

7 BAT ECOLOGY

This chapter has been reviewed and updated where necessary considering any subsequent modifications, updates and additional information acquired for the Further information Request issued by Louth County Council (LCC) on the 6th February 2025 (Reference No: 2460766). It is noted that for ease of reference all changes from the original chapter are shown in orange. Where text has been removed it is shown as ~~strikethrough~~.

Following a review of the proposed development based on the Request for Further Information, it has been determined that site entrance 4 is not required for the construction, operation and decommissioning of the proposed development, as all works can be accommodated via the proposed site entrances 1-3. Therefore, it is proposed that entrance 4 will not be taken forward as part of the proposed development, and the initially proposed use of entrance 4 will instead be accommodated at entrance 2. The author of this chapter has reviewed the revision, and no implications for the assessment presented in this chapter have been identified.

7.1 INTRODUCTION

This chapter assesses the impacts of the Development (Figure 7.1) on Bat Biodiversity. The Development refers to all elements of the application for the Development of Kellystown Wind Farm (**Chapter 2: Project Description**) including the Grid Connection Route (GCR) and Turbine Delivery Route (TDR). In accordance with Article 3(1) of the EIA Directive (2014/52/EU), this chapter will identify, describe and assess the direct and indirect effects of the Development on “(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC”. Where negative effects are predicted, the chapter identifies appropriate mitigation strategies therein. The assessment will consider the potential effects during the following phases of the Development:

- Construction of the Development
- Operation of the Development
- Decommissioning of the Development

Common acronyms used throughout this EIAR can be found in **Appendix 1.2**. This chapter of the EIAR is supported by Figures provided in Volume III.

7.1.1 Statement of Authority

This EIA report was authored by Frederico Hintze and Oisín O Sullivan and reviewed by Jason Guile. This Chapter was reviewed and updated considering any subsequent modifications,

updates and additional information acquired for the Further information Request issued by Louth County Council (LCC) on the 6th February 2025 (Reference No. 2460766) by Ms. Leona McSharry an Ecology Support and Data Officer at Woodrow APEM Group Woodrow C.V. available in Appendix 1.1 and approved by Jason Guile Associate Director 'Ecology'.

Frederico Hintze is an Ecologist with APEM Group Woodrow, he undertook surveys for the project and co-authored this report. Fred has also authored over 15 scientific publications and sampling event datasets, showcasing his extensive experience and expertise in bat ecology. He holds a B.Sc. in Biology-Geology and an M.Sc. in Ecology from the University of Minho (Portugal), as well as a Ph.D. in Animal Biology from the Federal University of Pernambuco (Brazil). Fred's experience with bats began during his undergraduate thesis in 2009. For his master's thesis, he focused on assessing the impact of agricultural dams on bat populations in Northeastern Portugal. During his PhD, Fred utilised bioacoustics and species distribution modelling to enhance understanding of the distribution of Neotropical bat species. Subsequently, Fred's post-doctoral work led him to the world's largest iron ore mine in Carajás, Pará, Brazil, where he aimed to characterize the vocalizations of Amazonian bats and assess the impacts of mining on bat populations. He also served as the coordinator of the Bioacoustics Committee at the Brazilian Bat Research Society. Throughout his career, Fred has actively participated many Environmental Impact Assessment (EIA) projects in Portugal, covering various topics such as dams, wind farms, roads, and transmission lines. He specializes and possesses advanced proficiency in bat data analysis, encompassing bat call identification, bat roost/habitat suitability surveys, and report writing and QA. Fred holds a license to survey bat roosts from the Department of Culture Heritage and the Gaeltacht (DER-BAT-2023-76) and a handling license (C229/2023) issued by NPWS.

Oisín O'Sullivan is a Senior Ecologist with APEM Group Woodrow, he co-authored this report and undertook surveys for the project. Oisín has completed a B.Sc. in Ecology and Environmental Biology at University College Cork. His final year thesis involved bat surveys of urban habitats in Cork City. When Oisín started as a graduate ecologist with Woodrow his worked was focused on bat data analysis including bat call identification and bat roost/habitat suitability surveys. Oisín has developed a high level of proficiency with Kaleidoscope, Ecobat and BatExplorer, all of which are analysis software used to assess bat calls and activity Since joining Woodrow. Oisín current role involves coordinating, surveying, analysing data, and writing technical bat reports for all onshore wind developments that Woodrow has worked on between 2021 and 2024. This also involves the use of R to provide data on bat activity relative to weather conditions with the goal of informing curtailment as a mitigation measure. During 2022 Woodrow began undertaking offshore bat surveys including Oisín as a technical lead on

these projects. These surveys involve the long-term recording of activity on islands and headlands to record migration events. Oisín holds a license to survey bat roosts from the Department of Culture Heritage and the Gaeltacht DER-BAT-2023-77 and a handling license (C231/2023) issued by NPWS.

