Appendix 6-2

Bat Report (2019)

Malachy Walsh and Partners
Engineering and Environmental Consultants

Bat Survey Report 2019

Shronowen Wind Farm

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1 SUMMARY

- Passive automated bat surveys were conducted at the site of a proposed wind farm development near Ballylongford, County Kerry, during July 2019.
- The surveys, which were designed to passively sample and record bat activity at 4 pre-selected sampling points (SP) for 11 consecutive nights.
- The following species were recorded within the proposed wind farm site:
    - Brown long-eared bat (*Plecotus auritus*)
    - Common pipistrelle (*Pipistrellus pipistrellus*)
    - Leisler's bat (*Nyctalus leisleri*)
    - Soprano pipistrelle (*Pipistrellus pygmaeus*)
    - Species from the genus *Myotis* were also recorded
- Lesser horseshoe bat (*Rhinolophus hipposideros*) and Nathusius' pipistrelle (*Pipistrellus nathusii*) were not recorded.
- The levels of activity recorded, even at the highest recorded levels, were extremely low and it is concluded that the activity levels recorded are reflective of the normal patterns that pertain at the location.
- The levels of activity recorded were consistent with the Bat Habitat Suitability Index ratings for the site and its surrounds.
- Considering the habitat and development related features of the proposed wind farm and the levels of activity recorded it is concluded that the site is assessed as being intrinsically 'Low' risk and the proposed development should not pose a significant risk to any species of bat.

2 INTRODUCTION

Malachy Walsh and Partners were commissioned by Emerging Markets Power (NI) Ltd., to conduct bat surveys, during the summer of 2019, at the location of a proposed wind farm development at Shronowen Bog near Ballylongford, County Kerry. (Irish Grid Co-ordinates: R 00498 40715).The survey area, outlined in red in **Figure 1**, below, includes the proposed development site and areas adjacent.

Figure 1: Site Location with Development Area boundary in red.

3 COMPETENCY OF ASSESSOR

This report was prepared by Patrick Ryan (BSc Hons, Wildlife Biology), staff ecologist with Malachy Walsh and Partners. He has 10 years' experience in designing, managing and analysing bat activity surveys and has a particular expertise in sonogram analysis. During 2020 he designed and carried out SNH (2019) compliant bat surveys at 10 proposed wind farm development sites which comprised a combined total of 64 sampling points and carried out sonogram and data analysis for each. He has completed numerous ecological assessments for a variety of projects, including wind farm proposals, and is an experienced ecologist with a diverse professional profile spanning the required skills, knowledge, competencies and areas of expertise.

The report has been reviewed by Muiréad Kelly (MSc. BSc.), Senior Ecologist, with Malachy Walsh and Partners. Muiréad has 9 years' experience in ecological surveys and impact assessment for EIA and AA and has authored and contributed to numerous Natura Impact Statements and Ecological Impact Assessments for renewable energy projects.

4 SCIENTIFIC NOMENCLATURE: CONVENTIONS

Species nomenclature follows the standard form of common name, followed by the binomial, on first instance of usage in the text or first instance of usage in a table. Thereafter, for any subsequent usage, common names only are used.

5 BRIEF DESCRIPTION OF THE DEVELOPMENT SITE

The site largely comprises cut over bog (*sensu* Fossitt, 2000), which in its original form was a blanket bog, but which is now substantially cut-over and significantly altered by turf cutting. It is situated within a landscape dominated by agricultural grassland habitats and with some commercial conifer plantations against which the bog itself abuts (see **Figure 2** for Corine Landcover). The topography of the site is essentially flat, albeit, with the slight peat dome that is a characteristic of the lowland bog type. The site is intersected by a network of access tracks of robust construction that, while too rough for cars, are, for the most part, in good condition.

Turbary rights pertain to the entire site and much of the original peat mass has been removed. While a large central area remains relatively uncut, a crisscross network of drains intersects the site and significant proportion of the bog now comprises a mix of exhausted banks or banks that are currently being, or historically have been, worked. A significant effect of the peat extraction is the extent to which the water table across the site has been lowered permanently. Because the water table plays an important role in aerobic and anaerobic processes in a bog, the lowering of the water table within the peat boundary, between the upper aerobic acrotelm (living) layer and the underlying, water-logged and compacted, catotelm (dead) layer, has fundamentally altered the peat forming capacity of Shronowen Bog.

While the dominant current practice is removal of peat by excavator to a hopper from which the peat is then extruded (see **Drone Flown Image 1**, below) there is clear evidence of historic sausage cutting in the eastern part of the site (see **Drone Flown Image 2**, below). **Aerial Image 1**, below, illustrates the extent to which, over time, the peat mass has been removed progressively and incrementally from the edge of the bog to the interior area of the peat mass.

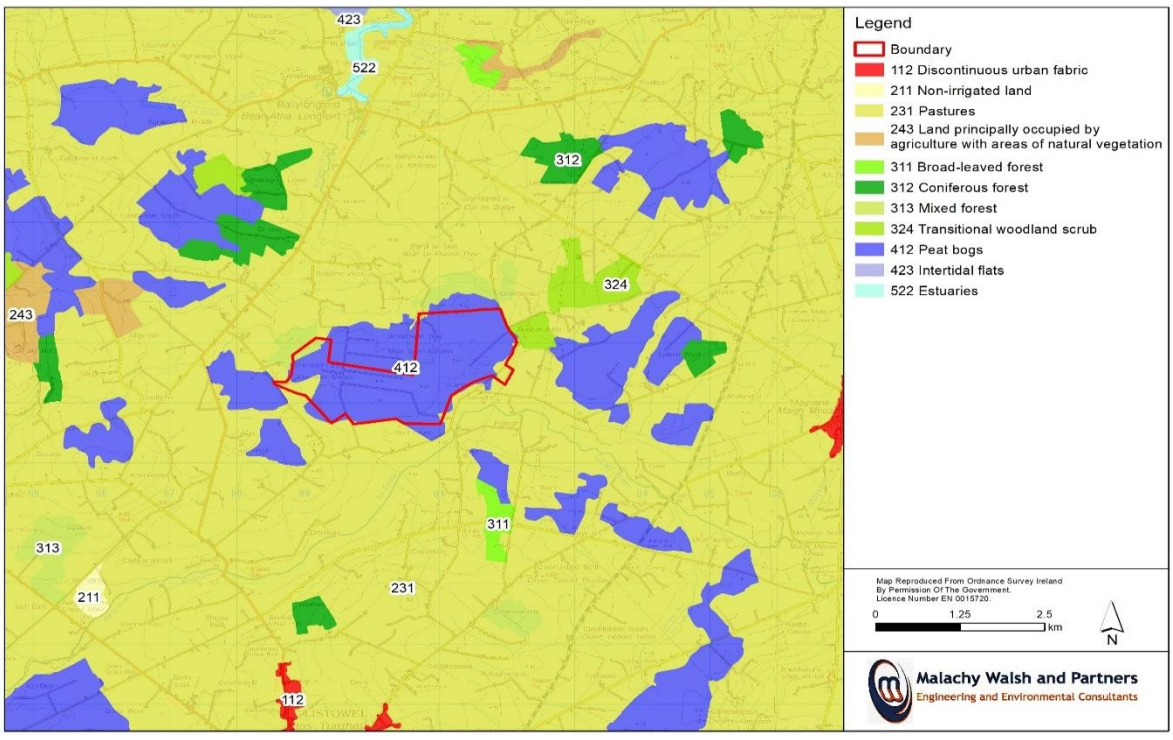
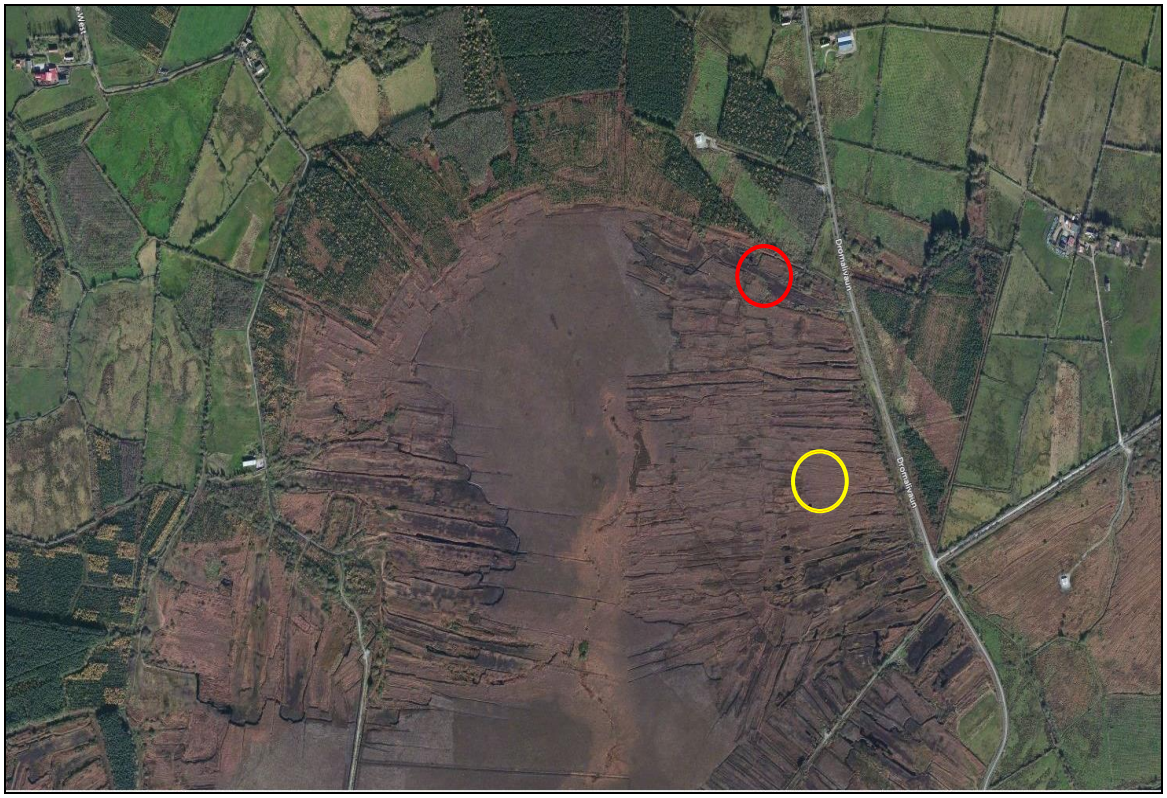


