	No specific data		In forestry	
15	No specific data		In forestry	
16	15	Spring 2020	Woodland edge/pasture	R
17	No specific data		In forestry	
18	12	Autumn 2019 Spring 2020	Forestry track	L
Point I (2019)	12 15	Summer 2019 Autumn 2019		I I
19	No high risk scores	2020		S
20	15	Spring 2020	Forestry	U
Point G (2019)	12 15	Summer 2019 Autumn 2019	Pasture	G G
21 21	12 12	Spring 2020 Summer 2020	Woodland edge/pasture	T

12 = Moderate Risk, 15 = High Risk

7. MITIGATION

There are three options for mitigation dependent on the assessed risk to bats on site.

7.1 Adjusting the layout of the turbines

The layout of the turbines can be adjusted to avoid parts of the site that been shown to have high bat activity. Where there is little scope for avoiding areas of high risk, buffer zones and/or curtailment mitigation can be put in place.

7.2 Buffers

It is recommended that a distance of 50m between turbine blade tip and nearest woodland/treeline is adequate in most lower-risk situations. A 50m buffer distance should be applied as a basic standard mitigation measure for all bat species occurring at proposed wind farms, including key-holed sites. High risk species such as Leisler's bat frequently fly in open areas, and mitigation using buffer zones is unlikely to be effective for this species.

7.3 Altering blade rotation

There is evidence that bat casualties at wind farms is reduced by pitching the blades out of the wind (feathering) to reduce rotation speeds below 2 rpm while idling, and in some cases, increasing the cut-in speed during high risk periods (i.e. warm summer evenings with low wind speeds).

7.3.1 Reduced rotation speed while idling

The reduction in speed resulting from feathering compared with normal idling may reduce fatality rate by up to 50%. As this option does not result in any loss of output, as best practice, it is recommended whenever it is practically possible and there remains uncertainty over the risk posed to bats. It can be applied at any site with a blade pitch control system.

7.3.2 Curtailment

This involves raising the cut in speed with associated loss of power generation in combination with reducing the blade rotation below the cut-in speed. It should be considered where feathering below cut-in normal speed will not provide sufficient reduction in risk to bats. The curtailment is achieved by feathering (not the actual braking of the turbine) so that the blades continue to rotate slowly (at ~2 rpm or less).

The most basic and least sophisticated form of curtailment is "Blanket" curtailment which involves feathering the blades between dusk and dawn over the entire bat active period (April to October). This results in considerable unnecessary down time for the turbines concerned. A more sophisticated solution is to focus on certain times and dates, corresponding to those periods when the highest level of bat activity is expected to occur. Further savings can be made by programming the SCADA operating system to only pause/feather below a specified wind speed and above a specified temperature within specified time periods. This approach is very effective if bat activity can be accurately modelled from environmental data. However, at site where bat activity is unpredictable this approach may not be effective.

In order to minimise down time, the threshold values at which turbines are feathered should be site specific and informed by bat activity peaks at that location. It is likely to be in the

range of wind speeds between 5.0 and 6.5m/s and at temperatures above 10°C. The effectiveness of curtailment needs to be monitored to determine whether it is working effectively. (i.e. that the level of bat mortality is considered to be incidental.)

Where the need for curtailment has been identified, a curtailment regime should be developed and presented as part of the supporting environmental statement for the project. Factors to be considered include Wind speed in m/s (at nacelle height), Time after sunset, Month, Temperature and Precipitation (mm/hr). Curtailment may be adjusted where post-construction monitoring provides evidence of a reduced (or increased) risk to bats.

7.4 Mitigation in relation to Castlebanny Wind Farm

7.4.1 Adjustment of Turbine Positions

The positions of some turbines were altered slightly between Spring 2020 and Summer 2020 surveys –

Turbine 2 – moved west away from forestry edge/pasture habitat into forestry – Prior to moving, this site had been a Medium collision risk site for Leisler's in 2020. Moving the turbine into the forestry should decrease the risk to Leisler's bats. The pasture fields immediately west of this turbine site are continuously grazed by cattle. Yellow dung flies on the cow dung attract Leisler's bats in to pasture to forage.

Turbine 2 is also the site with the highest levels of activity of Nathusius' pipistrelle – the second high-risk species recorded on site. This species was recorded at a Moderate/High activity level in Spring 2020 (Median 67 passes) with a Medium overall collision risk assessment.

Turbine 10 – moved southwest away from hedgerow into pasture field. Prior to moving this site was also a Medium collision risk for Leisler's bats in Spring 2020. There should be no increased level of risk in the new position.

Turbine 12 – moved south-east away from forestry edge. Prior to moving this site had a High collision risk in Autumn 2019 and Medium risk in Summer 2019 for Leisler's bats. This site was not resurveyed in 2020.

Turbine 16 – moved slightly south west, new position is still in Forestry edge/pasture habitat. This site was recorded as being High Risk for Leisler's bat in Spring 2020. This site also has a Moderate level of activity for Nathusius' pipistrelle (median no of calls 44 in Spring 2020, 45 in Summer 2020). This level of collision risk was assessed as Medium and is unlikely to change as a result of the turbine moving position. This turbine warrants further surveys ie Post-construction Monitoring

Turbine 18 – moved position slightly to west after Summer 2020 survey to avoid disturbance of badger sett. There should be no change in collision risk.

Turbine 19 – moved slightly south west into next pasture field. There should be no change in collision risk.

No high collision risks for Leisler's bats were recorded at this site in 2020. However, at a comparable site close by (Survey point I) a High collision risk of Leisler's bat was recorded in Autumn 2019 and Medium collision risk in Summer 2019.

Turbine 21 – moved northeast from pasture site into eucalyptus plantation. This site recorded a Medium collision risk to Leisler's bats in both Spring and Summer 2020. At a comparable site close by in 2019 (Survey Point G), a Medium collision risk was recorded in Summer 2019 but a High collision risk in Autumn 2019. It is considered that due to moving the turbine from the pasture into the eucalyptus plantation that the collision risk should be reduced.

7.4.2 Buffer Zones

Buffer zones of 50m from blade tip to nearest forestry/treeline/ hedgerow to be implemented at all turbines on site.

Where turbines are sited in pasture fields, hedgerows are to be removed to within 50m of the blade tip to create buffer zones around these turbines. Common and Soprano pipistrelles are both edge-feeders and often forage along treelines/hedgerows. Removal of hedgerow in the vicinity of the turbine should discourage Soprano and Common pipistrelle bats from approaching the turbine.

7.4.3 Altering blade rotation

Feathering - There is evidence that bat casualties at wind farms is reduced by pitching the blades out of the wind (feathering) to reduce rotation speeds below 2 rpm while idling,

The reduction in speed resulting from feathering compared with normal idling may reduce fatality rate by up to 50%. As this option does not result in any loss of output, as best practice, it is recommended whenever it is practically possible and there remains uncertainty over the risk posed to bats. It can be applied at any site with a blade pitch control system.

Turbines Assessed as having High Collision Risk for Leisler's bat

Turbine 6 – high collision risk in Spring 2020 (forestry site)

Turbine 12 – high collision risk in Autumn 2019 (pasture site)

Turbine 16 – high collision risk in Spring 2020 (Forestry edge/pasture)

Turbine 19 - high collision risk in Autumn 2019 (from nearby survey point I) – (Pasture site)

Turbine 20 – high collision risk in Spring 2020 (Forestry site)

Turbine 21 – high collision risk in Autumn 2019 (from nearby survey point G) – (Pasture)

In Spring 2020, two of the High collision risk sites were for Forestry sites (Turbine 6 and Turbine 20; median no. of calls 153.5 and 138 respectively). No high levels of activity/High collision risk for Leisler's bat was recorded in forestry in any other season. This represents a change in foraging strategy being used by the bats. Shiel *et al*., (1999) conducted a two-year research project on Leisler's bats, using radio telemetry to investigate the changes in foraging behaviour between seasons. This research was conducted in Co. Wexford.

In Spring, it was found that Leisler's regularly travelled long distances up to 13 km to forage on swarms of small midges either over coniferous forestry or lake sites. Rather than detecting individual insects they detect a whole swarm and almost "filter feed" through it. In spring, Leisler's bats generally only fly for 2-3 hours after sunset and then return to the roost. A second shorter flight c. 1.5 hours before sunrise will only occur if ambient temperature is high enough. Insect availability is closely linked to temperature. This bimodal pattern of activity was also evident from examining the timing of Leisler's calls in Spring 2020. The vast majority of calls were recorded in the 2-3 hours after sunset, followed by a long period of little activity and then a rise in activity before sunrise.

In Summer, during the lactation period Leisler's bats generally switch to foraging on larger prey items such as yellow dung flies which are caught over cattle pastures. They feed on yellow dung fly *Scatophaga stercoraria* (Shiel *et al*, 1998) particularly during the period of lactation when females are suckling their young (June/July).This was evident in Summer survey 2019 at Castlebanny but not in Summer Survey 2020. This may be due to poorer weather conditions during the survey period of 2020 than in Summer 2019. Also, the Summer season 2020 was conducted a month earlier than in 2019.

Shiel et al, (1999) also investigated the diet of Leisler's bats by faecal analysis on a seasonal basis. This switch from small insect prey in spring to larger insects in Summer was clearly illustrated.

Curtailment - The siting of Turbine 6, Turbine 12, Turbine 16, Turbine 19, Turbine 20 and Turbine 21 have been shown to have a high collision risk for Leisler's bat in at least one of the four survey seasons in the present study. This could result in significant mortality for Leisler's bats due to blade strike or barotrauma.

The position of Turbine 21 has been moved from pasture into eucalyptus plantation and should reduce the risk to Leisler's bats. The positions of Turbine 12 and Turbine 16 have moved slightly but are unlikely to reduce the risk to Leisler's bats.

These six turbine sites warrant further bat surveys during the post construction stage. If any of these turbine locations are again recorded as having a high collision risk for Leisler's bat mitigation measures involving curtailment will be recommended.

7.4.4 Key–hole felling

In the final turbine layout, 15 of the proposed 21 turbines are sited within forestry plantation where key hole felling will be necessary for construction (Turbines 1, 2, 3, 4, 6, 7, 8, 9, 11, 13, 14, 15, 18, 20 & 21). These turbines should not pose a significant threat to Common and Soprano pipistrelle bats, provided that buffer zones of 50 from blade tip to nearest trees is implemented. Turbine 6 and Turbine 20 present a high collision risk for Leisler's bats in Spring 2020. Other mitigation measures to be considered include curtailment or the provision of acoustic deterrents.

Increased foraging activity by bats has been documented previously at recently felled areas in coniferous plantations in Scotland where foraging activity of both pipistrelles and Leisler's bats increased in areas that had been recently felled (Kirkpatrick *et al.*, 2017). The increase in foraging activity is thought to be linked to increased insect activity at disturbed ground likely due to hatching midges.

It is recommended that in areas of forest where key-hole felling will be conducted that the ground is given time to settle and regenerate some vegetation prior to operation of turbines. It has been found in Scotland, that bats are attracted to recently felled areas of conifer plantation. Disturbance of the ground in the felled areas results in an increase in insect abundance, resulting in higher numbers of bats exploiting these insects. Insect abundance revert to normal levels when the ground resettles.

In autumn 2019, the highest numbers of Leisler's bats were recorded over the pasture fields at the north-west corner of the site in the townland of Kiltorcan – Turbine site 19 and Turbine 21 and from Turbine site 12 in the middle of the site. Since the 2019 surveys the number of turbines proposed for the Kiltorcan fields has been reduced from four turbines to two (Turbine 19 & Turbine 21).

As a mitigation measure, it is recommended that all hedgerows within 50m of the blade tip of all pasture-sited turbines are removed.

7.4.5 Post-Construction Monitoring

Post-construction monitoring is normally only required at developments where the mitigation involves turbine curtailment. Monitoring should assess changes in bat activity patterns in these locations. Monitoring should take place for at least three years after construction. Casualty searches and acoustic monitoring should be conducted concurrently.

The construction of the wind turbines may significantly reduce bat activity at a site relative to preconstruction levels and to a level at which there is no longer a need for curtailment. In some cases, activity may increase in the vicinity of turbines, e.g. where key-hole felling occurs in dense forestry which showed no bat activity pre-felling.

Post-construction monitoring is recommended for all 6 turbines found to have a high collision risk for Leisler's bats – Turbines 6,12, 16, 19, 20 and 21.

7.4.6 Acoustic Deterrents

Ultrasonic acoustic deterrents have potential to significantly reduce bat fatalities at wind farms. Recent research has shown that such deterrents have the ability to reduce the strike rate for some bat species but a lot more research is needed to improve species-specific effectiveness.