Leona McSharry is an Ecology Support and Data Officer for APEM Group Woodrow. Leona holds an Honours BSc in Zoology from the National University of Ireland, Galway, where she graduated with a First-Class Honours (1.1). She joined APEM Group Woodrow in December 2024. Leona began her professional ecological career in 2020 as an Intern Ecologist with the Venom Systems Lab at NUI Galway, where her research focused primarily on spiders. During this internship, she developed practical field skills, including coordinating bat surveys, ecological surveys, transect surveys, camera trapping and pit fall surveys. In 2022, she undertook a research internship at the Dog Lab of the University of Veterinary Medicine in Vienna, further broadening her research and field experience. Leona has ample scientific writing experience and has contributed as an author to several scientific publications and field note articles. In her current role, she specialises in bat ecology, with responsibilities including data analysis, field surveys, and assisting with technical bat reports.

Jason Guile is a Principal Ecologist for APEM Group Woodrow. He has over 13 years' relevant industry experience in ecological assessment and has worked in both Ireland and the UK. Jason has a B.Sc. in Marine Biology and Oceanography at University of Wales, Bangor. Jason holds a lead role on numerous projects undertaken by APEM Group Woodrow and provides technical expertise and experience for significant others. Jason's specialism is bats, having worked in this area for over 13 years. He has experience in monitoring, capture, handling, bioacoustics and impact assessment. Since moving to Ireland, Jason's work has involved coordinating, surveying, analysing data, and writing technical bat reports for numerous projects including renewables, infrastructure, landfill remediation works, urban planning applications and commercial regeneration sites. Jason is currently lead author of several Onshore Biodiversity and Offshore Bat chapters for several Environmental Impact Assessments for wind developments in Ireland and is considered one of the company technical leads for this subject. Jason is currently a committee member of Bat Conservation Ireland and Wind Energy Ireland and a representative with the Regional Wildlife Science Collaborative for Offshore Wind (RWSC) Science Plan addressing bat research and associated scientific needs in the context of offshore wind, on behalf of Apem. Jason holds licenses to survey and handle bats from the Department of Culture Heritage and the Gaeltacht, NPWS and Natural England.

7.1.2 Assessment Structure

The structure of this chapter is as follows:

- Assessment Methodology and Significance Criteria
- Description of baseline conditions at the Development
- Identification and assessment of impacts to bats associated with the Development during the construction, operational and decommissioning phases of the Development
- Identification and assessment of cumulative impacts if and where applicable
- Mitigation measures to avoid or reduce the impacts identified
- Identification and assessment of residual impact of the Development considering mitigation measures.

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7.2 BASELINE ASSESSMENT METHODOLOGY

As per CIEEM guidelines (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland, it states that "...the Zone of Influence for a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries."

The Zone of Influence (ZOI) differs for different habitats and species, the ZOI may be confined to the study area, whereas for highly mobile species like bats, the ZOI may extend beyond the Proposed Development Site and the surveys undertaken were scoped accordingly. At a maximum the zone of influence for foraging bats is 4 km based on the core sustenance zones for bats (Bat Conservation Trust, 2020), however, this varies from species to species. NatureScot *et al* 2021 guidance outlines that key bat features such as roosting and swarming sites within 200 m of turbine blade tip should be investigated and further characterised. As a precautionary approach, due to there being no fixed design at the early stages of the project, a study area of 300 m of the proposed build area was established. This allowed for changing turbine dimensions and locations. The wider area was examined primarily through the desk study with data searches up to 10km being conducted as per NatureScot *et al*. 2021.

7.2.1 Desk Study

A desktop study review was undertaken to determine existing data and records (including Annex II species) on the National Biodiversity Data Centre (NBDC) and National Parks and Wildlife Service (NPWS) websites. A data request for bat records within a 10 km radius of the centre of the Development of the site was made to Bat Conservation Ireland (BCI). The data was received on 31 January 2023, with the dataset last updated on 25 July 2022.