Figure 2: Corine Landcover



Aerial Image 1: Typical view showing distinct signature of turf banks progressing from edge to centre at northern section of Shronowen Bog. (Red circle: approximate location of Drone Image 1; Yellow circle approximate location of Drone Image 2).

Drone Flown Image 1: Extruded turf with excavated bank adjacent (2019)

Drone Flown Image 2: Evidence of historic sausage cutting (*parallel 'scars' aligned left to right*)

The vegetation communities that the bog supports are constrained by the nutrient poor conditions that pertain and the cover currently comprises a relatively uniform and homogenous cover of Purple Moor-grass (*Molinia caerulea*). While heather is present, surveys indicate that it is not a significant component in the overall plant mix. A few isolated treelines are present; these consist primarily of birch (*Betula* spp.) and all are of a relatively low stature with an average canopy height in the region of 5 m. Areas of willow scrub (*Salix* spp.) are also present; however, these are primarily distributed within the transitional marginal habitats that fringe the bog, in the interface areas between the agricultural and commercial forestry habitats and the bog itself. Willow shrub lines also fringe the sides of the tracks in many places. A variety of grasses and ruderal species have colonised the margins along the sides of the tracks where disturbance has disrupted the dominance of the indigenous vegetation that dominates the remainder of the site. A significant proportion of the site comprises bare unvegetated ground which is present in areas where sustained peat extraction has been occurring recently.

While the site is intersected by a network of man-made drains, the only natural water body within the site is an unnamed tributary[1] of the Ballylongford River which drains from a point of origin in the north of the site. Apart from some localised ponding of water in some of the lower lying peat banks no established ponds or other bodies of standing water were noted during the site surveys and none are visible in the range of aerial imagery reviewed[2].While stands of Bulrush (*Typha latifolia*) are present in some trackside drains in the western part of the site, the individual stands are generally small and localised and the distribution within the site is somewhat uneven and diffuse.

In summary the site is, both topographically and ecologically, relatively homogeneous, a characteristic that inhibits species diversity not only in terms of the floristic communities but also in the variety of insect species. The plant communities present comprise low-growing, open vegetation

[1] River Waterbody Code: IE_SH_24B030700 https://gis.epa.ie/EPAMaps/

[2] OSI aerial imagery (1995 to 2012); Google imagery (2017); Bing (undated)

with low plant species richness that lacks the variety and complexity required for high macroinvertebrate productivity and the site lacks the characteristics synonymous with high value foraging, roosting or breeding habitats for any bat species.

6 PURPOSE OF THE SURVEYS

The surveys were undertaken to establish the extent of bat activity at the proposed wind farm site during 2019 and the results of the survey, outlined in this report, will form the basis for the assessments of the potential impacts on bat species in the event that the proposed wind farm is submitted for assessment under the planning consent process.

6.1 SCOPE OF THE SURVEYS

6.1.1 Static Surveys

4 bioacoustic recorders were deployed from 21/7/2019 to 31/7/2019. The locations where the bioacoustic units were deployed are illustrated in **Figure 3.** The figure illustrates the turbine layout as per the current application.

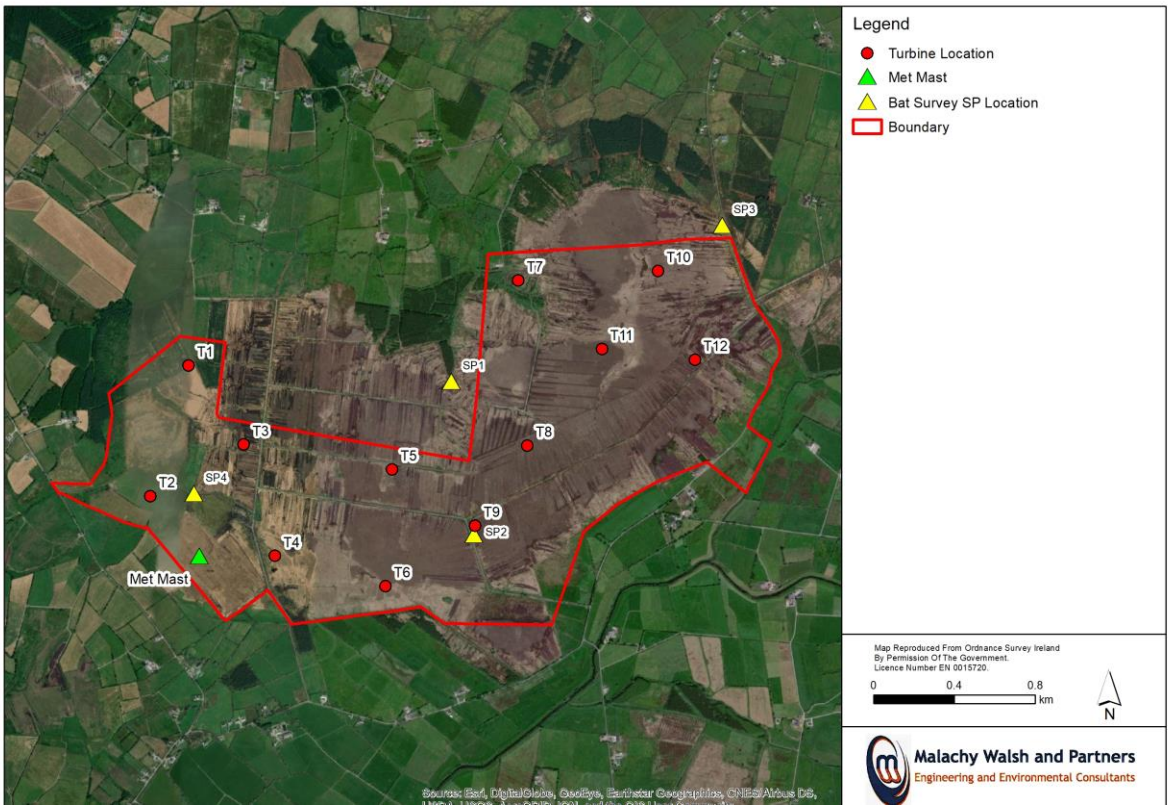


Figure 3: 2019 SP locations

Further details on the survey design are provided in **Section 8.4**, below and the results are presented in **Section 9**, below.