For example, NRG Systems in Vermont USA, are currently trialling their system on several wind projects in North America, as well as some small scale testing in Belgium and France. The study by Weaver *et al* (2020) has demonstrated high effectiveness with the North American Hoary bat and Brazilian Freetail bat – both of which echolocate at relatively low frequencies (as does Leisler's bat at 26 KHz). In general, the system ranges in price from $12,000 to $ 15,000 per turbine (not including installation).

An acoustic deterrent system may be recommended at turbines that prove to still have a high impact risk for Leisler's bat during post-construction monitoring surveys.

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APPENDIX

TABLE A.1- SUMMER 2019 – SURVEY POINT A

Grid reference: S58192 32269 Site: Forestry track between Turbines 9 & 11 Songmeter SM4 7990

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	7	12	17	13	3	1	7	6	13	3	82	7	8.2	
	Percentile	54	63	68	64	44	23	54	52	64	44		54	53	
	Activity level	M	M/H	M/H	M/H	M	L/M	M	M	M/H	M				Moderate
Common pipistrelle	Passes	112	176	284	427	400	291	396	289	463	523	3249	344	336.1	
	Percentile	95	95	97	99	98	97	98	97	99	98		97	97	
	Activity level	H	H	H	H	H	H	H	H	H	H				High
Soprano pipistrelle	Passes	6	27	151	176	81	69	74	106	262	124	1076	103	107.6	
	Percentile	45	76	94	95	90	88	89	92	96	93		91	86	
	Activity Level	M	M/H	H	H	H	H	H	H	H	H				High
Nathusius' pipistrelle	Passes	6	3	17	37	12	15	3	15	30	41	179	15	17.9	
	Percentile	45	44	68	80	63	66	44	66	78	82		66	64	

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	Total no. passes	Median	Mean	Overall activity level
	Activity Level	M	M	M/H	H	M/H	M/H	M	M/H	M/H	H				Mod/High
Whiskered	Passes	0	3	15	68	147	23	1	9	2	8	276	9	27.6	
	Percentile	0	44	66	88	94	73	23	59	40	57		58	54	
	Activity level	0	M	M/H	H	H	M/H	L/M	M	L/M	M				Moderate
Natterer's	Passes	3	0	1	1	0	0	0	0	1	0	6	0	0.6	
	Percentile	32	0	23	23	0	0	0	0	23	0		0	10	
	Activity Level	L/M	0	L/M	L/M	0	0	0	0	L/M	0				Low
Daubenton's	Passes	0	0	1	3	2	1	0	0	0	0	7	0	0.7	
	Percentile	0	0	23	44	40	23	0	0	0	0		0	13	
	Activity Level	0	0	L/M	M	L/M	L/M	0	0	0	0				Low
Brown Long-eared	Passes	0	9	4	2	4	0	4	7	1	0	31	3	3.1	
	Percentile	0	59	48	40	48	0	48	54	23	0	35	32		
	Activity Level	0	M	M	L/M	M	0	M	M	L/M	0				Low/Mod

No. of species = 8 Total No. of calls = 4,906

TABLE A.2 - AUTUMN 2019 – Survey Point A

Grid Reference: S58192 32269 Site: On forestry track between Turbines 9 & 11 Songmeter SM4 7695

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	0	3	2	0	2	2	1	1	0	0	1	0	0	12	1	0.9	
	Percentile	0	58	51	0	51	51	39	39	0	0	39	0	0		39	25	
	Activity level	L	M	M	L	M	M	M/L	M/L	L	L	L/M	L	L				Low-Mod
Common pipistrelle	Passes	323	374	524	472	101	147	10	40	3	53	34	0	189	2270	101	175	
	Percentile	98	98	99	99	90	92	64	82	53	84	80	0	95		84	80	
	Activity level	H	H	H	H	H	H	M/H	H	M	H	M/H	L	H				High
Soprano pipistrelle	Passes	101	80	96	299	270	78	115	154	19	25	48	2	202	1489	96	115	
	Percentile	90	86	89	97	97	86	90	92	77	79	83	47	96		89	85	
	Activity level	H	H	H	H	H	H	H	H	M/H	M/H	H	M	H				High
Nathusius' Pipistrelle	Passes	9	10	10	2	0	11	1	0	0	7	1	0	5	56	2	4.3	
	Percentile	63	64	64	47	0	66	37	0	0	60	37	0	57		47	38	
	Activity level	M/H	M/H	M/H	M	L	M/H	L/M	L	L	M	L/M	L	M				Mod
Whiskered	Passes	6	18	11	57	34	41	16	7	1	8	6	5	0	210	8	16.1	
	Percentile	59	76	66	85	80	82	72	66	37	62	59	57	0		66		
	Activity level	M	M/H	M/H	H	M/H	H	M/H	M	L/M	M/H	M	M	L				Mod-High
Natterer's	Passes	0	3	1	1	1	0	0	0	0	0	3	1	1	11	1	0.8	
	Percentile	0	58	39	39	39	0	0	0	0	0	53	39	39		39	24	

Date		**17.9.19**	**18.9.19**	**19.9.19**	**20.9.19**	**21.9.19**	**22.9.19**	**23.9.19**	**24.9.19**	**25.9.19**	**26.9.19**	**27.09.19**	**28.9.19**	**29.9.19**	**Total no. passes**	**Median**	**Mean**	**Overall activity level**
	Activity level	L	M	L/M	L/M	L/M	L	L	L	L	L	M	L/M	L/M				Low-mod
Daubenton's	Passes	1	1	1	1	0	3	1	0	0	0	0	0	1	9	1	0.7	
	Percentile	39	39	39	39	0	58	39	0	0	0	0	0	39		39	22	
	Activity level	L/M	L/M	L/M	L/M	L	M	L/M	L	L	L	L	L	L/M				Low-mod
Brown long-eared	Passes	0	3	7	2	5	0	0	0	0	0	1	0	0	18	0	1.4	
	Percentile	0	58	65	51	62	0	0	0	0	0	39	0	0		0	21	
	Activity level	L	M	M/H	M	M/H	L	L	L	L	L	L/M	L	L				Low

Total no. of species = 8 Total no. of calls = 4,079

TABLE A.3 - SUMMER 2019 – SURVEY POINT B

Grid reference: S58481 32420 Site: On Ash tree in pasture between Turbines 10 & 24 (now Turbine 12) Songmeter:SM4 8681

		30.7.19	**31.7.19**	**1.8.19**	**2.8.19**	**3.8.19**	**4.8.19**	**5.8.19**	**6.8.19**	**7.8.19**	**8.8.19**	**Total no. passes**	**Median**	**Mean**	**Overall activity level**
Leisler's	Passes	31	3	18	97	25	34	22	18	8	142	398	24	39.8	
	Percentile	84	44	69	91	75	79	72	69	57	93		73	73	
	Activity level	H	M	M/H	H	M/H	M/H	M/H	M/H	M	H				Mod-High
Common pipistrelle	Passes	87	258	584	559	313	284	160	70	264	443	3022	274	302.2	
	Percentile	89	96	100	99	98	97	94	89	97	99		97	96	
	Activity level	H	H	H	H	H	H	H	H	H	H				High
Soprano pipistrelle	Passes	26	107	291	208	81	67	21	26	153	258	1239	94	123.9	
	Percentile	79	92	97	96	90	88	71	76	94	96		91	88	
	Activity Level	M/H	H	H	H	H	H	M/H	M/H	H	H				High
Nathusius' pipistrelle	Passes	0	2	7	7	15	2	1	0	0	2	36	2	3.6	
	Percentile	0	40	54	54	66	40	23	0	0	40		40	32	

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	Total no. passes	Median	Mean	Overall activity level
	Activity Level	0	L/M	M	M	M/H	L/M	L/M	0	0	L/M				Low/Mod
Whiskered	Passes	1	2	2	1	0	0	0	3	1	0	10	1	1	
	Percentile	6	40	40	23	0	0	0	44	23	0		23	19	
	Activity level	L	L/M	L/M	L/M	0	0	0	M	L/M	0				Low/Mod
Natterer's	Passes	0	0	0	0	0	1	1	1	1	0	4			
	Percentile	0	0	0	0	0	23	23	23	23	0		0	9	
	Activity Level	0	0	0	0	0	L/M	L/M	L/M	L/M	0				Low
Daubenton's	Passes	0	0	1	1	3	1	0	3	1	0	10	1	1	
	Percentile	0	0	23	23	44	23	0	44	23	0		23	18	
	Activity Level	0	0	L/M	L/M	M	L/M	0	M	L/M	0				Low/Mod
Brown Long-eared	Passes	6	5	1	1	0	3	0	3	3	0	22	2	2.2	
	Percentile	45	50	23	23	0	44	0	44	44	0		23	27	
	Activity Level	M	M	L/M	L/M	0	M	0	M	M	0				Low/mod

No. of species = 8 **Total no. of calls = 4,741**

TABLE A.4 - AUTUMN 2019 – SURVEY POINT B

Grid Reference: S58481 32420 Site: On Ash tree in pasture between Turbines 10 & 24 (now Turbine 12) Songmeter:SM4 7863

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	124	88	92	48	11	36	4	17	0					420	36	46.6	
	Percentile	93	90	91	85	64	81	51	70	0						81	69	
	Activity level	H	H	H	H	M/H	H	M	M/H	0								High
Common pipistrelle	Passes	73	158	161	7	3	11	2	4	1					420	7	46.6	
	Percentile	89	94	95	57	47	64	43	51	27						57	63	
	Activity level	H	H	H	M	M	M/H	M	M	L/M								Mod
Soprano pipistrelle	Passes	11	17	18	13	0	10	15	16	10					110	13	12.2	
	Percentile	64	70	71	66	0	62	68	69	62						66	59	
	Activity level	M/H	M/H	M/H	M/H	0	M/H	M/H	M/H	M/H								M-H
Nathusius' Pipistrelle	Passes	1	11	0	0	0	7	0	1	0					20	0	2.2	
	Percentile	27	64	0	0	0	57	0	27	0						0	19.4	
	Activity level	L/M	M/H	0	0	0	M	0	L/M	0								Low
Whiskered	Passes	0	1	2	1	0	2	5	1	0					12	1	1.3	
	Percentile	0	27	43	27	0	43	53	27	0						27	24.4	
	Activity level	L	L/M	M	L/M	L	M	M	L/M	0								L-M
Natterer's	Passes	1	0	0	0	0	0	0	1	1					3	0	0.3	
	Percentile	27	0	0	0	0	0	0	27	27						0	9	

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	Total no passes	Median	Mean	Overall activity level
	Activity level	L/M	0	0	0	0	0	0	L/M	L/M								Low
Daubenton's	Passes	0	1	0	0	0	0	0	0	0					1	0	0.1	
	Percentile	0	27	0	0	0	0	0	0	0								Low
	Activity level																	
Brown long-eared	Passes	0	3	2	1	0	0	2	1	1					10	1	1.1	
	Percentile	0	47	43	27	0	0	43	27	27						27	28	
	Activity level	L	L	L	L/M	L	L	M	L/M	L/M								L-M

Total no. of species = 8 Total no. calls = 996

TABLE A.5- SUMMER 2019 – SURVEY POINT C

Grid reference: S58359 31142 Site: Edge of main forest track between Turbines 6 & 8 (now between Turbines 7 & 9) Songmeter: SM2 A

		30.7.19	**31.7.19**	**1.8.19**	**2.8.19**	**3.8.19**	**4.8.19**	**5.8.19**	**6.8.19**	**7.8.19**	**8.8.19**	**Total no. passes**	**Median**	**Mean**	**Overall activity level**
Leisler's	Passes	14	13	7	25	3	4	3	28	10	5	112	8.5	11.2	
	Percentile	69	64	54	75	44	48	44	76	60	50		57	58	
	Activity level	M/H	M/H	M	M/H	M	M	M	M/H	M	M				Moderate
Common pipistrelle	Passes	512	390	178	263	41	249	75	347	457	135	2646	256	264.6	
	Percentile	98	98	95	97	82	96	89	98	99	93		96	95	
	Activity level	H	H	H	H	H	H	H	H	H	H				High
Soprano pipistrelle	Passes	16	29	48	41	8	9	9	24	60	22	266	23	26.6	
	Percentile	75	77	85	82	57	59	59	74	87	72		74	73	
	Activity Level	M/H	M/H	H	H	M	M	M	M/H	H	M/H				Mod-High
Nathusius' pipistrelle	Passes	0	1	0	1	0	0	0	0	1	0	3	0	0.3	
	Percentile	0	23	0	23	0	0	0	0	23	0		0	7	