Consideration was also given towards examining aerial imagery and 6-inch maps to identify potential bat foraging and roosting habitats; and Lundy *et al.* (2011) which provides a high-level assessment of potential habitat suitability for different species of bat occurring in Ireland.

7.2.2 Preliminary ecological appraisal and roost inspection

The guidelines (NatureScot *et al.*, 2021) recommend that: “(...) *features that could support maternity roosts and significant hibernation and/or swarming sites (both of which may attract bats from numerous colonies from a large catchment) within 200 m plus rotor radius of the boundary of the proposed development should be subject to further investigation*”. Features along the access tracks between turbines (within c. 30 m) were also assessed for roosting potential. Wide reaching roost and foraging habitat assessment of the Proposed Development Site were undertaken during March 2020, as part of a scoping exercise.

As the new BCT guidance by Collins (2023) was published after the conceptualisation and execution of the works described in this report, certain essential assumptions and information needed for implementing the updated assessment criteria were unavailable. In particular this relates to the newer classification system released for potential roost features in trees. Consequently, consistency was maintained with assessment criteria described in Collins (2016), which provides guidelines for assessing potential suitability of habitat features as bat roosts and for foraging bats. Collins (2016) allows surveyors to assign Potential Roost Features (PRFs) as negligible, low, moderate, or high status in terms of their potential for bats, see Table 7.1. The use of this classification system remains robust. While the scale of suitability differs from a 4 tiered system (2016) to a 2 tiered system (2023) all roost features are still considered, and none are missed while coming to the conclusions of areas considered to provide a roost resource.

While specific surveys were not conducted for the turbine delivery and grid connection route, the presence and suitability of bat associated habitat features were assessed while ecologists were operating in the wider area and during the desk-study.

Table 7.1 Guidelines for assessing the potential suitability of proposed development sites for bats, based on the presence of habitat features within the landscape, to be applied using professional judgement (Collins, 2016).

Suitability	Description Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions ^a and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation ^b). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential ^c .	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions ^a and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland, or water.
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree lined watercourses and grazed parkland. Site is close to and connected to known roosts

^a for example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.

^b Evidence from the Netherlands shows mass swarming events of common pipistrelle bats in the autumn followed by mass hibernation in a diverse range of building types in urban environments (Korsten et al., 2015). This phenomenon requires some research in the UK bat ecologists should be aware of the potential for larger numbers of this species to be present during the autumn and winter in large buildings in highly urbanised environments.

^c This system of categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

Based on the features present and the location of the trees or other structures, the potential use of the feature can also be considered, and classified (according to Hundt, 2012):

- Maternity (breeding roost);

- Summer/transitional (to include transitional, occasional, satellite, night and day roosts); and,
- Hibernation roost.

Surveyors initially employed non-invasive external and internal inspection techniques for any building encountered, and trees were assessed from the ground (with reference to Bat Tree Habitat Key (BTHK), 2023). Based on the findings of the roost assessment surveys features classed as having low to high suitability for bats and/or demonstrating likely occupancy, (e.g., droppings found) were targeted for further bat activity surveys, including roost presence / absence surveys and roost characterisation surveys should a roost be confirmed present.

7.2.3 Roost surveys

Based on the results of the bat habitat assessments eight roost presence / absence surveys were carried out at potential roost sites identified as having low to high PRF suitability set out in Collins (2016). Dusk emergence surveys were undertaken on 28 April, 15 June, 30 June, 7 September, and 14 October 2022 and dawn re-entry surveys were undertaken on 29 April, 1 July and 15 October 2022. See survey details below in Table 7.2 and Table 7.3.

Table 7.2 Survey details of emergence surveys undertaken 2022.

Survey date	Survey time	Location	Weather Conditions	PRF ref.	PRF suitability (Collins, 2016)
28 April 2022	20:35 – 22:20	53.782791, -6.355393	Wind speed: 0 m/s Cloud: 1 Oktas Dry Temp: 8°C	R09	Low suitability - portacabin office building. O. O'Sullivan & P. Power.
15 June 2022	21:43 – 23:25	53.785535, -6.359822	Wind speed: 0 m/s Cloud: 0 oktas Dry Temp: 16°C	R06	High suitability - ash tree. O. O'Sullivan & P. Power.
30 June 2022	22:01 – 22:31	53.79174, -6.360234	Wind speed: 1 m/s Cloud: 0 Oktas Dry Temp: 15°C	R02	Moderate suitability - ash tree located close to an access track and to a densely vegetated area of scrub. Downgraded to Low. O. O'Sullivan & P. Power.
7 September 2022	19:50 – 21:35	53.785535, -6.359822	Wind speed: 5 m/s Cloud: 6 Oktas Dry Temp: 14°C	R02	High suitability - ash tree located in a mature tree line. P. Power & T. Regan.