6.1.2 Transect Surveys

Regarding transect surveys SNH (2019) notes that, while they

> *"can be used to complement the information gained from static detectors and other sources…* [t]*heir applicability is discretionary and site-specific."*

Transect surveys were not conducted.

7 BAT SPECIES IN IRELAND

There are 9 resident bat species on the island of Ireland. These species are:

- Brown long-eared bat
- Common pipistrelle
- Daubenton's bat (*Myotis daubentoni*)
- Leisler's bat
- Lesser horseshoe bat
- Nathusius' pipistrelle
- Natterer's bat (*Myotis nattereri*)
- Soprano pipistrelle
- Whiskered bat (*Myotis mystacinus*)

All are insectivores that feed on insects and use a seasonal feeding strategy to help build fat reserves during the summer and autumn, prior to their hibernation during winter - a time, generally, when insects are not available. Most hunt flying prey, but some species, e.g., lesser horseshoe bat or Daubenton's bat, glean their prey from surfaces of leaves or water on which the prey have alighted.

All hibernate during winter and typically become active in late spring and early summer. As the days and nights warm up each species flies out to forage for insects for progressively longer periods at night. Around late June or early July pregnant females give birth to one offspring which feeds on its mother's milk for 6-7 weeks at which point it is able to fly and learns to echolocate and to catch its own prey. Mating takes place from August onwards; the female retains the sperm throughout the winter but does not ovulate and become pregnant until spring the following year. The onset of hibernation, which takes place from October/November onwards, begins once temperatures drop and insect prey abundance drops.

7.1 LEGAL AND CONSERVATION STATUS OF BAT SPECIES IN IRELAND

All Irish bat species are protected under the Wildlife Acts (1976 to 2018)[3] and by the Habitats Directive[4] which protects rare species, including bats, and their habitats. All bat species are listed in Annex IV of the Habitats Directive as species protected across their entire natural range and the lesser horseshoe bat is further listed, under Annex II, as a species for which core areas of their habitat must be protected within the Natura 2000 network of protected sites.

Across Europe bats are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild

[3] Collective citation for the following: Wildlife Act 1976 (no. 39 of 1976); Wildlife (Amendment) Act 2000 (no. 38 of 2000); Wildlife (Amendment) Act 2010 (no. 19 of 2010); Wildlife (Amendment) Act 2012 (no. 29 of 2012) and Heritage Act 2018 (no. 15 of 2018), Part 3.

[4] Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora enacted in Ireland as European Communities (Birds and Natural Habitats) Regulations 2011-2015 (Collective citation for the following: S.I. No. 477 of 2011, S.I. No. 499 of 2013, S.I. No. 355/2015)

Animals (Bonn Convention 1979) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

Under Article 11 of the Habitats Directive, each member state is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and, under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive. In April 2019, Ireland submitted the third assessment of conservation statuses for 59 habitats and 60 species. The current Conservation Status assessments for bat species resident in Ireland are listed in **Table 1**, below; the trend in the Conservation Status for each is included.

Table 1: Overall Assessment of Conservation Status for bat species resident in Ireland (NPWS, 2019)

Species	Overall assessment of Conservation Status	Overall trend in Conservation Status
Brown long-eared bat	Favourable (FV)	Improving
Common pipistrelle	Favourable (FV)	Improving
Daubenton's bat	Favourable (FV)	Improving
Leisler's bat	Favourable (FV)	Improving
Lesser horseshoe bat	Unfavourable-Inadequate (U1)	Deteriorating
Nathusius' pipistrelle	Unknown (X)	N/A
Natterer's bat	Favourable (FV)	Stable
Soprano pipistrelle	Favourable (FV)	Improving
Whiskered bat	Favourable (FV)	Stable

7.2 HABITAT ASSOCIATIONS

Bats in Ireland feed exclusively on insects and, in the summer, they generally emerge from their roosts at dusk to feed. While the distances covered while foraging varies considerably between individual species, all are known to use several different foraging sites in the same night and to move between them to locate areas of high insect density.

The interplay between habitat mix, environmental conditions, topography, elevation, and availability of prey is a key determinant of whether a location is suitable for bats as is the distance between roosts and the location in question. Because bats preferentially select certain habitats and avoid others, each species has a strong association with different habitat types to which they exhibit a high level of site loyalty and will frequently return to the same foraging sites night after night (Entwhistle *et al.*, 2001). Because bats are colonial mammals, intergenerational learning is a fundamental characteristic of their biology and one that tends to reinforce site loyalty such that foraging grounds are frequented for periods of years or even decades. As was noted in **Section 7** juvenile bats hunt independently within weeks of birth and, therefore, acquire knowledge of foraging sites before their first hibernation period. Reliability of supply of prey biomass is foundational to each species' capacity to maintain populations at viable levels (in this regard see content on metabolic constraints in **Section 7.3**).

Table 2, below, lists and ranks, in order of precedence, the relative importance to bat species of certain landscape features that bats use as they roost, commute and hunt. They use hunting grounds - foraging habitats - to find food and commuting habitats to travel. Bog habitat of the type, which is

dominant at the proposed development site, while used by foraging bats, is less favoured than other habitat types and is, generally, avoided by all Irish species (Lundy *et al*., 2011).

Table 2: Landscape features of importance to bat species

Features of high importance	Features of medium importance	Features of low importance
Underground sites	Improved pasture	Intensive arable
Buildings with high bat roost potential	Drainage ditches	Dense urban, particularly lit areas
Broadleaved woodland and scrub	Walls and fences	
River valleys	Minor roads (no hedges)	
Small field systems with low intensity pasture	Exposed upland sites	
Tree lines and hedgerows	Coniferous woodland	
Bridges and structures with high bat roost potential		

(Adapted from the UK Department of Transport's Interim Advice Note 116/08 Nature Conservation Advice in Relation to Bats)[5]

7.2.1 Distribution of Prey

At any location the abundance of flying insects is heavily influenced by, *inter alia*, wind speed (Møller, 2013). Small insects generally tend to settle in areas with low wind speeds as control and manoeuvrability of flight is optimised where wind speeds are lower than the insect's flight speed (Pasek, 1988). Therefore, within any established foraging ground, existing windbreaks such as tree lines, vegetated field or roadside boundaries, and woodland edges create sheltered corridors where concentrations of insects accumulate leeward of these windbreaks particularly in comparison with adjacent unsheltered areas. Within these sheltered corridors the patterns of distribution will be affected by wind speed, angle of incidence of the wind, permeability of the windbreak, turbulence, vegetative composition, and source of insects (windbreak, local fields, upwind sites) (Pasek, 1988).

7.3 METABOLIC CONSTRAINTS

Two fundamental behavioural characteristics impose a high metabolic cost on all bat species – flight and the use of acoustic signalling to navigate, hunt and communicate. As true fliers, rather than gliders, bats use flapping flight which is one of the most expensive activities in terms of metabolic cost (Winter *et al*., 1998); the metabolic costs of acoustic signalling are about eight times that of the silent animal (Ophir *et al.*, 2010), and the cost of echolocation can be even higher. As a group, therefore, bats have evolved to favour minimal mass because of the energetic demands of flight, hunting and communication.

The wing of a bat resembles a modified human hand with a flexible skin membrane that extends between each long finger bone and it is the many movable joints that make bats agile fliers. Because of the thin wing membrane, flying during the heat of the day could be hazardous causing excessive absorption of heat and resulting in dehydration and possible heat prostration. Nocturnality offers protection from the heat and helps bats maintain body temperature and moisture. It also affords protection from aerial predators most of which hunt during the day.