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	Total no. passes	Median	Mean	Overall activity level
	Activity Level	0	L/M	0	L/M	0	0	0	0	L/M	0				Low
Whiskered	Passes	0	0	0	0	0	0	0	4	0	0	4	0	0.4	
	Percentile	0	0	0	0	0	0	0	48	0	0		0	4.8	
	Activity level	0	0	0	0	0	0	0	M	0	0				Low
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	0	0	0	0	0	0	1	0	0	1	0	0.1	
	Percentile	0	0	0	0	0	0	0	23	0	0		0	2.3	
	Activity Level	0	0	0	0	0	0	0	L/M	0	0				Low
Brown Long-eared	Passes	0	0	0	0	0	0	0	0	0	0				
	Percentile														
	Activity Level														

No. of species = 6 **Total no. calls = 3032**

TABLE A.6 - AUTUMN 2019 – SURVEY POINT C

Grid Reference: S58359 31142 Site: Edge of main forest track between Turbines 6 & 8 (now between Turbines 7 & 9) Songmeter: SM4 7929

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No. of passes	Median	Mean	Overall activity level
Leisler's	Passes	0	0	0	0	1	0	0	1	0	0	0	0	0	2	0	0.15	
	Percentile					58			58							0		
	Activity level					M			M									Low
Common pipistrelle	Passes	2	1	3	0	4	0	2	6	30	2	3	0	2	55	2	5.5	
	Percentile	67	58	71	0	74	0	67	77	89	67	71	0	67		67	54	
	Activity level	M/H	M	M/H	0	M/H	0	M/H	M/H	H	M/H	M/H	0	M/H				M-H
Soprano pipistrelle	Passes	0	66	0	1	14	5	3	0	11	1	2	1	3	107	2	8.2	
	Percentile	0	92	0	58	84	75	71	0	81	58	67	58	71		67	55	
	Activity level		H		M	H	M/H	M/H	0	H	M	M/H	M	M/H				M-H
Nathusius' Pipistrelle	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0				
	Percentile																	
	Activity level																	
Whiskered	Passes	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0.2	
	Percentile		67													0	5.2	
	Activity level		M/H															Low
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Percentile																	

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No. of passes	Median	Mean	Overall activity level
	Activity level																	
Daubenton's	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0				
	Percentile																	
	Activity level																	
Brown long-eared	Passes	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile			58														
	Activity level			M														Low

No. of species = 5 Total no. calls = 167

TABLE A.7 - SPRING 2020 – SURVEY POINT C

Grid reference: S58359 31142 Site: Edge of main forest track between Turbines 7 & 9

		24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	30.4.20	1.5.20	2.5.20	3.5.20	4.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	158	75	41	126	239	136	313	251	297	97	1733	147	173.3	
	Percentile	82	75	64	79	86	80	89	86	88	78		81	80.7	High
	Activity level	H	M/H	M/H	M/H	H	H	H	H	H	M/H				
Common pipistrelle	Passes	27	47	22	57	101	61	70	34	57	7	483	52	48.3	
	Percentile	59	68	56	70	78	72	75	64	70	39				
	Activity level	M	M/H	M	M/H	M/H	M/H	M/H	M/H	M/H	L/M				
Soprano pipistrelle	Passes	8	7	2	2	6	1	1	1	12	0	40	2	4	
	Percentile	42	39	12	12	34	20	20	20	47	0				
	Activity Level	M	L/M	L	L	L/M	L	L	L	M	L				
Nathusius's pipistrelle	Passes	0	1	2	0	20	7	1	0	2	0	33	1	3.3	
	Percentile	0													
	Activity Level														

Whiskered	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity level														
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Brown Long-eared	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														

No. of species = 4 **Total no. calls = 2,289**

TABLE A.8- SUMMER 2019 – SURVEY POINT D

Grid reference: S58359 31142 Site: Across field to edge of plantation at Turbine 1 (now Turbine 2) Songmeter: SM2 B

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	No. of passes	Median	Mean	Overall activity level
Leisler's	Passes	0	4	10	69	1	4	4	11	8	4	115	4	11.5	
	Percentile	0	48	60	88	23	48	48	62	57	48		48	48	
	Activity level	0	M	M	H	L/M	M	M	M/H	M	M				Moderate
Common pipistrelle	Passes	6	10	28	174	10	63	6	7	48	87	439	19	43.9	
	Percentile	45	60	76	95	60	87	52	54	85	90		68	70	
	Activity level	M	M	M/H	H	M	H	M	M	H	H				Mod-High
Soprano pipistrelle	Passes	0	0	20	66	5	10	0	2	24	54	181	8	18.1	
	Percentile	0	0	71	88	50	60	0	40	74	86		55	47	
	Activity Level	0	0	M/H	H	M	M	0	L/M	M/H	H				Moderate
Nathusius' pipistrelle	Passes	0	0	0	0	0	0	0	0	0	0				
	Percentile														

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	No of passes	Median	Mean	Overall activity level
	Activity Level														
Whiskered	Passes	0	0	0	1	0	0	0	1	0	0	2	0	0.2	
	Percentile				23				23				0	5	
	Activity level				L/M				L/M						Low
Natterer's	Passes	0	1	0	0	0	0	0	0	0	1				
	Percentile		23								23		0	5	
	Activity Level		L/M								L/M				Low
Daubenton's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Brown Long-eared	Passes	0	0	0	1	0	0	0	0	0	1	2	0	0.2	
	Percentile				23						23				
	Activity Level				L/M						L/M				Low

No. of species = 6 **Total no. of calls = 741**

TABLE A.9 - AUTUMN 2019 – SURVEY POINT D

Grid Reference: S58359 31142 Site: Site: Across field to edge of plantation at Turbine 1 (now Turbine 2) Songmeter: SM2 (WW)

Date		16.9.19	17.9.19	18.9.19	19.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No of calls	Median	Mean	Overall activity level
Leisler's	Passes	10	0				0	0	0	1	0	0	11	0	1.4	
	Percentile	80								58				0		
	Activity level	H								M						Low
Common pipistrelle	Passes	238	69				3	2	0	4	1	30	347	3.5	43.4	
	Percentile	98	93				71	67	0	74	58	89		71	69	
	Activity level	H	H				M/H	M/H		M/H	M	H				M-H
Soprano pipistrelle	Passes	23	9				1	0	1	8	0	11	87	5	6.6	
	Percentile	87	80				58		58	79		81		79	55	
	Activity level	H	M/H				M		M	M/H		H				M-H
Nathusius' Pipistrelle	Passes	8	0				0	0	0	0	0	O	8	0	1	
	Percentile	79														
	Activity level	M														
Whiskered	Passes	0	0				0	0	0	0	0	0	0			
	Percentile															
	Activity level															

Date		16.9.19	17.9.19	18.9.19	19.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No of calls	Median	Mean	Overall activity level
Natterer's	Passes	0	0				0	0	0	0	0	0	0			
	Percentile															
	Activity level															
Daubenton's	Passes	0	0				0	0	0	0	0	0	0			
	Percentile															
	Activity level															
Brown long-eared	Passes	0	0				0	0	0	0	0	0	0			
	Percentile															
	Activity level															

No. of species = 4 Total no. of calls = 453

Detector failed to record from 18.9.19 to 24.09.19

TABLE A.10- SPRING 2020 – SURVEY POINT D

Grid reference: S559585 29712 Site: Across field to edge of plantation close to Turbine 2

		23.4.20	24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	30.4.20	1.5.20	2.5.20	3.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	70	107	70	246	39						532	70	53.2	
	Percentile	78	87	78	92	72							78	81.4	M/H
	Activity level	M/H	H	M/H	H	M/H									
Common pipistrelle	Passes	189	640	1177	429	425						2860	429	286	
	Percentile	92	98	99	96	95							96		High
	Activity level	H	H	H	H	H									
Soprano pipistrelle	Passes	170	107	67	32	70						446	70	44.6	
	Percentile	91	87	78	69	78							78		M/H
	Activity Level	H	H	M/H	M/H	M/H									
Nathusius' pipistrelle	Passes	6	26	58	11	20						121	20	12.1	
	Percentile	60	69	76	62	67							67		M/H
	Activity Level	M/H	M/H	M/H	M/H	M/H									

Whiskered	Passes	0	1	0	0	0						1			
	Percentile														
	Activity level														
Natterer's	Passes	1	0	1	0	0						2			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	4	5	1	3						13			
	Percentile														
	Activity Level														
Brown Long-eared	Passes	0	0	0	0	0						0			
	Percentile														
	Activity Level														

No. of species = 7 **Total no. calls = 3,975**

TABLE A.11- SUMMER 2020 – SURVEY POINT D

Grid reference: 559585 29712 Site: Across field to edge of plantation at Turbine 2

		29.6.20	30.6.20	2.7.20	4.7.20	6.7.20	7.7.20	9.7.20	10.7.20	11.7.20	12.7.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	3	6	4	7	10	25	0	3	0	0	58	3.5	5.8	
	Percentile	43	53	48	56	62	78	0	43	0	0		45.5		Mod
	Activity level	M	M	M	M	M/H	M/H		M						
Common pipistrelle	Passes	0	5	5	0	4	5	0	9	0	0	28	2	2.8	
	Percentile	0	51	51	0	48	51		60				24		L/M
	Activity level	L	M	M		M	M		M						
Soprano pipistrelle	Passes	0	0	0	0	1	4	0	0	0	0	5	0	0.5	
	Percentile					25	48							0	Low
	Activity Level					L/M	M								
Nathusius' pipistrelle	Passes	1	0	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile	25												0	Low
	Activity Level	L/M													

Whiskered	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity level														
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Brown Long-eared	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														

No. of species = 4 **Total no. calls = 92**

TABLE A.12 - SUMMER 2019 – SURVEY POINT E

Grid reference: S59164 31575 Site: On rowan in pasture up hill from red barn at Turbine 7 Songmeter: SM4 8028

		30.7.19	**31.7.19**	**1.8.19**	**2.8.19**	**3.8.19**	**4.8.19**	**5.8.19**	**6.8.19**	**7.8.19**	**8.8.19**	**No. of passes**	**Median**	**Mean**	**Overall activity level**
Leisler's	Passes	9	7	21	22	3	2	3	6	12	6	91	7	9.1	
	Percentile	62	54	71	72	44	40	44	52	63	52		53	55	
	Activity level	M/H	M	M/H	M/H	M	L/M	M	M	M/H	M				Mod
Common pipistrelle	Passes	40	30	160	76	55	17	8	14	38	66	504	39	50.4	
	Percentile	86	78	94	89	86	68	57	65	81	88		83	79	
	Activity level	H	M/H	H	H	H	M/H	M	M/H	H	H				M-H
Soprano pipistrelle	Passes	8	25	46	90	88	23	3	8	54	68	413	35.5	41.3	
	Percentile	59	75	84	90	90	73	44	57	86	88		35	41	
	Activity Level	M	M/H	H	H	H	M/H	M	M	H	H				Mod
Nathusius' pipistrelle	Passes	0	1	0	1	0	0	0	0	0	0	2	0	0.2	
	Percentile		23		23								0	4.6	
	Activity level		L/M		L/M										Low

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	No. of passes	Median	Mean	Overall activity level
Whiskered	Passes	1	1	6	1	1	0	0	0	1	2	13	1	1.3	
	Percentile	6	23	52	23	23				23	40		23	19	
	Activity level	L	L/M	M	L/M	L/M	0	0	0	L/M	L/M				Low-Mod
Natterer's	Passes	0	0	0	1	0	0	0	1	0	0	2	0	0.2	
	Percentile				23				23				0	4.6	
	Activity Level				L/M				L/M						Low
Daubenton's	Passes	0	0	1	1	1	0	0	0	0	0		0	6.9	
	Percentile			23	23	23									
	Activity Level			L/M	L/M	L/M									Low
Brown Long-eared	Passes	1	1	0	1	0	1	0	0	0	1	5	1	0.5	
	Percentile	6	23		23		23				23		3	10	
	Activity Level	L	L/M		L/M		L/M				L/M				Low

No. of species = 8 **Total no. of calls = 1,033**

TABLE A.13 - AUTUMN 2019 – Survey Point E

Grid Reference: S59164 31575 Site: On rowan in pasture up hill from red barn at Turbine 7 Songmeter: SM4 8028