14 October 2022	18:20 – 20:05	53.785535, -6.359822	Wind speed: 1 m/s Cloud: 1 Oktas Dry Temp: 10°C	R02	High suitability - ash tree located in a mature tree line. O O'Sullivan & R O'Connell.
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Table 7.3 Survey details of re-entry surveys undertaken 2022

Survey date	Survey time	Location	Weather Conditions	PRF ref.	PRF suitability (Collins, 2016)
29 April 2022	04:28 – 06:00	53.785535, -6.359822	Wind speed: 0 m/s Cloud: 0 oktas Dry Temp: 3°C	R02	High class potential ash tree in mature tree line. Adjacent to T05. O. O'Sullivan & P. Power.
1 July 2022	03:30 – 05:15	53.782791, -6.355393	Wind speed: 1 m/s Cloud: 9 Oktas Dry Temp: 14°C	R09	Low class portacabin office buildin. O O'Sullivan & P. Power.
15 October 2022	06:18 – 08:05	53.785331, -6.358273	Wind speed: 1 m/s Cloud: 1 Oktas Dry Temp: 7°C	R08	Moderate class potential lightning struck beech tree. In mature tree line. O O'Sullivan & R O'Connell.

Hibernation roost inspections with the aid of an endoscope (under license) was carried out on the 22 February 2022 within the timeframe in which bats would still be hibernating. Inspections were carried out on 12 trees between potential roost features on trees marked R11 and R08 (Figure 7.1) and one structure (R03 Figure 7.1) with potential for conditions suitable for hibernation. Surveys involved closer examination of roost potential identifying signs of roosting.

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Kellystown Wind Farm

Potential roost features

Legend

- ⊗ Turbine Points
 - Redline boundary
 - Roost characterisation buffer 300m
- Potential roost features
- High
 - Moderate
 - Low

Notes

Coordinate System:
IRENET95 / Irish Transverse
Mercator

0 0.2 0.4 km

Scale: 1:13853 @ A4 Date: 01/10/2024 Drawn by: OOS

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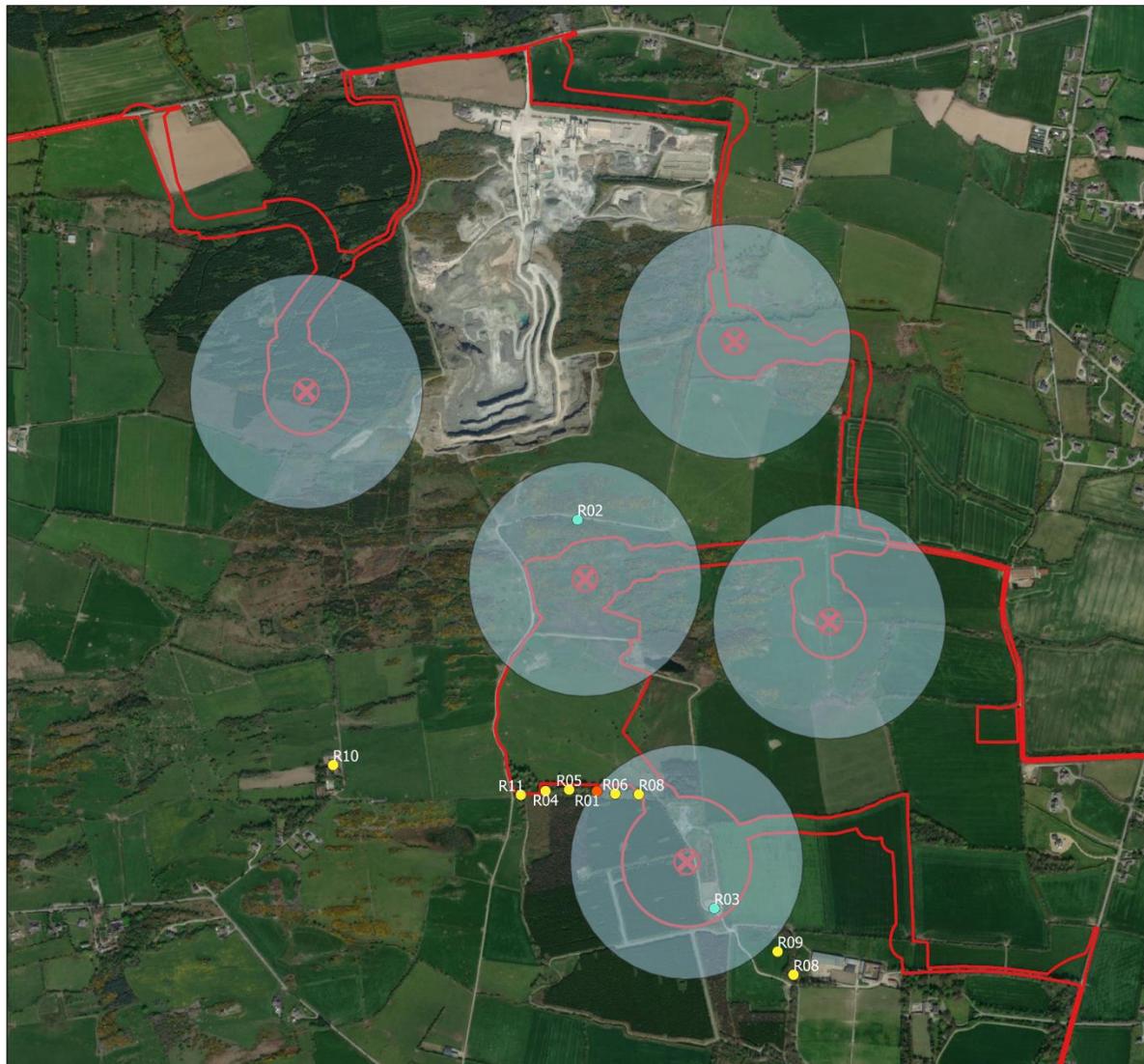