[5] Available at http://www.dft.gov.uk/ha/standards/ians/pdfs/ian116.pdf

Even though they share the characteristics of all mammals - hair, regulated body temperature, the ability to bear their young alive, and to nurse them; bats are the only mammals to truly fly. Flying consumes so much energy that each female bat is only able to produce a single off-spring each year and a bat typically will need to consume about 1/3 of its own body weight in food per night; a common pipistrelle, for example, can eat over 3,000 insects in a single night. As insectivores, bats in Ireland feed on arthropods which contain the energy-rich carbohydrate chitin, which is indigestible for the typical mammalian gastrointestinal tract. However, European vespertilionid bat species have evolved an enzymatic adaptation (acidic mammalian chitinase) which enables them to digest the chitin present in their primary source of food to optimize resource use and energy intake (Strobel *et al.* 2013[6]).

This aspect of their ecology, this high metabolic demand, is a key determinant in the foraging strategies of all bat species. Speculative foraging carries too low a risk/reward ratio in that the metabolic cost of flight, and echolocation, are so high that bats will seek out locations that have previously rewarded energy cost inputs. This aspect of their behaviours is demonstrated by the previously mentioned high level of site loyalty exhibited by bat species and the repeated return to the same foraging sites night after night (Entwhistle *et al*., 2001). In addition, because the cost of flight increases with decreasing body size, de Jong (1994 cited in Erickson *et al*., 2003) hypothesized that smaller bats with slower flight could be restricted from using habitats where insect abundance was low and long-distance foraging flights were required. Strong winds can increase the cost of flight and can affect the net energy gain for foraging adults (Weimerskirch *et al*., 2012; cited in Møller, 2013).

Differences in activity on different nights could be the result of climatic conditions, insect availability or morphological differences between species. Cooler and windier nights tend to suppress flight activity of bats (Anthony *et al.*, 1981; O'Farrell, 1967; Stebbings, 1968; cited in Erickson *et al*., 2003) by imposing thermoregulatory stress and by reducing the activity of their insect prey.

7.4 AUDIO SIGNATURE

Because they have evolved to be active in the dark, bats use echolocation, a form of acoustic signalling for sensing the environment and to orientate and forage at night. It is these signals that were detected and recorded during the surveys described in this report. Echolocation involves the production of pulses of high frequency sound, usually in the ultrasound range above 20 kHz and the detection of the returning echoes with acutely sensitive ears. By comparing the outgoing pulse with the returning echoes — which are modified versions of the outgoing pulse — their brains can assemble dynamic images of the surroundings including the size, shape, distance, and motion of their prey the location of which can be determined, in three dimensions, from its range and direction (Jones, 2005).

Each species uses echolocation in an individualised manner adapted to its preferred habitat and flight behaviour. Species that fly high emit signals over a long range, i.e., long signals that sweep through a narrow spectrum, which enable them to retrieve information from long way ahead. Conversely species that hunt where obstacles are likely to be quite near do not need to emit intense pulses because of proximity.

[6]Strobel *et al.* (2013) included analyses of, *inter alia*: common pipistrelle, brown long-eared, Natterer's, Daubenton's and Leisler's bats all of which are vespertilionid bat species resident in Ireland.

7.5 SPECIES DETECTABILITY

The detectability of a species depends mainly on 2 factors:

- the abundance of the species and its ubiquity in the area surveyed;
- the intensity of its echolocation signals.

As a result, the probability of acoustic detection varies from species to species and this probability is also influenced by the acuity of the microphones in the units used for detection. Each species' Intensity of emission is characterised in **Table 3**, below; the detection range is included.

Table 3: Intensity of emission and detection range (open to semi-open environment)

Intensity of emission	Species	Detection range (m)
Very weak	Daubenton's bat	15
	Natterer's bat	15
	Lesser horseshoe bat	5
	Whiskered bat	10
Medium	Brown long-eared bat	20
	Common pipistrelle	25
	Nathusius' pipistrelle	25
	Soprano pipistrelle	25
Strong	No species in this category are resident in Ireland	N/A
Very strong	**Leisler's bat**	**80**

[Adapted from Barataud (2020)]

8 SURVEY METHODOLOGY

8.1 CONSTRAINTS

- Surveyors did not have permission to access any lands outside the client's control. However, this did not impose a significant constraint on sampling as these lands comprise, almost exclusively, agricultural grassland habitats and it is expected, in light of the methodologies that were used, that the typical species associated with the proposed development site and its surrounds would be detected during the surveys.

- SNH (2019 stipulates that

  > *Survey effort should be focused in those parts of the development site where turbines are most likely to be located. …..and where the proposed turbine locations are known, static detectors should be placed ….. at or close to these points*.

  However, as, at the survey design stage, neither the final number of turbines nor their locations were known it was concluded, based on professional judgement and expertise, that, in order to collect robust baseline data, the bioacoustic units should be located as described, in detail, in paragraph 2 of **Section 8.4.2** and in **Table 9**, below.

- There are three species of the genus *Myotis* resident in Ireland namely, Daubenton's bat, whiskered bat, and Natterer's bat. Because the sonograms generated by recordings of the

calls of these species cannot reliably be identified to species level based on sonogram analysis alone, any calls attributed to the genus are specified as *Myotis* spp. in this report.

8.2 DESK STUDY

A desk study was carried out to collate available information on the bat species likely to be present. This comprised a review of the following publications, datasets and on-line resources:

- *The Status of EU Protected Habitats and Species in Ireland* (NPWS, 2019)
- OSI Aerial photography and 1:50000 mapping
- National Parks and Wildlife Service (NPWS)
- Bat Conservation Ireland publications and website
- National Biodiversity Centre (NBDC) (on-line map-viewer)
- Aerial imagery available at Google Earth and Bing Maps
- Other information sources and reports footnoted in the course of the report

8.2.1 Data Base Search

8.2.1.1 Bat Habitat Suitability Index

The National Biodiversity Data Centre's online mapper[7] includes a Bat Habitat Suitability Index (BHSI) layer derived from an analysis of the habitat and landscape associations of Irish bats compiled in Lundy *et al.* (2011). The index evaluation ratings range from 0 to 100 with 0 being the least favourable and 100 the most favourable for bats. Index evaluations are available for each individual species and an overall rating is also available for all species in combination. As the ratings are mapped to a 2 km grid square resolution multiple ratings are available for areas that extend beyond this 2 km scope. In order to ensure that the BHSI ratings for the proposed wind farm site and its surrounds are fully described, the reference area, to which the indices listed in **Table 4** and **Table 5**, below, relate, comprise the proposed wind farm site, lands immediately adjacent and the wider geographical area[8]. With regard to the area within the proposed wind farm site, as can be seen from the ratings listed in **Table 4**, below, not only is the overall habitat suitability rating for all bat species very low, only soprano pipistrelle and brown long-eared bat have a rating above 30, and, while Daubenton's bat, Leisler's bat and common pipistrelle have a rating above 20, the remainder of the species have ratings below this level - a clear indication that the site is evaluated, by the BHSI criteria, as, in effect, having little or no potential value for these species.

Table 4: BHSI Ratings

Species	Rating
All bats	20.44
Nathusius' pipistrelle (*P. nathusii)*	9
Whiskered bat (*M. mystacinus)*	9
Daubenton's bat (*M. daubentonii*);	22
Natterer's bat (*M. nattereri)*	18
Common pipistrelle (*P. pipistrellus*);	29
Leisler's bat (*N. leisleri*)	26

[7] https://maps.biodiversityireland.ie/Map

[8] The 40 km^2 area encompassed within hectads Q93, Q94, R03 and R04.

Soprano pipistrelle (*P. pygmaeus*)	34
Brown long-eared bat (*P. auritus)*	31
Lesser horseshoe bat (*R. hipposideros*)	6

The BHSI ratings for hectads Q93, Q94, R03 and R04 are listed in **Table 5**, below. The ratings from said table that fall within different data classes are listed in **Table 6**, below, and the percentages of the total that fall within different data classes are included. As can be seen from these tables, while there is a degree of variation in the ratings listed, the area encompassed within the 4 hectads is, quite consistently, of relatively low value to bats of all species. Only 5.6% of the ratings across this considerable expanse of the landscape, that surrounds the proposed wind farm site, are above 40 and 62.3% have a rating below 30. These ratings, while not predictive, provide meaningful metrics that characterise the probable value of the area within and surrounding the proposed wind farm site to bat species and are an indicator as to the likelihood that different bat species are, or are not, likely to, typically, be a significant presence in the area within and around the site. This likelihood then, in turn, indicates the probability that bats may use the proposed development area. In this regard see **Section 7.2**, above.