Date		16.9.19	17.9.19	18.9.19	19.9.19	20.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No. of Calls	Median	Mean	Overall activity level
Leisler's	Passes	8	1												4.5	4.5	
	Percentile	79	58												69	69	
	Activity level	M/H	M														M/H
Common pipistrelle	Passes	147	54											201	100.5	100.5	
	Percentile	96	92												94	94	
	Activity level	H	H														High
Soprano pipistrelle	Passes	18	95											113	56.5	56.5	
	Percentile	86	95												91	91	
	Activity level	H	H														High
Nathusius' Pipistrelle	Passes	0	0														
	Percentile																
	Activity level																
Whiskered	Passes	0	0														
	Percentile																
	Activity level																
Natterer's	Passes	0	0														
	Percentile																
	Activity level																

Date		**16.9.19**	**17.9.19**	**18.9.19**	**19.9.19**	**20.9.19**	**23.9.19**	**24.9.19**	**25.9.19**	**26.9.19**	**27.09.19**	**28.9.19**	**29.9.19**	**No. of calls**	**Median**	**Mean**	**Overall activity level**
Daubenton's	Passes	1	0											1	0.5	0.5	
	Percentile														29	29	
	Activity level																L-M
Brown long-eared	Passes	0	0														
	Percentile																
	Activity level																

Only 2 nights data – Cattle pulled down microphone cable from high in tree Total no. of calls = 324

No. of species = 4

TABLE A.14 - SUMMER 2019 – SURVEY POINT F

Grid reference: S58493 33501 Site: up long lane at Kilvinoge townland at Turbine 14 Songmeter SM4 7863

		30.7.19	**31.7.19**	**1.8.19**	**2.8.19**	**3.8.19**	**4.8.19**	**5.8.19**	**6.8.19**	**7.8.19**	**8.8.19**	**No. of calls**	**Median**	**Mean**	**Overall activity level**
Leisler's	Passes	6	1	22	118	14	0	5	10	18	39	233	12	23.3	
	Percentile	45	23	72	92	65		50	60	69	81		62	56	
	Activity level	M	L/M	M/H	H	M/H		M	M	M/H	H				Mod-High
Common pipistrelle	Passes	3	4	35	303	42	79	17	34	61	41	619	38	61.9	
	Percentile	32	48	79	97	83	90	68	79	87	82		80	75	
	Activity level	L/M	M	M/H	H	H	H	M/H	M/H	H	H				Mod-High
Soprano pipistrelle	Passes	2	7	30	114	20	6	6	16	46	18	265	17	26.5	
	Percentile	25	54	78	94	71	52	52	67	84	69		68	65	
	Activity Level	L/M	M	M/H	H	M/H	M	M	M/H	H	M/H				Mod-High
Nathusius' pipistrelle	Passes	0	0	0	1	0	1	0	0	0	0	2	0	0.2	
	Percentile				23		23						0	4.6	

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	No. of calls	Median	Mean	Overall activity level
	Activity Level				L/M		L/M								Low
Whiskered	Passes	1	0	2	4	1	0	1	21	7	1	38	1	3.8	
	Percentile	6		40	48	23		23	71	54	23		23	29	
	Activity level	L		L/M	M	L/M		L/M	M/H	M	L/M				Low-Mod
Natterer's	Passes	0	0	1	1	0	0	0	0	1	0				
	Percentile			23	23					23			0	6.9	
	Activity Level			L/M	L/M					L/M					Low
Daubenton's	Passes	0	0	0	1	0	0	0	1	1	1	4	0	0.4	
	Percentile				23				23	23	23				
	Activity Level				L/M				L/M	L/M	L/M				Low
Brown Long-eared	Passes	1	3	1	1	7	0	2	3	1	6	25	2	2.5	
	Percentile	6	44	23	23	54		40	44	23	52		16	31	
	Activity Level	L	M	L/M	L/M	M		L/M	M	L/M	M				Low

No. of species = 8 Total no. of calls = 1189

TABLE A.15 - AUTUMN 2019 – SURVEY POINT F

Grid Reference: S58493 33501 Site: up long lane at Kilvinoge townland at Turbine 14 Songmeter SM4 0058

Date		**16.9.19**	**17.9.19**	**18.9.19**	**19.9.19**	**20.9.19**	**21.9.19**	**22.9.19**	**23.9.19**	**24.9.19**	**25.9.19**	**26.9.19**	**27.09.19**	**28.9.19**	**No. of calls**	**Median**	**Mean**	**Overall activity level**
Leisler's	Passes	0	2	6	5	4	1	2	0	1	0	1	0	0	22	1	1.7	
	Percentile		67	77	75	74	58	67		58		58				58	41	
	Activity level		M/H	M/H	M/H	M/H	M	M/H		M		M						Mod
Common pipistrelle	Passes	9	36	29	17	3	0	16	5	0	1	1	0	0	117	3	9	
	Percentile	80	89	89	85	71		84	75		58	58				71	53	
	Activity level	M/H	H	H	H	M/H		H	M/H		M	M						M-H
Soprano pipistrelle	Passes	5	24	34	17	6	2	15	2	111	0	0	0	0	217	5	16.7	
	Percentile	75	88	89	85	77	67	84	67	84						75	56	
	Activity level	M/H	H	H	H	M/H	M/H	H	M/H	H								M-H
Nathusius' Pipistrelle	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0				
	Percentile																	
	Activity level																	
Whiskered	Passes	0	3	27	12	0	3	0	0	0	0	0	0	0	45	0	3.5	
	Percentile		71	88	83		71									0	24	
	Activity level		M/H	H	H		M/H											Low
Natterer's	Passes	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0.2	
	Percentile	67														0	5	

Date		**16.9.19**	**17.9.19**	**18.9.19**	**19.9.19**	**20.9.19**	**21.9.19**	**22.9.19**	**23.9.19**	**24.9.19**	**25.9.19**	**26.9.19**	**27.09.19**	**28.9.19**	**No of calls**	**Median**	**Mean**	**Overall activity level**
	Activity level	M/H																Low
Daubenton's	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Percentile																	
	Activity level																	
Brown long-eared	Passes	0	2	1	0	0	1	0	0	1	0	0	0	0	5	0	0.4	
	Percentile		67	58			58			58						0	19	
	Activity level																	
			M/H	M			M			M								Low

No of species = 6 Total no. of calls = 408

TABLE A.16 - SUMMER 2019 – SURVEY POINT G

Grid reference: **S56886 34291** Site: Kiltorcan Lane pasture behind cottage and farm sheds at Turbine 23 Songmeter SM4 7695

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	No. of calls	Median	Mean	Overall activity level
Leisler's	Passes	110	45	39	7	27	22	32	40	44	8	374	40	37.4	
	Percentile	92	84	81	54	76	72	79	82	84	57		80	76	
	Activity level	H	H	H	M	M/H	M/H	M/H	H	H	M				Mod-High
Common pipistrelle	Passes	16	20	42	143	44	0	221	130	156	72	844	58	84.4	
	Percentile	75	71	83	93	84		96	93	94	89		86	78	
	Activity level	M/H	M/H	H	H	H	0	H	H	H	H				High
Soprano pipistrelle	Passes	8	23	37	116	18	0	9	12	32	29	284	20	28.4	
	Percentile	59	73	80	92	69		59	63	79	77		71	65	
	Activity Level	M	N/H	H	H	M/H		M	M/H	M/H	M/H				Moderate
Nathusius' pipistrelle	Passes	0	1	0	1	1	0	0	0	0	0	3	0	0.3	
	Percentile		23		23	23							0	6.9	

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	No of calls	Median	Mean	Overall activity level
	Activity Level		L/M		L/M	L/M									Low
Whiskered	Passes	1	4	2	0	0	0	0	0	0	O	7	0	0.7	
	Percentile	6	48	40									0	9.4	
	Activity level	L	M	L/M											Low
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Brown Long-eared	Passes	0	0	1	0	0	0	0	0	0	0	1	0	0.1	
	Percentile			23									0	2.3	
	Activity Level			L/M											Low

No. of species = 6 **Total no. of calls = 1,513**

TABLE A.17 - AUTUMN 2019 – Point G

Grid Reference: S56886 34291 Site: Kiltorcan Lane pasture behind cottage and farm sheds at Turbine 23 Songmeter SM4 7285

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No of calls	Median	Mean	Overall activity level
Leisler's	Passes	66	131	148	77	41	118	75	458	223	425	75	16	222	2075	118	159.6	
	Percentile	92	96	96	93	90	95	93	99	98	99	93	84	97		96	94	
	Activity level	H	H	H	H	H	H	H	H	H	H	H	H	H				High
Common pipistrelle	Passes	25	48	76	104	76	259	144	348	329	484	220	187	214	2514	187	193.4	
	Percentile	88	91	93	95	93	98	96	98	98	100	97	92	97		96	95	
	Activity level	H	H	H	H	H	H	H	H	H	H	H	H	H				High
Soprano pipistrelle	Passes	25	95	23	9	8	16	14	32	32	55	42	22	72	445	25	34.2	
	Percentile	88	95	87	86	79	84	84	89	89	92	91	87	93		88	88	
	Activity level	H	H	H	M/H	M/H	H	H	H	H	H	H	H	H				High
Nathusius' Pipistrelle	Passes	0	0	0	0	0	0	1	0	2	1	0	0	1	5	0	0.4	
	Percentile							58		67	58			58				
	Activity level							M		M/H	M			M				Low
Whiskered	Passes	0	0	1	0	0	0	0	0	0	0	1	0	0	2	0	0.2	
	Percentile			58								58						
	Activity level			M								M						Low
Natterer's	Passes	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile			58												0	4	
	Activity			M														Low

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No of calls	Median	Mean	Overall activity level
Daubenton's	Passes	0	0	0	0	0	1	0	0	1	0	0	0	0	2	0	0.2	
	Percentile						58			58						0	9	
	Activity level						M			M								Low
Brown long-eared	Passes	2	0	0	3	3	0	5	15	5	6	3	0	0	31	3	3.2	
	Percentile	67			71			75	84	75	77	71				71	45	
	Activity level	M/H			M/H	M/H		M/H	H	M/H	M/H	M/H						Mod-High

No. of species = 8 Total no. of calls = 5,086

TABLE A.18 - SUMMER 2019 – SURVEY POINT H

Grid reference: S57187 33449 Site: In field to south of lane to telecom mast close to Turbine 19 Songmeter SM4 8025

		30.7.19	**31.7.19**	**1.8.19**	**2.8.19**	**3.8.19**	**4.8.19**	**5.8.19**	**6.8.19**	**7.8.19**	**8.8.19**	**No. of calls**	**Median**	**Mean**	**Overall activity level**
Leisler's	Passes	12	84	30	10	1	14	5	23	52	41	272	18.5	27.2	
	Percentile	67	90	78	60	23	65	30	73	85	82		70	65.3	
	Activity level	M/H	H	M/H	M	L/M	M/H	M	M/H	H	H				Mod-High
Common pipistrelle	Passes	14	29	53	58	28	7	5	13	38	44	289	28.5	28.9	
	Percentile	69	77	86	87	76	54	50	64	81	84		76	73	
	Activity level	M/H	M/H	H	H	M/H	M	M	M/H	H	H				Mod-High
Soprano pipistrelle	Passes	2	10	10	24	11	1	2	7	27	14	108	10	10.8	
	Percentile	25	60	60	74	62	23	40	54	76	65		60	54	
	Activity Level	L/M	M	M	M/H	M/H	L/M	L/M	M	M/H	M/H				Moderate
Nathusius' pipistrelle	Passes	1	0	0	0	0	0	0	1	0	0	2	0	0.2	
	Percentile	6							23						

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	No. of calls	Median	Mean	Overall activity level
	Activity Level	L							L/M						Low
Whiskered	Passes	0	0	0	0	0	0	0	1	1	2	4	0	0.4	
	Percentile								23	23	40		0	8.6	
	Activity level								L/M	L/M	L/M				Low
Natterer's	Passes	1	0	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile	6											0	0.6	
	Activity Level	L													Low
Daubenton's	Passes	1	0	1	0	0	0	0	1	2	0	5	0	0.5	
	Percentile	6		23					23	40			0	9	
	Activity Level	L		L/M					L/M	L/M					Low
Brown Long-eared	Passes	0	0	1	1	0	0	0	0	3	1	6	0	0.6	
	Percentile			23	23					44	23		0	11	
	Activity Level			L/M	L/M					M	L/M				Low

No of species = 8 Total no. of calls = 687

TABLE A.19 - AUTUMN 2019 – SURVEY Point H

Grid Reference: S57187 33449 Site: In field to south of lane to telecom mast at Turbine 19 Songmeter = SM4 8681