Figure Reference: Shanloon

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Figure 7.1 Potential roost feature locations 2022

7.2.4 Bat Activity Surveys

Static detectors

Static bat detectors were deployed to record bat species present and to provide an overview of how bat activity is broadly distributed over the Development and specifically at selected turbine locations (based on turbine design of 2022).

In 2022, Wildlife Acoustics Song Meter 4 (SM4BAT-FS) static detectors using SMM-U2 microphone were deployed for the three activity seasons spring (April – May), summer (June – August) and autumn (August – October) as required by guidance (NatureScot *et al.* 2021) within the Development. The location of all static detectors for each deployment in 2022 are provided in Table 7.4. The summer deployment had two additional context detectors (D.08 and D.09) and three context detectors (D.02, D.08 and D.09) in autumn. Context detectors are used to sample specific habitat features rather than turbine locations. This provides further context to bat activity within the Development to supplement and provide a comparison for the turbine locations, for example comparing bat activity along linear features vs bat activity in open areas removed from features, emulating post-construction conditions around turbines. Weather conditions during the three deployment periods were compliant with NatureScot *et al.* (2021) requirements.

D.01 was situated in the northwest of the Development in a mixed commercial coniferous woodland. D.02 was situated in a semi natural woodland (mixed species of hawthorn (*Crataegus* spp.), ash (*Fraxinus excelsior*) and other scrub species) that is adjacent to a woodland comprising commercial forest species birch (*Betula*), spruce (*Picea*) and larch (*Larix*). D.03 was situated in a conifer plantation fire break which consisted of gorse (*Ulex*). D.04 was situated in an area of acidic grassland, on the edge of a gorse and hawthorn scrub area with honeysuckle climbers. D.05 was situated on extensively grazed improved grassland with some fragmented hawthorn trees within the grassland. D.06 was situated on the corner of a tilled field along a stretch of the stream that flows from Drumshallon lough. D.07 was situated along a break in a stand of mixed commercial forestry. D.08 was situated along a mature tree line that consists of beech (*Fagus sylvatica*), ash and hawthorn. This context was situated due to the mature tree line consisting of high and moderate class roosting potential and is also close the swarming site identified during initial site scoping and PRF surveys. D.09 was another context detector situated adjacent to a track that runs through the woodland in the west part of the Development. The final detector D.10 was situated in the former location for T02, this is situated in a semi natural woodland and mixed scrub.

In 2023, a Wildlife Acoustics Song Meter mini Bat (SMmini-Bat) static detector was deployed at the proposed location for the substation and battery energy storage system (BESS) (2023 design), approximately 550 m southeast of the final design location (Figure 7.2). This detector was deployed on 16 August attached to an ash tree situated in the hedgerow between two improved agricultural grassland fields, one of which had undergone slurry spreading at the time of deployment. It served as a permanent monitoring device and was in place until it was collected on 10 October (Table 7.5).