Table 5: BHSI Ratings for 4 hectads encompassing proposal site and surrounds

Species	Suitability Index Rating								
	Q94		RO4		Q93			R03	
All bats	17.67	31	21.11	30.33	20.56	28.56	25.44	21.11	23.33
Nathusius' pipistrelle	11	26	12	31	3	3	2	3	2
Whiskered bat	4	14	8	19	9	20	11	7	12
Daubenton's bat	17	28	23	24	30	30	34	23	25
Natterer's bat	16	31	18	29	20	28	26	19	22
Common pipistrelle	27	36	31	34	30	40	35	32	35
Leisler's bat	23	36	27	34	28	39	34	29	32
Soprano pipistrelle	31	41	35	40	35	44	40	37	38
Brown long-eared bat	25	42	31	43	33	45	39	33	36
Lesser horseshoe bat	5	25	5	19	7	8	8	7	8

Table 6: BHSI Ratings from Table 4 within data classes

Data Class (1)	Number	%	Data Class (2)	Number	%
0 - 1	0	0	**0 - 10**	16	17.8
2 - 5	8	8.9			
6 - 10	8	8.9			
11 - 15	5	5.6	**10 - 20**	14	15.6
16 - 20	9	10.0			
21 - 25	12	13.3	**20 - 30**	26	28.9
26 - 30	14	15.6			
31 - 35	19	21.1	**30 - 40**	29	32.2
36 - 40	10	11.1			
41 - 45	5	5.6	**> 40**	5	5.6

8.2.2 Initial Site Risk Assessment

In order to characterise potential risks that may exist at the site SNH (2019) recommends that an Initial Site Risk Assessment (ISRA) of site-based risk factors be carried out. This ISRA, which comprises an evaluation of the site's risk level, is based on a consideration of the habitat and development related features of the proposed wind farm site. Using the risk criteria outlined in **Table 7**, below, the proposed wind farm site is evaluated as 'Low' risk.

Table 7: Initial Site Risk Assessment

Habitat Risk	Project Size		
	Small	Medium	Large
	Site Risk Level		
Low	1[9]	2	3
Moderate	2	3	4
High	3	4	5

Habitat Risk Level	
Habitat Risk	**Description**
Low	• Small number of potential roost features, of low quality. **NO ROOST FEATURES** • Low quality foraging habitat that could be used by small numbers of foraging bats. **YES** • Isolated site not connected to the wider landscape by prominent linear features. **YES**
Moderate	• Buildings, trees or other structures with moderate-high potential as roost sites on or near the site. **NO** • Habitat could be used extensively by foraging bats. **NO** • Site is connected to the wider landscape by linear features such as scrub, tree lines and streams. **YES**
High	• Numerous suitable buildings, trees (particularly mature ancient woodland) or other structures with moderate-high potential as roost sites on or near the site, and/or confirmed roosts present close to or on the site. **NO** • Extensive and diverse habitat mosaic of high quality for foraging bats. **NO** • Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows. **NO** • At/near edge of range and/or on an important flyway. **NO** • Close to key roost and/or swarming site. **NO**
Project Size Risk Level	
Project Size	**Description**
Small	• Small scale development (≤10 turbines). **NO** • No other wind energy developments within 10 km. **NO** • Comprising turbines <50 m in height. **NO**
Medium	• Larger developments (between 10 and 40 turbines). **YES** • May have some other wind developments within 5 km. **YES** • Comprising turbines 50-100 m in height. **NO**
Large	• Largest developments (>40 turbines) with other wind energy developments within 5 km. **NO** • Comprising turbines >100 m in height.). **YES**

[9] Key: (1-2) - low/lowest site risk; (3) - medium site risk; (4-5) - high/highest site risk

8.3 SITE INVESTIGATION

The desk top included a preliminary assessment of the availability of landscape features of importance to bats within the proposed development site and/or that connect it to the geographical area extending away from it.

This initial assessment was supplemented by a ground truthing daytime survey conducted when the remote survey bioacoustic units were deployed. During the ground truthing surveys an assessment of the potential value to foraging bats of the existing habitats and features was made. Given the generally open and flat character of the site and surrounding landscape, particular attention was paid to the presence of linear features within the site that connected the site to the surrounding hinterland. The habitat mix present within the proposed development's agricultural hinterland, the presence of linear landscape features and the types of land use was noted. The purpose of this daytime survey was to ensure that the locations of the remote bioacoustic units would intersect with a habitat mix that was representative of the proposed wind farm site and would, therefore, accurately sample the activity of any bat populations present. When determining which landscape features were of importance to bat species, cognisance was taken, during both the desk top and ground truthing assessments, of the criteria listed in

above, of NRA (2006a and 2006b), Collins (2016) and of the UK Department of Transport's Interim Advice Note 116/08[10].

This initial assessment was also informed by knowledge of the site and its surrounds accumulated over repeated visits to the site during the course of ecological and bird surveys, by bat surveys and assessments conducted previously by MWP in areas adjacent to the proposed wind farm site and by a range of ecological surveys and assessments completed by MWP in the locality.

8.3.1 Preliminary Bat Roost Survey (Visual Daytime Search)

The preliminary bat roost survey was conducted per Aughney *et al.* (2008) and Collins (2016) and was cognisant of criteria include in Kelleher *et al.* (2006) (see **Table 8**, below). Routes were driven in daylight hours to determine if suitable roost habitat sites such as old farmyard buildings or derelict houses were available or present within/adjacent to the site. The proposed development site comprises open habitats and is devoid of dwellings or suitable mature broadleaf trees such as beech, willow, oak or ash. While bats will use suitable conifer trees for roosting, the tree species within the adjacent commercial conifer plantations do not typically form cavities that would be suitable for bats. This is very much the case at Shronowen where the uniform growth form of the relatively young trees that dominate the conifer blocks, and the lack of damage to them, militate against any likelihood that bats can use them as roost sites.

Table 8: Species associations with roost types

Species	Trees		Buildings		Underground	
	Maternity	Hibernation	Maternity	Hibernation	Maternity	Hibernation
Lesser horseshoe bat	L	L	H	M	L	H
Daubenton's bat	M?	L?	M	L	M?	H
Whiskered bat	M?	M?	H	L	N	H
Natterer's bat	M?	M?	H	L	L	H

[10] 'Nature Conservation Advice In Relation To Bats'(Available at http://www.dft.gov.uk/ha/standards/ians/pdfs/ian116.pdf

Species	Trees		Buildings		Underground	
Nathusius' pipistrelle			H?			
Common pipistrelle	M	M	H	H	N	L
Soprano pipistrelle	M	M	H	H	N	L
Leisler's bat	M	M	H	L	N	N
Brown long-eared bat	H	H	H	H	N	M

Trees- includes all types of crevice and hollow as well as bat-boxes attached to trees.
Buildings – above-ground areas, with an emphasis on roof voids and other areas warmed by the sun.
Underground – anywhere that provides cool humid conditions buffered against rapid temperature change. Includes caves, mines, tunnels, souterrains, fortifications, cellars, ice-houses, lime-kilns etc.

N – not recorded in recent times
L- low dependence; unusual, but has been recorded
M – some usage recorded, though perhaps not the most important type of site
H – the most frequently recorded type of site for this species/activity

Species associations with roost types (adapted from Kelleher *et al.* 2006)

8.4 FIELD SURVEY DESIGN

8.4.1 Guidance

In January 2019, Scottish Natural Heritage (SNH) published an updated interim guidance document (SNH, 2019) providing advice and information on what that body considered to constitute best practice for developers, planners and consultants in the UK. The guidance was intended to replace the previous guidance on the subject and it tailored the generic Eurobats guidance, which informs assessment of the impact of wind turbines on European bats (Rodrigues *et al.* 2014), to the UK.

While cognisance of SNH (2019) was taken when designing the survey for the Shronowen site, the specific circumstances at the proposed wind farm site and the extensive in–house experience of bat surveys were given equal weight in the design of said survey.