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No. of calls	Median	Mean	Overall activity level
Leisler's	Passes	7	7	11	0	0	80	1	2	18	3	37	0	36	202	7	15.5	
	Percentile	78	78	81			93	58	67	86	71	90		89		78	61	
	Activity level	M/H	M/H	H			H	M	M/H	H	M/H	H		H				M-H
Common pipistrelle	Passes	13	20	27	3	0	30	10	43	5	24	12	0	31	218	13	16.8	
	Percentile	83	87	88	71		89	80	91	75	88	83		89		83	71	
	Activity level	H	H	H	M/H		H	H	H	M/H	H	H		H				High
Soprano pipistrelle	Passes	3	6	18	3	0	11	1	4	5	16	8	5	9	89	5	6.8	
	Percentile	71	77	86	71		81	58	74	75	84	79	75	80		75	70	
	Activity level	M/H	M/H	H	M/H		H	M	M/H	M/H	H	M/H	M/H	M/H				M-H
Nathusius' Pipistrelle	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Percentile																	
	Activity level																	
Whiskered	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Percentile																	
	Activity level																	
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Percentile																	

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No of calls	Median	Mean	Overall activity level
	Activity level																	
Daubenton's	Passes	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile		58													0	4	
	Activity level		M															Low
Brown long-eared	Passes	0	0	2	1	0	2	1	1	0	1	1	0	0	9	1	0.7	
	Percentile			67	58		67	58	58		58	58				58	33	
	Activity level			M/H	M		M/H	M	M		M	M						Mod

No. of species = 5 Total no. of calls = 519

TABLE A.20 - SUMMER 2019 – SURVEY POINT I

Grid reference: S57455 33750 Site: field on northern section of lane to telecom mast between Turbines 18 & 21 Songmeter SM4 7285

		30.7.19	**31.7.19**	**1.8.19**	**2.8.19**	**3.8.19**	**4.8.19**	**5.8.19**	**6.8.19**	**7.8.19**	**8.8.19**	**No. of calls**	**Median**	**Mean**	**Overall activity level**
Leisler's	Passes	5	18	17	11	3	16	3	19	41	35	168	16.5	16.8	
	Percentile	41	69	68	62	44	67	44	70	82	78		67	63	
	Activity level	M	M/H	M/H	M/H	M	M/H	M	M/H	H	M/H				Mod-High
Common pipistrelle	Passes	1	1	69	199	7	10	3	8	27	40	365	9	36.5	
	Percentile	6	23	88	95	54	60	44	57	76	82		58	59	
	Activity level	L	L/M	H	H	M	M	M	M	M/H	H				Moderate
Soprano pipistrelle	Passes	2	2	18	16	10	2	0	4	28	24	106	7	10.6	
	Percentile	25	40	69	67	60	40		48	76	74		54	50	
	Activity Level	L	L/M	M/H	M/H	M	L/M		M	M/H	M/H				Moderate
Nathusius' pipistrelle	Passes	0	1	1	1	0	0	0	0	0	0	3	0	0.3	
	Percentile		23	23	23										

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	No. of calls	Median	Mean	Overall activity level
	Activity Level		L/M	L/M	L/M	0	0	0	0	0	0				Low
Whiskered	Passes	2	0	0	2	1	0	0	1	1	2	9	1	0.9	
	Percentile	25			40	23			23	23	40		23	17	
	Activity level	L/M			L/M	L/M			L/M	L/M	L/M				Low-Mod
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	0	0	1	0	1	0	0	0	0	2	0	0.2	
	Percentile				23		23						0	4.6	
	Activity Level				L/M		L/M								Low
Brown Long-eared	Passes	0	0	1	0	0	0	1	0	1	0	3	0	0.3	
	Percentile			23				23		23			0	6.9	
	Activity Level			L/M				L/M		L/M					Low

NO. OF SPECIES = 7 **Total no. of calls = 656**

TABLE A.21 - AUTUMN 2019 – Point I

Grid Reference: S57455 33750 Site: field on northern section of lane to telecom mast between Turbines 18 & 21 Songmeter SM2 B

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No. of calls	Median	Mean	Overall activity level
Leisler's	Passes	35	37	50	1	0	89								212	36	35.3	
	Percentile	89	90	92	58	0	94									90	71	
	Activity level	H	H	H	M		H											High
Common pipistrelle	Passes	7	7	8	1	0	96								119	7	19.8	
	Percentile	78	78	79	58		95									78	65	
	Activity level	M/H	M/H	M/H	M		H											M-H
Soprano pipistrelle	Passes	6	4	3	0	1	41								55	5	84	
	Percentile	77	74	71		58	90									73	62	
	Activity level	M/H	M/H	M/H		M	H											M-H
Nathusius' Pipistrelle	Passes	0	0	2	0	0	0								2	0	0.5	
	Percentile			67												0	11	
	Activity level			M/H														Low
Whiskered	Passes	0	0	0	0	0	0								0			
	Percentile																	
	Activity level																	
Natterer's	Passes	0	0	0	0	0	0								0			
	Percentile																	
	Activity																	

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No. of calls	Median	Mean	Overall activity level
Daubenton's	Passes	0	0	0	0	0	0								0			
	Percentile																	
	Activity level																	
Brown long-eared	Passes	0	0	2	1	0	1								3	1	0.7	
	Percentile			67	58		58											
	Activity level			M/H	M		M											Low

SM2 batteries failed after 6 nights

Total no of calls = 392

No of species = 5

TABLE A.22 - SUMMER 2019 – SURVEY POINT J

Grid reference: S57378 34708 Site: end of Castlecosker Lane to rear of farm buildings at Turbine 22 Songmeter SM4 3664

		30.7.19	**31.7.19**	**1.8.19**	**2.8.19**	**3.8.19**	**4.8.19**	**5.8.19**	**6.8.19**	**7.8.19**	**8.8.19**	**No. of calls**	**Median**	**Mean**	**Overall activity level**
Leisler's	Passes	10	12	7	17	9	25	6	20	9	29	144	11	14.4	
	Percentile	65	63	54	68	59	75	52	71	59	77		64	64	
	Activity level	M/H	M/H	M	M/H	M	M/H	M	M/H	M	M/H				Mod-High
Common pipistrelle	Passes	28	30	55	99	40	37	42	21	32	26	410	34.5	41	
	Percentile	81	78	86	91	82	80	83	71	79	76		80	81	
	Activity level	H	M/H	H	H	H	H	H	M/H	M/H	M/H				High
Soprano pipistrelle	Passes	5	16	62	48	24	18	14	12	30	14	243	17	24.3	
	Percentile	41	67	87	85	74	69	65	63	78	65		68	69	
	Activity Level	M	M/H	H	H	M/H	M/H	M/H	M/H	M/H	M/H				Mod-High
Nathusius' pipistrelle	Passes	0	0	0	1	0	1	0	0	0	0	2	0	0.2	
	Percentile				23		23						0	4.6	

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19		Median	Mean	Overall activity level
	Activity Level				L/M		L/M								Low
Whiskered	Passes	0	0	0	0	0	0	1	0	0	0	1	0	0.1	
	Percentile							23					0	2.3	
	Activity level							L/M							Low
Natterer's	Passes	0	0	0	0	1	0	0	0	0	1	2	0	0.2	
	Percentile					23					23		0	4.6	
	Activity Level					L/M					L/M				Low
Daubenton's	Passes	0	0	0	1	0	0	0	0	1	0	2	0	0.2	
	Percentile				23					23			0	4.6	
	Activity Level				L/M					L/M					Low
Brown Long-eared	Passes	0	0	2	0	0	2	0	4	1	0	9	0	0.9	
	Percentile			40			40		48	23			0	15	
	Activity Level			L/M			L/M		M	L/M					Low

TABLE A.23 - AUTUMN 2019 – Point J

Grid Reference: S57378 34708 Site: end of Castlecosker Lane to rear of farm buildings at Turbine 22 Songmeter SM4 7990

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No of calls	Median	Mean	Overall activity level
Leisler's	Passes	11	12	17	10	5	43	3	16	1	8	11	0	25	162	11	12.5	
	Percentile	81	83	85	80	75	91	71	84	58	79	81		88		81	74	
	Activity level	H	H	H	H	M/H	H	M/H	H	M	M/H	H		H				High
Common pipistrelle	Passes	29	50	72	19	8	37	6	18	5	17	11	6	9	287	17	22.1	
	Percentile	89	92	93	86	79	90	77	86	75	85	81	77	80		85	84	
	Activity level	H	H	H	H	M/H	H	M/H	H	M/H	H	H	M/H	M/H				High
Soprano pipistrelle	Passes	19	16	25	7	3	24	8	10	5	23	13	3	10	166	10	12.8	
	Percentile	86	84	88	78	71	88	79	80	75	87	83	71	80		80	81	
	Activity level	H	H	H	M/H	M/H	H	M/H	H	M/H	H	H	M/H	H				M-H
Nathusius' Pipistrelle	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Percentile																	
	Activity level																	
Whiskered	Passes	1	2	2	0	0	0	0	1	0	25	7	0	3	41	1	3.2	
	Percentile	58	67	67					58		88	78		71		58	37	
	Activity level	M	M/H	M/H					M		H	M/H		M/H				M
Natterer's	Passes	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0.1	
	Percentile						58									0	4	

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No. of calls	Median	Mean	Overall activity level
	Activity level						M											Low
Daubenton's	Passes	0	1	0	1	1	0	1	0	0	2	1	0	0	7	0	0.5	
	Percentile		58		58	58		58			67	58				0	27	
	Activity level		M		M	M		M			M/H	M						Low
Brown long-eared	Passes	1	3	2	1	1	1	3	3	3	2	3	0	0	23	2	1.8	
	Percentile	58	71	67	58	58	58	71	71	71	67	71				67	55	
	Activity level	M	M/H	M	M	M	M	M/H	M/H	M/H	M/H	M/H						M-H

No. of species = 7 Total no. of calls = 687

TABLE A.24 - SUMMER 2019 – SURVEY POINT K

Grid reference S59428 31101 Site: Forestry Track in southern half of site on split post south of Turbine 5 (now north of Turbine 6) Songmeter SM4 7929

		30.7.19	**31.7.19**	**1.8.19**	**2.8.19**	**3.8.19**	**4.8.19**	**5.8.19**	**6.8.19**	**7.8.19**	**8.8.19**	**No. of calls**	**Median**	**Mean**	**Overall activity level**
Leisler's	Passes	0	5	43	13	3	4	1	8	10	19	106	9	10.6	
	Percentile		50	84	64	44	48	23	57	60	70		53	50	
	Activity level		M	H	M/H	M	M	L/M	M	M	M/H				Moderate
Common pipistrelle	Passes	1	59	387	216	101	71	56	18	102	10	1021	65	102.1	
	Percentile	6	87	98	96	91	89	87	69	92	60		88	77	
	Activity level	L	H	H	H	H	H	H	M/H	H	M				High
Soprano pipistrelle	Passes	3	19	138	179	38	15	37	3	23	1	456	21	45.6	
	Percentile	32	70	93	95	81	66	80	44	73	23		71	66	
	Activity Level	L/M	M/H	H	H	H	M/H	H	M	M/H	L/M				Mod-High
Nathusius' pipistrelle	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	No. of calls	Median	Mean	Overall activity level
	Activity Level														
Whiskered	Passes	0	1	0	1	1	0	0	0	0	0	3	0	0.3	
	Percentile		23		23	23							0	6.9	
	Activity level		L/M		L/M	L/M									Low
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	0	0	1	0	0	0	0	0	0	1	0	0.1	
	Percentile				23								0	2.3	
	Activity Level				L/M										Low
Brown Long-eared	Passes	0	0	1	0	0	0	0	0	0	0	1	0	0.1	
	Percentile			23									0	2.3	
	Activity Level			L/M											Low

No. of species = 6 **Total no. of calls = 1588**

TABLE A.25 - AUTUMN 2019 – Survey Point K

Grid Reference: S59428 31101 Site: Forestry Track in southern half of site on split post south of Turbine 5 (now north of Turbine 6)
Songmeter SM4 8025

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No of calls	Median	Mean	Overall activity level
Leisler's	Passes	4	3	3	1	0	0	0	0	0	0	0	0	0	11	0	0.8	
	Percentile	74	71	71	58											0	21	
	Activity level	M/H	MH	M/H	M													Low
Common pipistrelle	Passes	13	22	15	0	0	11	0	0	0	0	1	0	4	66	0	5.1	
	Percentile	83	87	84	81	58	74					58		74		0	36	
	Activity level	H	H	H	H	M	M/H					M		M/H				Low
Soprano pipistrelle	Passes	2	3	2	2	0	0	0	0	1	0	0	0	1	11	0	0.8	
	Percentile	67	71	67	67					58				58		0	30	
	Activity level	M/H	M/H	M/H	M/H					M				M				Low
Nathusius' Pipistrelle	Passes	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile		58													0	4	
	Activity level		M															Low
Whiskered	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Percentile																	
	Activity level																	
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Percentile																	

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No. of calls	Median	Mean	Overall activity level
	Activity level																	
Daubenton's	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Percentile																	
	Activity level																	
Brown long-eared	Passes	0	1	0	0	0	0	0	0	0	0	1	0	0	2	0	0.2	
	Percentile		58									58				0	9	
	Activity level		M									M						Low

No. of species = 5 Total no. of calls = 91

TABLE A.26 - SPRING 2020 – SURVEY POINT K

Grid reference: S59428 31101 Site: Forestry track in southern half of site, just north of Turbine 6

		24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	30.4.20	1.5.20	2.5.20	3.5.20	4.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	306	155	152	262	180	120	133	16	101	317	1742	153.5	174.2	
	Percentile	94	86	86	91	88	82	85	54	80	95		86	84.1	High
	Activity level	H	H	H	H	H	H	H	M	M/H	H				
Common pipistrelle	Passes	658	281	122	323	121	116	942	151	974	312	4000	296.5	400	
	Percentile	99	93	83	96	83	82	99	85	100	95		95.5		High
	Activity level	H	H	H	H	H	H	H	H	H	H				
Soprano pipistrelle	Passes	0	1	2	0	1	0	0	0	3	0	7	0	0.7	
	Percentile	0	20	27	0	20	0	0	0	31	0		0		Low
	Activity Level	L	L	L/M	L	L	L	L	L	L/M	L				
Nathusius' pipistrelle	Passes	1	3	0	9	10	2	9	1	15	10	60	6	6	
	Percentile	20	31	0	43	44	27	43	20	52	44		37		L/M
	Activity Level	L	L/M	0	M	M	L/M	M	L	M	M				

Whiskered	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity level														
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	1	0	0	0	0	0	0	0	0	1			
	Percentile														
	Activity Level														
Brown Long-eared	Passes	0	1	0	0	0	0	0	0	0	0	1			
	Percentile														
	Activity Level														

No. of species = 6 **Total no. calls = 5,811**

TABLE A.27 - SUMMER 2019 – SURVEY POINT L

Grid reference S58141 34299 Site: Near top of northernmost forestry track west of Turbine 17 (now Turbine 18)
Songmeter SM4 0058

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	No. of calls	Median	Mean	Overall activity level
Leisler's	Passes	3	6	24	36	0	0	5	8	5	2	89	5.5	8.9	
	Percentile	32	52	74	80			50	57	50	40		50	43	
	Activity level	L/M	M	M/H	M/H			M	M	M	L/M				Moderate
Common pipistrelle	Passes	7	13	54	351	8	36	25	8	51	19	572	22	57.2	
	Percentile	54	64	86	98	57	80	75	57	85	70		72	73	
	Activity level	M	M/H	H	H	M	M/H	M/H	M	H	M/H				Mod-High
Soprano pipistrelle	Passes	1	1	10	98	6	4	0	3	33	9	165	5	11.5	
	Percentile	6	23	60	91	52	48		44	79	59		50	46	
	Activity Level	L	L/M	M	H	M	M		M	M/H	M				Moderate
Nathusius' pipistrelle	Passes	0	0	1	1	0	0	0	0	0	0	2	0	0.2	
	Percentile			23	23								0	4.6	

		30.7.19	31.7.19	1.8.19	2.8.19	3.8.19	4.8.19	5.8.19	6.8.19	7.8.19	8.8.19	No. of calls	Median	Mean	Overall activity level
	Activity Level			L/M	L/M										Low
Whiskered	Passes	0	0	0	0	0	0	0	0	0	0				
	Percentile														
	Activity level														
Natterer's	Passes	0	0	1	0	0	0	0	0	1	1	3	0	0.3	
	Percentile			23						23	23		0	6.9	
	Activity Level			L/M						L/M	L/M				Low
Daubenton's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Brown Long-eared	Passes	0	0	1	1	0	0	0	2	1	0	5	0	0.5	
	Percentile			23	23				40	23			0	6.3	
	Activity Level			L/M	L/M				L/M	L/M					Low

No of species = 6 **Total no. of calls = 836**

TABLE A.28 - AUTUMN 2019 – SURVEY POINT L

Grid Reference: S58141 34299 Site: Top of northernmost forestry track west of Turbine 17 (now Turbine 18) Songmeter SM2 A

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No. of calls	Median	Mean	Overall activity level
Leisler's	Passes	1	6	2	3	0	4				0	1			17	2	2.1	
	Percentile	58	77	67	71		74					58				63	51	
	Activity level	M	M/H	M/H	M/H		M/H					M						Mod-High
Common pipistrelle	Passes	276	360	399	668	161	23				21	11			1919	218.5	239.8	
	Percentile	98	98	99	100	96	87				87	81				97	93	
	Activity level	H	H	H	H	H	H				H	H						High
Soprano pipistrelle	Passes	172	358	380	173	235	23				46	8			1395	109	174.3	
	Percentile	97	98	99	97	98	87				91	79				97	93	
	Activity level	H	H	H	H	H	H				H	M						High
Nathusius' Pipistrelle	Passes	0	0	2	0	0	0				0	0			2	0	0.3	
	Percentile			67												0	8	
	Activity level			M/H														Low
Whiskered	Passes	1	4	3	2	0	0				0	0			10	1	1.3	
	Percentile	58	74	71	67	0	0				0	0				29	34	
	Activity level	M	M/H	M/H	M/H													Low-Mod
Natterer's	Passes	0	0	0	0	0	0				0	0			0			
	Percentile																	
	Activity level																	

Date		**17.9.19**	**18.9.19**	**19.9.19**	**20.9.19**	**21.9.19**	**22.9.19**	**23.9.19**	**24.9.19**	**25.9.19**	**26.9.19**	**27.09.19**	**28.9.19**	**29.9.19**	**No. of calls**	**Median**	**Mean**	**Overall activity level**
Daubenton's	Passes	0	0	0	0	0	0				0	0	0	0	0			
	Percentile																	
	Activity level																	
Brown long-eared	Passes	1	1	5	18	0	0				0	0			25	1	3.1	
	Percentile	58	58	75	86											29	35	
	Activity level	M	M	M/H	H													Low-Mod

SM2 Cutting in and out

No. of species = 6 Total no. of calls = 3368

TABLE A.29 – SPRING 2020 – SURVEY POINT L

Grid reference S58141 34299 Site: Top of northernmost forestry track west of Turbine 18

		24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	30.4.20	1.5.20	2.5.20	3.5.20	4.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	157	96	60	10	3	21	0	51	90	0	488	36	48.8	
	Percentile	86	79	72	44	31	58	0	70	78	0		64	51.8	M/H
	Activity level	H	M/H	M/H	M	L/M	M	L	M/H	M/H	L				
Common pipistrelle	Passes	88	34	15	2	63	5	0	34	28	1	270	21.5	27	
	Percentile	77	64	52	27	72	37	0	64	61	20		56.5		M
	Activity level	M/H	M/H	M	L/M	M/H	L/M	L	M/H	M/H	L				
Soprano pipistrelle	Passes	8	1	0	0	0	0	0	1	0	0	10	0	0.1	
	Percentile	42	20						20				0		Low
	Activity Level	M	L						L						
Nathusius' pipistrelle	Passes	0	3	0	0	0	0	0	4	1	0	8	0	0.8	
	Percentile		31						35	20			0		Low
	Activity Level		L/M						L/M	L					

Whiskered	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity level														
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	0	0	1	0	0	0	0	0	0	1	0	0.1	
	Percentile														
	Activity Level														Low
Brown Long-eared	Passes	0	1	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile														
	Activity Level														Low

No. of species = 6 **Total no. calls = 778**

TABLE A.30 - AUTUMN 2019 – Survey Point M

Grid Reference S58839 29804 Site SW corner of site on southern forestry track Songmeter SM4 3664

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No. of calls	Median	Mean	Overall activity level
Leisler's	Passes	0	0	0	0	0	1	0	0	0	0	1	0	1	3	0	0.2	
	Percentile						66					66		66		0	15	
	Activity level						M/H					M/H		M/H				Low
Common pipistrelle	Passes	26	147	95	1	0	44	11	2	2	4	8	0	12	352	8	27.1	
	Percentile	95	99	98	66		96	91	79	79	88	89		92		89	75	
	Activity level	H	H	H	M/H		H	H	M/H	M/H	H	H		H				High
Soprano pipistrelle	Passes	49	14	14	2	0	31	0	0	0	2	0	0	13	125	2	9.6	
	Percentile	96	93	93	79		95				79			92		79	48	
	Activity level	H	H	H	M/H		H				M/H			H				M-H
Nathusius' Pipistrelle	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Percentile																	
	Activity level																	
Whiskered	Passes	1	2	2	1	0	0	0	0	0	0	1	0	0	7	0	0.5	
	Percentile	66	79	79	66							66				0	27	
	Activity level	M/H	M/H	M/H	M/H							M/H						Low
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Percentile																	

Date		17.9.19	18.9.19	19.9.19	20.9.19	21.9.19	22.9.19	23.9.19	24.9.19	25.9.19	26.9.19	27.09.19	28.9.19	29.9.19	No. of calls	Median	Mean	Overall activity level
	Activity level																	
Daubenton's	Passes	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Percentile																	
	Activity level																	
Brown long-eared	Passes	0	2	2	0	0	0	0	0	0	1	1	0	1	7	0	0.5	
	Percentile		79	79							66	66		66		0	27	
	Activity level		M/H	M/H							M/H	M/H		M/H				Low

No of species = 5 Total no. of calls = 494

TABLE A.31 – SPRING 2020 – Survey Point M

Grid Reference S58845 29791 Site SW corner of site on southern forestry track between Turbine 3 and Turbine 4

		24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	30.4.20	1.5.20	2.5.20	3.5.20	4.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	41	20	53	43	37	109	333	14	57	76	783	48	78.3	
	Percentile	67	57	71	68	65	81	96	51	71	76		69.5	70.4	M/H
	Activity level	M/H	M	M	M/H	M/H	H	H	M	M/H	M/H				
Common pipistrelle	Passes	37	19	3	32	23	32	36	51	215	19	464	32	46.4	
	Percentile	65	56	31	62	59	62	65	71	89	56		62		M/H
	Activity level	M/H	M	L/M	M/H	M	M/H	M/H	M	H	M				
Soprano pipistrelle	Passes	3	3	1	0	0	0	0	1	3	0	11	0	1.1	
	Percentile	31	31	20					20	31			10		Low
	Activity Level														
Nathusius' pipistrelle	Passes	0	0	0	0	0	1	3	0	0	0	4			
	Percentile						20	31							
	Activity Level						L	L/M					0		Low

Whiskered	Passes	1	0	0	0	0	0	0	0	1	0	2	0	0.2	
	Percentile														
	Activity level														
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	1	0	1	0	0	0	0	0	0	2	0	0.2	
	Percentile														
	Activity Level														Low
Brown Long-eared	Passes	1	0	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile														
	Activity Level														Low

No. of species = 7 **Total no. calls = 1,267**

TABLE A.32 – *SPRING 2020 – Survey Point N*

Grid Reference S58522 28879 Site Southernmost survey point close to Turbine 1

		24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	30.4.20	1.5.20	2.5.20	3.5.20	4.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	75	17	18	157	116	87	247	13	124	57	911	81	91.1	
	Percentile	75	55	56	86	82	76	90	50	83	71		75.5	72.4	
	Activity level	M/H	M	M	H	H	M/H	H	M	H	M/H				M/H
Common pipistrelle	Passes	290	44	3	15	10	0	11	16	108	5	502	13	50.2	
	Percentile	93	69	31	52	44	0	47	52	81	37		49.5		Moderate
	Activity level	H	M/H	L/M	M	M	L	M	M	H	L/M				
Soprano pipistrelle	Passes	26	11	0	0	0	0	0	0	12	0	49	0	4.9	
	Percentile	60	47							49			0		Low
	Activity Level	M	M							M					
Nathusius' pipistrelle	Passes	1	2	2	1	1	0	0	1	2	3	13	1	1.3	
	Percentile	20	27	27	20	20			20	27	31		20		Low
	Activity Level	L	L/M	L/M	L	L			L	L/M	L/M				