SNH (2019 stipulates that:

> *Survey effort should be focused in those parts of the development site where turbines are most likely to be located. …..and where the proposed turbine locations are known, static detectors should be placed ….. at or close to these points*.

However, as, at the survey design stage, neither the final number of turbines nor their locations were known it was concluded, based on professional judgement and expertise, that, in order to collect robust baseline data, the bioacoustic units should be located as described, in detail, in paragraph 2 of **Section 8.4.2** and in **Table 9**, below.

8.4.2 Characteristics of the Proposed Development

The proposed wind farm development is situated in an area that is largely homogenous in terms of its habitat composition and undifferentiated in terms of its potential value to bats. There is little in the way of variation in terms of topography, exposure or proximity to, or availability of, biodiversity rich areas capable of supporting high levels of insect prey biomass and, as described previously in **Section 5**, above, the site generally lacks the ecological and landscape characteristics synonymous with high levels of bat activity and both the specific location of the proposed site and the

geographical area extending away from it which are evaluated as being of low suitability for bats (see **Section 8.2.1.1**, above).

In light of all these characteristics of the proposed wind farm site, the locations of the bioacoustic unit Sampling Points (SP) were chosen on the basis of their proximity to potential access routes to the site or to the presence of shelter in circumstances where the ground flora was more diverse, even marginally so, than the surrounding bog habitat. The locations were also chosen in the expectation that, should bats be present, detectable levels of activity were reasonably foreseeable at the selected SP locations, particularly in light of the fact that bats are known to exhibit a high level of site loyalty and will frequently return to the same foraging sites night after night (Entwhistle *et al*., 2001). This characteristic of the SP locations also increased the probability that any species with a habitual presence in the survey area would, at some point, be encountered at the sampling locations. Details of the characteristics of the SP locations are summarised in **Table 9**, below.

8.4.3 Passive Automated Bat Surveys (PABS)

Passive Automated Bat Surveys (PABS) designed to passively sample and record bat activity at 4 pre-selected sampling points (SPs) were carried out from 21/7/2019 to 31/7/2019, inclusive. Song Meter[11] bioacoustic recording units were deployed at the SP locations shown in **Figure 4**, below.

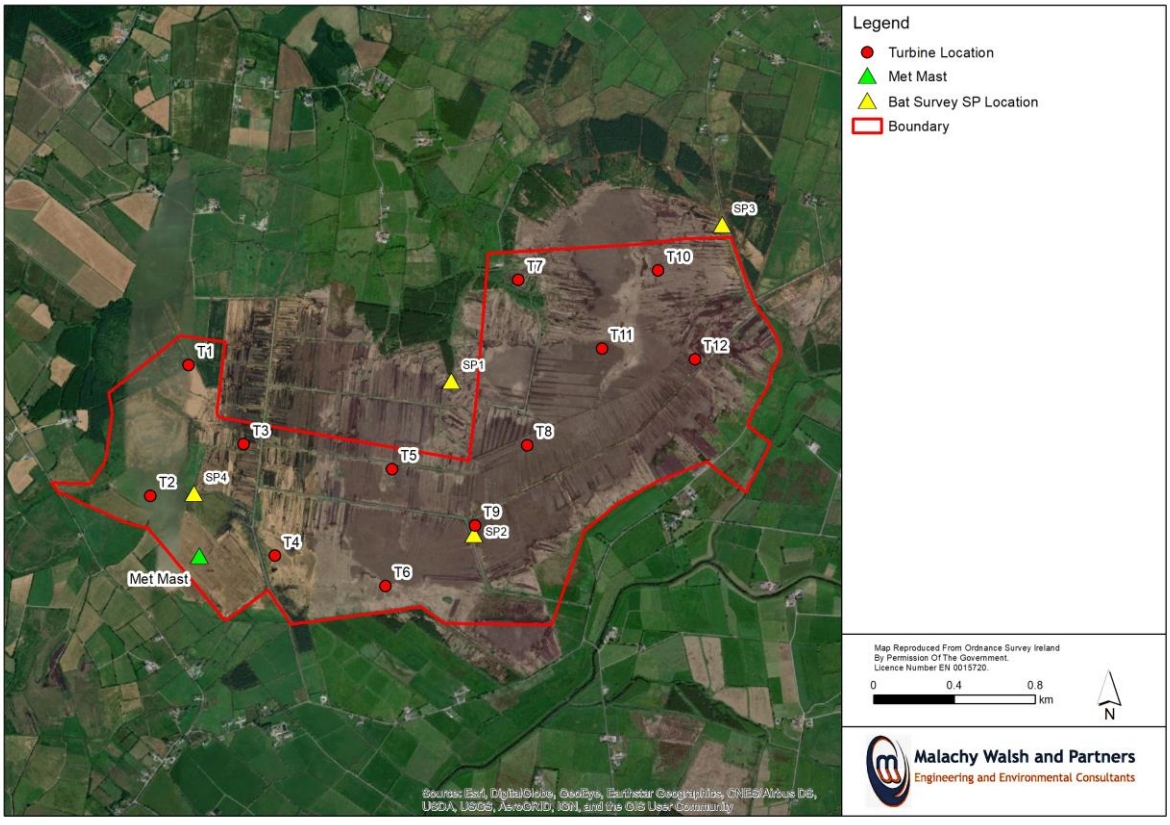


Figure 4: SP locations

The units were programmed to begin recording a half an hour before sunset each evening and to continue until half an hour after dawn the next morning. Prior to deployment the latitude, longitude and time zone for each survey location was inputted to each unit and each then automatically

[11] SMZC manufactured by Wildlife Acoustics Ltd.

determined the times of dawn and dusk, thereby, reducing the likelihood of operator error. Calls emitted by bats that passed within the detecting range of the units, between the hours of sunset and dawn, were recorded and their calls stored for later analysis. Each unit has an omnidirectional microphone that detects bat ultrasonic calls and each unit can record and store data on internal SD cards.

The total numbers of calls by each species recorded at each SP are provided in **Table 10**, **Section 9.1**, below, and further details are provided in subsequent tables in **Sections 9.1.1** to **Section 9.1.3** inclusive, below.

8.4.3.1 Characteristics of Sampling Points (SP)

The characteristics of the Sampling Points, all of which are situated approximately 30 m AOD[12], are summarised in **Table 9**, below.

Table 9: Characteristics of SP locations

SP	Irish Grid	Habitat Type/Characteristics	Structure	Diversity of Ground Flora
1	R 00514 40854	Cutover bog (active) with closed canopy conifer and large bracken stand adjacent. Bare soil dominant due to recent turf harvesting. Connected to areas extending to north and north west of the wind farm site by woodland edges and by field boundary/hedgerows that extend into the hinterland.	Open but shelter in lee of closed canopy conifer.	Absent at location but, somewhat, diverse ground flora in area adjacent to north east.
2	R 00626 40096	Cutover bog (inactive) with birch dominated tree line and bog access track contiguous to the west. Vegetated ground with dwarf shrub height heather dominant. Connected to areas extending to south by diffuse roadside hedgerow that connects to the system of field boundary/hedgerows that extend into the agricultural hinterland.	Open but some degree of shelter in lee of birch tree line.	Poor.
3	R 01853 41626	Interface between areas of active and inactive cutover bog. Local road and closed canopy adjacent. Connected to areas extending north and north east of wind farm site by field boundary/hedgerows that bound local road and by edges of conifer blocks.	Open but some degree of shelter from contiguous gorse and willow scrub and from close canopy conifer adjacent.	Moderate.
4	Q 99243 40299	Field boundary fence line with field drain. Recently mown agricultural grassland adjacent to the west. Cutover bog (inactive) adjacent to the north. Wet grassland dominated rough grazing adjacent to the south. Connected to field boundary hedgerows that extend into wider landscape.	Open.	Moderate/Good.

[12] Above Ordnance Datum

8.4.4 Transect Surveys

Limitations pertain to transect surveys in that, while they *"can be used to complement the information gained from static detectors and other sources. Their applicability is discretionary and site-specific."* (SNH, 2019).