Whiskered	Passes	0	1	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile														Low
	Activity level														
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	3	1	0	0	1	0	0	0	0	0	5	0	0.5	
	Percentile														Low
	Activity Level														
Brown Long-eared	Passes	1	0	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile														Low
	Activity Level														

No. of species = 7 **Total no. calls = 1,482**

TABLE A.33 – SUMMER 2020 – Survey Point N

Grid Reference S58522 28879 Site Southernmost survey point close to Turbine 1

		29.6.20	30.6.20	2.7.20	4.7.20	6.7.20	7.7.20	9.7.20	10.7.20	11.7.20	12.7.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	4	25	18	6	16	40	1	9	13	24	156	18.5	15.6	
	Percentile	58	83	79	63	77	89	34	69	74	83		75.5		M/H
	Activity level	M	H	M/H	M/H	M/H	H	L/M	M/H	M/H	H				
Common pipistrelle	Passes	26	64	108	41	129	81	92	98	61	0	700	72.5	70	
	Percentile	84	93	95	89	96	94	94	95	92	0		93.5		High
	Activity level	H	H	H	H	H	H	H	H	H					
Soprano pipistrelle	Passes	1	5	54	1	55	76	0	73	4	0	269	4.5	26.9	
	Percentile	34	60	92	34	92	94	0	94	58	0		59		Moderate
	Activity Level	L/M	M/H	H	L/M	H	H		H	M					
Nathusius' pipistrelle	Passes	0	1	2	0	0	1	0	0	0	0	4	0	0.4	
	Percentile	0	34	48			34						0		Low
	Activity Level		L/M	M			L/M								

Whiskered	Passes	0	1	1	0	0	1	0	0	2	0	5	0	0.5	
	Percentile														
	Activity level														Low
Natterer's	Passes											0			
	Percentile														
	Activity Level														
Daubenton's	Passes	1										1	0	0.1	Low
	Percentile														
	Activity Level														
Brown Long-eared	Passes											0			
	Percentile														
	Activity Level														

No. of species = 6 **Total no. calls = 1,135**

TABLE A.34 – SPRING 2020 – Survey Point 0

Grid Reference S58537 30278 Site: Corner of pasture field on west of site at Turbine 5

		24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	30.4.20	1.5.20	2.5.20	3.5.20	4.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	21	4	6	4	14	10	21	6	17	10	113	10	11.3	
	Percentile	58	35	39	35	51	44	58	39	55	44		44	45.8	Moderate
	Activity level	M	L/M	L/M	L/M	M	M	M	L/M	M	M				
Common pipistrelle	Passes	309	501	24	15	6	3	5	30	310	4	1207	19.5	120.7	
	Percentile	95	98	59	52	39	31	37	62	95	35		55.5		Moderate
	Activity level	H	H	M	M	L/M	L/M	L/M	M/H	H	L/M				
Soprano pipistrelle	Passes	62	184	1	0	0	0	0	0	12	1	260	0.5	26	
	Percentile	72	88	20						49	20		10		Low
	Activity Level	M/H	H	L						M	L				
Nathusius' pipistrelle	Passes	0	0	0	0	0	0	0	0	0	2	2	0	0.2	
	Percentile										27				
	Activity Level										L/M				Low

Whiskered	Passes	3	4	0	0	1	0	0	0	0	0	8	0	0.8	
	Percentile														
	Activity level														
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	2	1	0	0	3	0	0	0	0	0	6	0	0.6	
	Percentile														
	Activity Level														Low
Brown Long-eared	Passes	0	0	0	0	0	0	0	0	0	1	1	0	0.1	
	Percentile														
	Activity Level														Low

No. of species = 7 **Total no. calls = 1,597**

TABLE A.35 – SUMMER 2020 – Survey Point 0

Grid Reference S58537 30278 Site: Corner of pasture field on west of site at Turbine 5

		29.6.20	30.6.20	2.7.20	4.7.20	6.7.20	7.7.20	9.7.20	10.7.20	11.7.20	12.7.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	0	13	15	13	9	26	5	13	14	8	116	13	11.6	
	Percentile	0	65	68	65	60	78	50	65	67	58		65		M/H
	Activity level		M/H	M/H	M/H	M	M/H	M	M/H	M/H	M				
Common pipistrelle	Passes	9	27	13	2	17	84	6	12	6	2	178	10.5	17.8	
	Percentile	60	78	65	39	70	91	53	64	53	39		62		M/H
	Activity level	M	M/H	M/H	L/M	M/H	H	M	M/H	M	L/M				
Soprano pipistrelle	Passes	0	1	21	0	22	32	0	33	6	0	115	3.5	11.5	
	Percentile	0	24	74	0	74	81	0	81	53		38.5			L/M
	Activity Level		L/M	M/H		M/H	H		H	M					
Nathusius' pipistrelle	Passes	0	0	3	0	1	2	0	0	0	0	6	0	0.6	
	Percentile	0	0	43	0	24	39						0		Low
	Activity Level			M		L/M	L/M								

Whiskered	Passes	0	2	0	0	0	1	0	1	0	1	5	0	0.5	
	Percentile														
	Activity level														Low
Natterer's	Passes											0			
	Percentile														
	Activity Level														
Daubenton's	Passes											0			
	Percentile														
	Activity Level														
Brown Long-eared	Passes											0			
	Percentile														
	Activity Level														

No. of species = 5 **Total no. calls = 420**

TABLE A.36 – SPRING 2020 – Survey Point P

Grid Reference S58731 31996 Site Pasture fields south of anemometer at Turbine 10

		24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	30.4.20	1.5.20	2.5.20	3.5.20	4.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	40	42	13	20	15	9	27	30	66	33	295	28.5	29.5	
	Percentile	66	68	50	57	52	43	60	62	73	63		61	59.4	
	Activity level	M/H	M/H	M	M	M	M	M/H	M/H	M/H	M/H				M/H
Common pipistrelle	Passes	13	9	0	1	2	1	2	8	39	6	81	4	8.1	
	Percentile	50	43	0	20	27	20	27	41	66	39		33		L/M
	Activity level	M	M	L	L	L/M	L	L/M	M	M/H	L/M				
Soprano pipistrelle	Passes	4	5	3	0	1	0	1	3	6	2	25	2.5	2.5	
	Percentile	35	37	31		20		20	31	39	27		29		L/M
	Activity Level	L/M	L/M	L/M		L		L	L/M	L/M	L/M				
Nathusius' pipistrelle	Passes	0	1	0	0	1	0	0	0	6	1	9	0	0.9	
	Percentile		20			20				39	20				Low
	Activity Level		L			L				L/M	L				

Whiskered	Passes	2	0	0	0	0	0	0	0	0	0	2	0	0.2	
	Percentile														
	Activity level														Low
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	1	0	0	0	0	0	0	0	0	1			
	Percentile														
	Activity Level														Low
Brown Long-eared	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														

No. of species = 6 **Total no. calls = 413**

TABLE A.37 – SUMMER 2020 – Survey Point P

Grid Reference S58731 31996 Site Pasture fields south of anemometer at Turbine 10

		30.6.20	1.7.20	2.7.20	3.7.20	6.7.20	7.7.20	9.7.20	10.7.20	11.7.20	12.7.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	1	3	12	0							16	2	4	
	Percentile	24	43	64	0								33.5		L/M
	Activity level	L/M	M	M/H											
Common pipistrelle	Passes	7	52	5	1							65	6	16.25	
	Percentile	56	87	50	24								53		Moderate
	Activity level	M	H	M	L/M										
Soprano pipistrelle	Passes	0	0	0	1							1	0	0.1	
	Percentile	0	0	0	24								0		Low
	Activity Level				L/M										
Nathusius' pipistrelle	Passes	0	0	0	0							0			
	Percentile														
	Activity Level														

Whiskered	Passes											0			
	Percentile														
	Activity level														
Natterer's	Passes											0			
	Percentile														
	Activity Level														
Daubenton's	Passes											0			
	Percentile														
	Activity Level														
Brown Long-eared	Passes	0	15	39	1							55	8	13.75	
	Percentile												?		
	Activity Level														?

No. of species = 4 **Total no. calls = 137**

Cattle pulled down microphone on night of 3.7.20. No recordings after this date. Used dates 1/7/20 and 3/7/20 to maximise results for this site.

High no. of Brown long-eared calls – this survey point is one field south of BLE roost in ruins

TABLE A.38 – SPRING 2020 – Survey Point Q

Grid Reference S57628 32400 Site: In forestry just west of Turbine 13

		24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	30.4.20	1.5.20	2.5.20	3.5.20	4.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	43	27	11	0	10	1	11	12	88	33	236			
	Percentile	68	60	47	0	44	20	47	49	77	63		48	47.5	Moderate
	Activity level	M/H	M/H	M	L	M	L	M	M	M/H	M/H				
Common pipistrelle	Passes	134	69	27	15	111	0	14	10	75	19	474	23	47.4	
	Percentile	85	73	60	52	82	0	51	44	75	56		58		Moderate
	Activity level	H	M/H	M/H	M	H	L	M	M	M/H	M				
Soprano pipistrelle	Passes	54	90	0	1	18	0	0	78	88	12	341	15	34.1	
	Percentile	71	78	0	20	56			76	77	49		52.5		Moderate
	Activity Level	M/H	M/H		L	M			M/H	M/H	M				
Nathusius' pipistrelle	Passes	1	7	3	0	6	0	0	3	5	1	26	2	2.6	
	Percentile	20	41	31		39			31	37	20		25.5		L/M
	Activity Level	L	M	L/M	-	L/M	-	-	L/M	L/M	L				

Whiskered	Passes	1	0	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile														
	Activity level														Low
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	2	0	7	2	0	0	0	0	0	1	12	0	1.2	
	Percentile											?			
	Activity Level														?
Brown Long-eared	Passes	6	4	1	0	0	0	0	5	1	0	17	0.5	1.7	
	Percentile											?			
	Activity Level														?

No. of species = 7 **Total no. calls = 1,107**

TABLE A.39 – SUMMER 2020 – Survey Point Q

Grid Reference S57628 32400 Site: In forestry just west of Turbine 13

		29.6.20	30.6.20	2.7.20	4.7.20	6.7.20	7.7.20	9.7.20	10.7.20	11.7.20	12.7.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	0	23	22	50	7	18	5	13	17	17	172	17	17.2	
	Percentile	0	76	74	87	56	72	50	65	70	70		70		M/H
	Activity level		M/H	M/H	H	M	M/H	M	M/H	M/H	M/H				
Common pipistrelle	Passes	177	233	372	602	114	289	82	207	290	174	2540	220	254	
	Percentile	96	97	98	100	93	97	91	96	98	95		96.5		High
	Activity level	H	H	H	H	H	H	H	H	H	H				
Soprano pipistrelle	Passes	32	17	57	9	27	14	10	21	16	3	206	16.5	20.6	
	Percentile	81	70	88	60	78	67	61	74	69	43		69.5		M/H
	Activity Level	H	M/H	H	M	M/H	M/H	M/H	M/H	M/H	M				
Nathusius' pipistrelle	Passes	2	4	2	2	4	3	0	6	3	24	50	3	5	
	Percentile	39	47	39	39	47	43	0	63	43	76		43		Moderate
	Activity Level	L/M	M	L/M	L/M	M	M		M	M	M/H				

Whiskered	Passes			1						2		3	0	0.3	
	Percentile														
	Activity level														Low
Natterer's	Passes												0		
	Percentile														
	Activity Level														
Daubenton's	Passes									1		1	0	0.1	
	Percentile														
	Activity Level														Low
Brown Long-eared	Passes												0		
	Percentile														
	Activity Level														

No. of species = 6 **Total no. calls = 2,972**

TABLE A.40 – SPRING 2020 – Survey Point R

Grid Reference S58511 33691 Site: Forestry edge/pasture to east of site at Turbine 16

		23.4.20	24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	2.5.20	3.5.20	4.5.20	6.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	76	415	302	250	102	40	51	289	290	26	1841		184.1	
	Percentile	76	98	94	91	80	66	70	93	93	60		85.5	83.1	High
	Activity level	M/H	H	H	H	H	M/H	M/H	H	H	M				
Common pipistrelle	Passes	120	515	248	175	231	212	195	544	239	121	2600		260	
	Percentile	82	98	91	88	90	89	90	99	90	83		90		High
	Activity level	H	H	H	H	H	H	H	H	H	H				
Soprano pipistrelle	Passes	2	13	11	1	0	6	4	11	8	0	56		5.6	
	Percentile	27	50	47	20		39	30	47	42			34.5		L/M
	Activity Level	L/M	M	M	L		L/M	L/M	M	M					
Nathusius' pipistrelle	Passes	2	13	15	1	17	35	5	22	5	6	121		12.1	
	Percentile	27	50	52	20	55	64	37	59	36	38		44		Moderate
	Activity Level	L/M	M	M	L	M	M/H	L/M	M	L/M	L/M				

Whiskered	Passes	0	0	0	0	0	1	0	0	0	0	1	0	0.1	
	Percentile														
	Activity level														Low
Natterer's	Passes	0	0	0	1	2	0	2	0	2	0	7	0	0.7	
	Percentile														
	Activity Level														Low
Daubenton's	Passes	0	0	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile														
	Activity Level														Low
Brown Long-eared	Passes	4	3	6	0	1	1	1	0	1	0	17	1	1.7	
	Percentile												?		
	Activity Level														?

No. of species = 8 **Total no. calls = 4,644**

TABLE A.41 – SUMMER 2020 – Survey Point R

Grid Reference S58511 33691 Site: Forestry edge/pasture to east of site at Turbine 16

		29.6.20	30.6.20	2.7.20	4.7.20	6.7.20	7.7.20	9.7.20	10.7.20	11.7.20	12.7.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	0	27	1	1	2	31	3	9	7	25	106	5	10.6	
	Percentile	0	78	24	24	39	81	43	60	56	77		49.5		Moderate
	Activity level		M/H	L/M	L/M	L/M	H	M	M	M	M/H				
Common pipistrelle	Passes	52	35	41	3	35	29	29	59	50	33	366	38	36.6	
	Percentile	87	82	84	43	82	80	80	88	87	81		82		High
	Activity level	H	H	H	M	H	M/H	M/H	H	H	H				
Soprano pipistrelle	Passes	0	2	4	0	4	4	5	10	11	17	57	4	5.7	
	Percentile	0	39	47	0	47	47	50	61	63	70		47		Moderate
	Activity Level		L/M	M		M	M	M	M/H	M/H	M/H				
Nathusius' pipistrelle	Passes	6	4	3	2	4	4	3	5	1	0	32	3.5	3.2	
	Percentile	53	47	43	39	47	47	43	50	24	0			45	Moderate
	Activity Level	M	M	M	L/M	M	M	M	M	L/M	0				

Whiskered	Passes	0	1	0	0	0	0	1	3	1	11	17	0.5	1.7	
	Percentile														
	Activity level														Low
Natterer's	Passes	0	1	0	0	0	0	0	1	1	2	5	0	0.5	
	Percentile														
	Activity Level														Low
Daubenton's	Passes	0	1	0	0	0	0	0	1	0	1	3	0	0.3	
	Percentile														
	Activity Level														Low
Brown Long-eared	Passes	0	0	2	0	0	3	0	4	2	1	12	0.5	1.2	
	Percentile											?			
	Activity Level														?

No. of species = 8 **Total no. calls = 598**

TABLE A.42 – SPRING 2020 – Survey Point S

Grid Reference S57408 34054 Site: Pasture at west of site at Turbine 19

		24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	30.4.20	1.5.20	2.5.20	3.5.20	4.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	101	93	71	6	6	4	24	5	16	12	338	14	33.8	
	Percentile	80	79	74	39	39	35	59	37	54	49		51.5	54.5	Moderate
	Activity level	M/H	M/H	M/H	L/M	L/M	L/M	M	L/M	M	M				
Common pipistrelle	Passes	39	32	1	2	3	0	1	2	11	2	93	2	9.3	
	Percentile	66	62	20	27	31	0	20	27	47	27		27		L/M
	Activity level	M/H	M/H	L	L/M	L/M	L	L	L/M	M	L/M				
Soprano pipistrelle	Passes	8	3	0	1	1	0	0	0	0	2	15	1	1.5	
	Percentile	42	31		20	20					27		10		Low
	Activity Level	M	L/M		L	L					L/M				
Nathusius' pipistrelle	Passes	1	2	0	1	0	0	0	1	2	3	10	1	1	
	Percentile	20	27		20				20	27	31		20		Low
	Activity Level	L	L/M		L				L	L/M	L/M				

Whiskered	Passes	1	1	0	0	0	0	0	0	0	0	2	0	0.2	
	Percentile														
	Activity level														Low
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	1	0	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile														
	Activity Level														Low
Brown Long-eared	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														

No. of species = 6 **Total no. calls = 459**

TABLE A.43 – SUMMER 2020 – Survey Point S

Grid Reference S57408 34054 Site: Pasture at west of site at Turbine 19

		29.6.20	30.6.20	2.7.20	4.7.20	6.7.20	7.7.20	9.7.20	10.7.20	11.7.20	12.7.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	13	12	6	13	11	4	2	14	7	4	86	9	8.6	
	Percentile	65	64	53	65	63	47	39	67	56	47		59.5		Moderate
	Activity level	M/H	M/H	M	M/H	M/H	M	L/M	M/H	M	M				
Common pipistrelle	Passes	0	4	19	1	2	32	0	1	2	0	61	1.5	6.1	
	Percentile	0	47	73	24	39	81	0	24	39	0			31.5	L/M
	Activity level		M	M/H	L/M	L/M	H		L/M	L/M					
Soprano pipistrelle	Passes	1	0	0	0	0	1	0	0	1	0	3	0	0.3	
	Percentile	24					24			24			0		Low
	Activity Level	L/M					L/M			L/M					
Nathusius' pipistrelle	Passes	0	0	0	0	0	0	0	0	0	0	0		0	
	Percentile														
	Activity Level														

Whiskered	Passes											0			
	Percentile														
	Activity level														
Natterer's	Passes									1		1	0	0.1	
	Percentile														
	Activity Level														Low
Daubenton's	Passes														
	Percentile														
	Activity Level														
Brown Long-eared	Passes	15	2	26	0	3	5	1	6	2	2	62	2.5	6.2	
	Percentile											???			
	Activity Level														?

No. of species = 5 **Total no. calls = 213**

High no. of Brown long eared calls indicates there is a roost nearby

TABLE A.44 – SPRING 2020 – Survey Point T

Grid Reference S57044 34453 Site: Pasture Fields at Kiltorcan at Turbine 21

		24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	30.4.20	1.5.20	2.5.20	3.5.20	4.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	361	267	95	42	7	66	268	11	74	91	1282	82.5	128.2	
	Percentile	97	92	79	68	41	73	92	47	75	78		76.5	74.2	M/H
	Activity level	H	H	M/H	M/H	M	M/H	H	M	M/H	M/H				
Common pipistrelle	Passes	172	181	33	5	18	3	7	40	277	53	789	36.5	78.9	
	Percentile	87	88	63	37	56	31	41	66	93	71		64.5		M/H
	Activity level	H	H	M/H	L/M	M	L/M	M	M/H	H	M/H				
Soprano pipistrelle	Passes	8	10	6	0	0	0	0	3	29	8	64	4.5	6.4	
	Percentile	42	44	39					31				35		L/M
	Activity Level	M	M	L/M					M/H						
Nathusius' pipistrelle	Passes	5	3	36	0	1	1	0	0	1	10	57	1	5.7	
	Percentile	37	31	65		20	20			20	44		20		Low
	Activity Level	L/M	L/M	M/H		L	L			L	M				

Whiskered	Passes	1	4	0	0	4	0	0	0	0	1	10	0	0.5	
	Percentile														
	Activity level														Low
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	0	1	0	0	0	0	2	0	0	3	0	0.3	
	Percentile														
	Activity Level														Low
Brown Long-eared	Passes	1	1	2	0	0	0	0	1	1	2	9	1	0.9	Low
	Percentile														
	Activity Level														

No. of species = 7 **Total no. calls = 2,214**

TABLE A.45 – SUMMER 2020 – Survey Point T

Grid Reference S57044 34453 Site: Pasture Fields at Kiltorcan at Turbine 21

		29.6.20	30.6.20	2.7.20	4.7.20	6.7.20	7.7.20	9.7.20	10.7.20	11.7.20	12.7.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	14	12	4	8	22	18	10	11	9	5	113	10.5	11.3	
	Percentile	67	64	47	58	74	72	61	63	60	50		62		M/H
	Activity level	M/H	M/H	M	M	M/H	M/H	M/H	M/H	M	M				
Common pipistrelle	Passes	17	36	67	6	12	14	16	13	7	20	208	15	20.8	
	Percentile	70	82	89	53	64	67	69	65	56	73		68		M/H
	Activity level	M/H	H	H	M/H	M/H	M/H	M/H	M	M/H	M/H				
Soprano pipistrelle	Passes	1	5	0	10	1	3	0	1	0	0	21	0.5	2.1	
	Percentile	25	50	0	61	24	43	0	24	0	0		24		L/M
	Activity Level	L/M	M		M/H	L/M	M		L/M						
Nathusius' pipistrelle	Passes	1	1	1	0	1	0	0	0	0	0	4	0	0.4	
	Percentile	24	24	24	0	24							0		Low
	Activity Level	L/M	L/M	L/M		L/M									

Whiskered	Passes	0	20	1	6	1	1	0	0	0	0	29	0.5	2.9	
	Percentile														
	Activity level														Low
Natterer's	Passes											0			
	Percentile														
	Activity Level														
Daubenton's	Passes											0			
	Percentile														
	Activity Level														
Brown Long-eared	Passes	0	0	0	0	1	0	1	1	1	0	4	0	0.4	
	Percentile														
	Activity Level														Low

No. of species = 6 **Total no. calls = 379**

TABLE A.46 – SPRING 2020 – Survey Point U

Grid Reference S57861 34733 Site northernmost survey point near Turbine 20

		24.4.20	25.4.20	26.4.20	27.4.20	28.4.20	30.4.20	1.5.20	2.5.20	3.5.20	4.5.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	360	264	122	188	10	132	254	10	33	144	1517	138	151.7	
	Percentile	97	92	83	88	44	84	91	44	63	85		84.5	77.1	High
	Activity level	H	H	H	H	M	H	H	M	M/H	H				
Common pipistrelle	Passes	23	9	1	0	1	4	0	6	10	23	77	9.5	7.7	
	Percentile	59	43	20		20	35		39	44	59		37		L/M
	Activity level	M	M	L		L	L/M		L/M	M	M				
Soprano pipistrelle	Passes	8	1	0	0	1	0	0	2	0	2	14	1	1.4	
	Percentile	42	20			20			27		27		10		Low
	Activity Level	M	L			L			L/M		L/M				
Nathusius' pipistrelle	Passes	3	0	0	0	0	0	0	0	3	3	9	0	0.9	
	Percentile	31								31	31		0		Low
	Activity Level	L/M								L/M	L/M				

Whiskered	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity level														
Natterer's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Daubenton's	Passes	0	0	0	0	0	0	0	0	0	0	0			
	Percentile														
	Activity Level														
Brown Long-eared	Passes	0	1	0	0	0	0	0	0	0	0	1	0	0.1	
	Percentile														
	Activity Level														Low

No. of species = 5 **Total no. calls = 1,618**

TABLE A.47 – SUMMER 2020 – Survey Point U

Grid Reference S57861 34733 Site northernmost survey point near Turbine 20

		29.6.20	30.6.20	2.7.20	4.7.20	6.7.20	7.7.20	9.7.20	10.7.20	11.7.20	12.7.20	Total no. passes	Median	Mean	Overall activity level
Leisler's	Passes	2	6	0	3	17	3	5	16	6	4	62	4.5	6.2	
	Percentile	39	53	0	43	70	43	50	69	53	47		48.5		Moderate
	Activity level	L/M	M		M	M/H	M	M	M/H	M	M				
Common pipistrelle	Passes	0	4	2	0	2	1	0	5	0	1	15	1	1.5	
	Percentile	0	47	39	0	39	24	0	50	0	24			24	L/M
	Activity level		M	L/M		L/M	L/M		M		L/M				
Soprano pipistrelle	Passes	0	2	0	0	1	0	0	1	0	0	4	0	0.4	
	Percentile	0	39	0	0	24	0	0	24	0	0			0	Low
	Activity Level		L/M			L/M			L/M						
Nathusius' pipistrelle	Passes	0	0	0	0	0	0	0	0	0	0	0		0	
	Percentile														
	Activity Level														

Whiskered	Passes					1						1	0	0.1	
	Percentile														
	Activity level														Low
Natterer's	Passes											0			
	Percentile														
	Activity Level														
Daubenton's	Passes		1									1			
	Percentile														
	Activity Level														Low
Brown Long-eared	Passes											0			
	Percentile														
	Activity Level														

No. of species = 5 **Total no. calls = 81**