In light of these limitations on the value of transect survey data and having due cognisance of the characteristics of the site and surrounds (Sections **5** and **8.2.1.1**, above), and because, during lengthy transects carried out previously, by the surveyor, in areas adjacent to the proposed wind farm development site, very few bats were encountered, transect surveys were not conducted.

8.4.5 Sonogram Analysis

Post survey, the sound files were converted, using a proprietary software[13], to produce sonograms (graphs of the sound recorded). As each species has a unique audio signature, the sonograms, or graphs, can be used to distinguish between one species and another. Using their training and experience of sonogram analysis MWP ecologists used the software to eliminate all data files that were not generated by bats. Once an individual call is identified the recording is labelled using tools available in the software.The species identification was carried out by a senior ecologist who has extensive experience of, and expertise in, sonogram analysis.

Not every call emitted by a bat is the echolocation call that is characteristic of the species in question. Many bat species use differently structured echolocation calls, adapted to their habitat structure or foraging situation (Miller & Degn, 1981; Fenton, 1987; Rydell, 1990; Kalko, Schnitzler & Schnitzler, 1993; Jones, 1995 cited in Pfalzer *et al.,* 2003). In addition to echolocation calls bats use 'social' calls which are differentiated from echolocation calls by their solely communicational function. Pfalzer *et al.* (2003) categorise these into 4 types, as follows, squawk, trill (repeated), cheep (curved) and song (complex). While these can readily be attributed to bats they cannot be used to differentiate between species. In this report any calls that match the parameters outlined in the preceding sentences are designated as unidentified. Sonograms of this category are shown in the various tables under the column heading 'NoID'.

9 RESULTS

9.1 STATIC SURVEY

9.1.1 Species Recorded

Sonogram analysis of the 2019 survey data determined that the following species were present at the SP locations within the proposed wind farm site:

- Brown long-eared bat.
- Common pipistrelle.
- Leisler's bat.
- Soprano pipistrelle.

In addition, species from the genus *Myotis* were also recorded.

[13] Kaleidoscope Pro Software (Manufactured by Wildlife Acoustics Ltd.)

The total numbers of calls of each species recorded at each SP over the course of the survey period are listed in **Table 10**, below. The numbers recorded on each night at each SP are included in **Table 11** to **Table 14** inclusive, below. The nightly averages are included in **Table 15**, below; the hourly averages are included in **Table 16**, below.

A total of 2,255 calls generated by bats, including calls to which a species or genus could not be attributed, were recorded. With 781 calls common pipistrelle was the most frequently recorded species and was so at a rate significantly higher than any other species. At 446 calls, soprano pipistrelle was the next most frequently recorded species and while Leisler's bat (271 calls), bats from the genus *Myotis* (14 calls) and brown long-eared bat (9 calls) were also recorded, these species were recorded in very low numbers particularly the latter two species. These figures equate, respectively, to 34.6%, 19.8%, 12.0%, 0.6% and 0.4% of the total calls recorded. Calls generated by bats to which a species or genus could not be attributed comprised 32.5% of the total.

Table 10: Species' calls: Nightly totals all SPs

SP	*Myotis* spp.	Leisler's bat	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	NoID	Total
1	4	108	118	127	1	179	537
2	5	46	152	69	0	121	393
3	4	79	290	151	2	160	686
4	1	38	221	99	6	274	639
Total	14	271	781	446	9	734	2255
%[14]	0.6	12.0	34.6	19.8	0.4	32.5	

9.1.2 Numbers of Calls Recorded at Individual SPs

The seasonal and annual totals of all bat calls, both those identified to genus and species level and those designated as unidentified,[Error! Bookmark not defined.] that were recorded at each SP are listed in **Table 11** to **Table 14** inclusive, below.

Table 11: SP1

Date	*Myotis* spp.	Leisler's bat	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	NoID	Total
21/7	0	1	0	0	0	0	1
22/7	2	17	24	27	1	33	104
23/7	1	10	11	26	0	25	73
24/7	0	2	1	3	0	0	6
25/7	0	17	18	16	0	21	72
26/7	0	16	6	10	0	20	52
27/7	0	5	18	15	0	20	58
28/7	0	17	18	16	0	32	83
29/7	0	6	7	6	0	16	35
30/7	0	13	12	3	0	6	34
31/7	1	4	3	5	0	6	18
Total	**4**	**108**	**118**	**127**	**1**	**179**	**537**

Table 12: SP2

Date	*Myotis* spp.	Leisler's bat	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	NoID	Total
21/7	0	0	0	0	0	0	0
22/7	0	11	7	5	0	17	40
23/7	1	7	17	6	0	13	44
24/7	0	1	0	2	0	1	4
25/7	1	14	23	19	0	21	78
26/7	0	1	12	8	0	12	33
27/7	1	4	20	6	0	15	46
28/7	0	2	39	14	0	22	77
29/7	2	2	2	0	0	2	8
30/7	0	3	25	8	0	15	51
31/7	0	1	7	1	0	3	12
Total	**5**	**46**	**152**	**69**	**0**	**121**	**393**

Table 13: SP3

Date	*Myotis* spp.	Leisler's bat	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	NoID	Total
21/7	0	0	1	0	0	0	1
22/7	0	9	65	23	0	32	129
23/7	0	5	50	45	1	33	134
24/7	0	1	0	1	0	0	2
25/7	2	7	37	13	0	16	75
26/7	1	9	26	10	0	11	57
27/7	0	9	29	9	1	21	69
28/7	0	12	34	9	0	24	79
29/7	0	8	25	32	0	13	78
30/7	0	14	15	9	0	6	44
31/7	1	5	8	0	0	4	18
Total	**4**	**79**	**290**	**151**	**2**	**160**	**686**

Table 14: SP4

Date	*Myotis* spp.	Leisler's bat	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	NoID	Total
21/7	0	2	0	0	0	1	3
22/7	0	3	10	14	0	42	69
23/7	0	1	20	15	2	42	80
24/7	0	0	2	0	0	0	2
25/7	0	9	8	7	0	16	40
26/7	1	3	18	22	1	37	82
27/7	0	9	49	8	3	43	112
28/7	0	4	55	19	0	29	107
29/7	0	0	0	0	0	9	9
30/7	0	3	28	10	0	19	60
31/7	0	4	31	4	0	36	75
Total	**1**	**38**	**221**	**99**	**6**	**274**	**639**

9.1.3 Average Nightly and Hourly Numbers of Calls Recorded at Individual SPs

The average nightly[15] and hourly[16] numbers of calls recorded of each species for each SP are listed in **Table 15** and **Table 16**, below. The peak average values for each SP are highlighted in green in each table. As can be seen from **Table 15** the nightly rate exceed 20 calls on only 3 occasions and the data in **Table 16** shows all of the average hourly rates were 5 calls or less.

Table 15: Nightly Average

SP	*Myotis* spp.	Leisler's bat	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	NoID
1	0.36	9.82	10.73	11.55	0.09	16.27
2	0.45	4.18	13.82	6.27	0.00	11.00
3	0.36	7.18	26.36	13.73	0.18	14.55
4	0.09	3.45	20.09	9.00	0.55	24.91

Table 16: Hourly Average

SP	*Myotis* spp.	Leisler's bat	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	NoID
1	0.06	1.64	1.79	1.92	0.02	2.71
2	0.08	0.70	2.30	1.05	0.00	1.83
3	0.06	1.20	4.39	2.29	0.03	2.42
4	0.02	0.58	3.35	1.50	0.09	4.15

Table 16, above comprises 24 data points. The numbers and percentages of these data points that fall within different data classes are listed in **Table 17**, below. The largest data class (41%) is 0 to 1, 70% are 2 or less calls per hour and all of the average hourly rates were 5 per hour or less.

Table 17: Average hourly rates: Numbers of data points within each class

Data Class	Number of data points	%
0 - 1	10	41.67
1 – 2	7	29.17
2– 3	4	16.67
3 – 4	1	4.17
4 - 5	2	8.33

10 DISCUSSION

10.1 SUITABILITY OF THE SITE AS BAT FORAGING HABITAT

The site, described in **Section** 5, above, lacks the characteristics that would render it of high potential value as bat foraging habitat and there is little in the way of variation within the habitat structure of the site and, relative to its surroundings, it is less ecologically and structurally diverse than is the case in the geographical area extending away from it. As a result, the site will provide less insect prey biomass than in the agricultural grassland areas that dominate the area extending away from the proposed wind farm site which, in any event, bats are more likely to preferentially select. In addition, because the proposed development site comprises an open and relatively featureless terrain, it is quite exposed and lacks the types of landscape features that would provide habitat connectivity for bats, within the site and between the site and the surrounding landscape, which

[15] Average = total number of calls at each SP divided by 11 survey nights.

[16] In calculating these a nightly duration of 6 hours was used based on sunset to sunrise as per https://www.timeanddate.com/sun/@2961574?month=9&year=2019

bats could use for commuting between roosts and foraging grounds. While forest edges are present that do provide sheltered corridors along which insect prey may accumulate and bats forage, the open and unsheltered character of the majority of the proposal site is entirely lacking in equivalent shelter belts. In this regard see also **Table 2, Section 7.2**, above.

With regard to the area within the proposed wind farm site, as can be seen from the BHSI ratings listed in **Table 4**, above, not only is the overall habitat suitability rating for all bat species very low, only soprano pipistrelle and brown long-eared bat have a rating above 30, and, while Daubenton's bat, Leisler's bat and common pipistrelle have a rating above 20, the remainder of the species have ratings below this level - a clear indication that the site is evaluated, by the BHSI criteria, as, in effect, having little or no potential value for these species.

Of the 90 individual species BHSI ratings listed in **Table 5**, above, that pertain to the 40 km^2 area[17] that encompasses the proposed wind farm site and the extended geographical area surrounding it, only 60 (37.8%) have a rating above 30; of which only 5 (5.6%) are above 40[18]. This characteristic of the location and its extended surrounds is significant in light of the known strong correlation between bat activity and the habitat mix of an area. While this preferential selection behaviour and the tendency towards site loyalty, that are characteristic of bat foraging behaviours (described in **Section 7**, above) do not preclude the occasional use of sub-optimal habitats, they are key determinants in the level of activity at any location and of the frequency or regularity of its occurrence. It is self-evident, if the wider geographical area is of uniformly low value to bats, then the likelihood that the proposed wind farm is within the core or extended foraging ranges of any bat species is significantly reduced as, in all cases, individual species forage over relatively limited ranges that do not exceed kilometres in the single digit range. For detail on metabolic constraints on bat activity see **Section 7.3**, above.

Therefore, in light of the low BHSI ratings for the site and the bog habitat that dominates (see **Section 5**, above) it is considered that the site is of relatively low value for bat species particularly by comparison with the characteristics of the surrounding area and which is characterised by a more ecologically and structurally diverse habitat mix than is the case within the proposed wind farm site. It is also evident from the 'All species' ratings for the wider geographical area, comprising the 4 hectads that are listed in, **Table 5**, above, that the proposed development site is not adjacent to any locations rated as being of high ecological value to bats.

In summary the site is, both topographically and ecologically, relatively homogeneous, a characteristic that influences species diversity not only in terms of the floristic communities but also in the variety and biomass of insect species. The proposed development site is exposed and unsheltered and the plant communities present comprise low-growing, open vegetation with low plant species richness that lacks the variety and complexity required for high macroinvertebrate productivity. It is concluded that the site is unlikely to provide significant foraging, roosting or breeding habitats for any bat species.

[17] The proposed development site and surrounds are encompassed within the following hectads: Q93, Q94, R03 and R04.

[18] See **Table 5** for BHSI ratings and **Table 6** for data classes and %

Therefore, while bat activity by certain species is reasonably foreseeable, the levels of activity are unlikely to be significant at any point and it is concluded that the level of activity and the patterns in site usage elucidated in **Section 9**, above, are consistent with this assessment of the proposed wind farm site's suitability as bat foraging habitat. It is concluded, therefore, that the levels of activity recorded during 2019 are reflective of the normal patterns that pertain at the site.

10.2 BAT ACTIVITY LEVELS DURING 2019 SURVEYS

Because an individual bat can be the source of more than one, or even many, calls, the numbers of calls recorded by the bioacoustic units are not a direct measure of numbers of any bat species. In fact, the number of calls recorded is likely to be greater than the numbers of bats that generated them. Bats will frequently fly over and back along short sections of habitat if prey is readily available while foraging and they use linear features to navigate through the landscape, to and from roosts and within foraging sites.

However, the numbers recorded are a reliable proxy for the levels of bat activity at the proposed wind farm site, particularly in light of the relatively homogenous habitat and ecological characteristics of the site.

Sonogram analysis of the 2019 survey data determined that the following species were present at the SP locations within the proposed wind farm site:

- Brown long-eared bat.
- Common pipistrelle.
- Leisler's bat.
- Soprano *p*ipistrelle.

In addition, species from the genus *Myotis* were also recorded.

As evidenced by the data summarised in **Table 10**, above and provided in detail in the tables in **Sections 9.1.1** to **Section 9.1.3** inclusive, above, the level of bat activity recorded during the 2019 surveys was low with low nightly and hourly averages (**Section 9.1.3**) even for the highest levels recorded.

The levels of activity recorded, described in **Section 9.1**, above, strongly suggest that, while the proposed development site is within the extended foraging range of local populations of these species the levels of activity, even of the most frequently recorded species, namely common pipistrelle, are low. With regard to soprano pipistrelle, Leisler's bats, brown long-eared bats, and bats from genus *Myotis* it is considered, in light of the fact that the numbers recorded comprise such low total numbers of calls recorded that the level of activity of these species is extremely low. It is concluded that use of the proposed wind farm site by these species is sporadic and inconsistent and the site is not within the core, or extended, foraging range of the local populations of the species recorded. Specifically, with regard to brown long-eared bat and species from genus *Myotis* it is concluded that the individuals recorded are considered to be vagrants hunting or commuting through the site outside their core foraging grounds.

It is concluded, therefore, that the levels of activity recorded are indicative of an area at the least used limit of the foraging ranges of the species recorded and the proposed development site is not,

therefore, within the core foraging range of these species. On the basis of the numbers of calls recorded, it is concluded that the species recorded use the site sporadically rather than regularly and, in the main, in low numbers only. Therefore, while the site is within the extended foraging range of local populations of these species the level of use is indicative of occasional use and not consistent with those expected within the core foraging range. It is probable that any increase in the use of the site, should it occur, would be opportunistic and would occur in response to the onset of stable mild weather conditions when winds are abated, and air temperatures elevated above the norm and when the thermoregulatory cost is minimised, and accumulations of insect prey are increased.

When viewed in the context of the distribution of the SPs across the site, a clear pattern in the levels of activity emerges and no differentiation between SPs that can be attributed to the locations of individual SPs or to habitat type is evident.

In summary, the survey data indicate that common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bat and species from the genus *Myotis* were present at the site during the 2019 surveys. However, there was a marked contrast between the levels of activity recorded for individual species and even the species most frequently recorded, namely common pipistrelle, was recorded at very low average hourly rates. On the basis of the numbers of calls recorded it is concluded that none of these species were present to any significant extent during the 2019 surveys.

10.3 CONCLUSION

The site and much of its hinterland are generally lacking the habitat, environmental, landscape and topographic characteristics that are conducive to high and sustained levels of bat activity. By contrast these characteristics are abundantly available in the areas that are present in the wider geographical area surrounding the area that encompasses the site and its immediate surrounds. As a result, the site is of less significance to foraging bats than the habitats of higher ecological value that surround it and which bats will preferentially select. While the species listed above were recorded, the levels of site usage were, even at the highest recorded levels, extremely low. The levels of usage, as reflected in the average hourly rates in recorded calls across all the species are consistent with the BHSI ratings for the site and its surrounds, as outlined in **Section 8.2.1.1**.

Section 10.1, above, concluded that the levels of activity recorded during 2019 are reflective of the normal patterns that pertain at the site. This conclusion, when viewed in conjunction with the assessment in **Section 8.2.2**, above, that the habitat and development related features of the proposed wind farm site render the site as intrinsically 'Low' risk to bat species suggest that the proposed development should not pose a significant risk to bat species.

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