In 2024, four locations were surveyed using Wildlife Acoustics SM4BAT-FS detectors. Three deployments were carried out in spring, summer, and autumn each meeting a minimum recording time of 10 nights of compliant weather. Locations, deployment dates, run times, and unit numbers are shown in (Table 7.6). Three of the detectors were deployed to gather data at turbine locations T2, T3 and T4. D.11 (T2) was situated in the northeast of the Development and was placed within a field of improved grassland approximately 40 m from the nearest linear feature (hedgerow) to the north. D.12 (T3) was situated in an area of gorse and hawthorn scrub within a field of acidic grassland. D.13 (T4) was situated on a stone wall running between an open area adjacent to gorse and hawthorn and a tilled field. A detector (Sub.02) was deployed at an alternative substation and BESS location (2024 design). It was placed along a hedgerow with tilled fields to the north and improved grassland to the south. There was a small stand of woodland 54 m south of this detector location.

Table 7.4 Static detector deployment locations 2022

Location code	Longitude	Latitude	Spring deployment (13 April – 28 April 2022)		Summer deployment (15 June – 30 June 2022)		Autumn deployment (24 August – 7 September 2022)	
			Unit number	Run Time (min)	Unit number	Run Time (min)	Unit number	Run Time (min)
D.01	-6.3685	53.79531	WSS052	8415	WSS033	7612	WSS027	10080
D.02	-6.3676	53.79219	WSS035	8415	WSS031	7612	WSS062	10080
D.03	-6.3611	53.79168	WSS038	8415	WSS053	7612	WSS064	10080
D.04	-6.3524	53.7905	WSS060	7910	WSS032	7612	WSS038	10080
D.05	-6.3597	53.78717	WSS037	8415	WSS037	7612	WSS025	n/a
D.06	-6.3489	53.78749	WSS053	8415	WSS029	7612	WSS035	7990
D.07	-6.3564	53.78334	WSS030	8415	WSS025	7612	WSS059	10080
D.08	-6.3603	53.78553	n/a	n/a	WSS027	7612	WSS060	10080
D.09	-6.3693	53.79067	n/a	n/a	WSS030	7612	WSS053	10080
D.10	-6.3719	53.79097	n/a	n/a	n/a	n/a	WSS061	10080

Table 7.5 Static detector deployment locations 2023

Location code	Longitude	Latitude	Unit number	Run Time (min)	Deployment dates
Sub.01	-6.3437	53.78167	WSS083	18943	16 th August – 3 rd September 2023 3 rd October – 10 th October 2023

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Table 7.6 Static detector deployment locations 2024

Location code	Longitude	Latitude	Spring deployment (12 th April 2024 – 01 st May 2024)		Summer deployment (10 th June 2024 – 27 th June 2024)		Autumn deployment (21 st August 2024 – 09 September 2024)	
			Unit number	Run Time (min)	Unit number	Run Time (min)	Unit number	Run Time (min)
D.11	-6.35391	53.79574	WSS093	12833	WSS051	8220	WSS040	10399
D.12	-6.36014	53.79032	WSS103	12833	WSS081	8220	WSS070	10399
D.13	-6.35053	53.78932	WSS029	12833	WSS054	8220	WSS058	10399
Sub.02	-6.34783	53.78521	WSS040	12833	WSS082	8220	WSS078	10399

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Kellystown Wind Farm

Detector Locations

Legend

- Road Alignment
- Turbine Locations
- Statics Locations 2022 & Sub.1 detector 2023



Notes

Basemap: Contains Ordnance Survey data © Crown copyright and database rights (2024). OS OpenData

Coordinate System: WGS 84 / Pseudo-Mercator

0 0.2 0.4 km



Scale: 1:27675 @ A4 Date: 12/09/2024 Drawn by: OOS

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Figure 7.2 Static detector locations 2022 and 2023 in relation to 2024 turbine layout and the substation and BESS location

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Kellystown Wind Farm

Detector layout 2024

Legend

- Turbine Points
- Redline boundary
- Statics 2024

Notes

Coordinate System:
IRENET95 / Irish Transverse
Mercator

0 0.2 0.4 km

Scale: 1:13853 @ A4 Date: 01/10/2024 Drawn by: OOS

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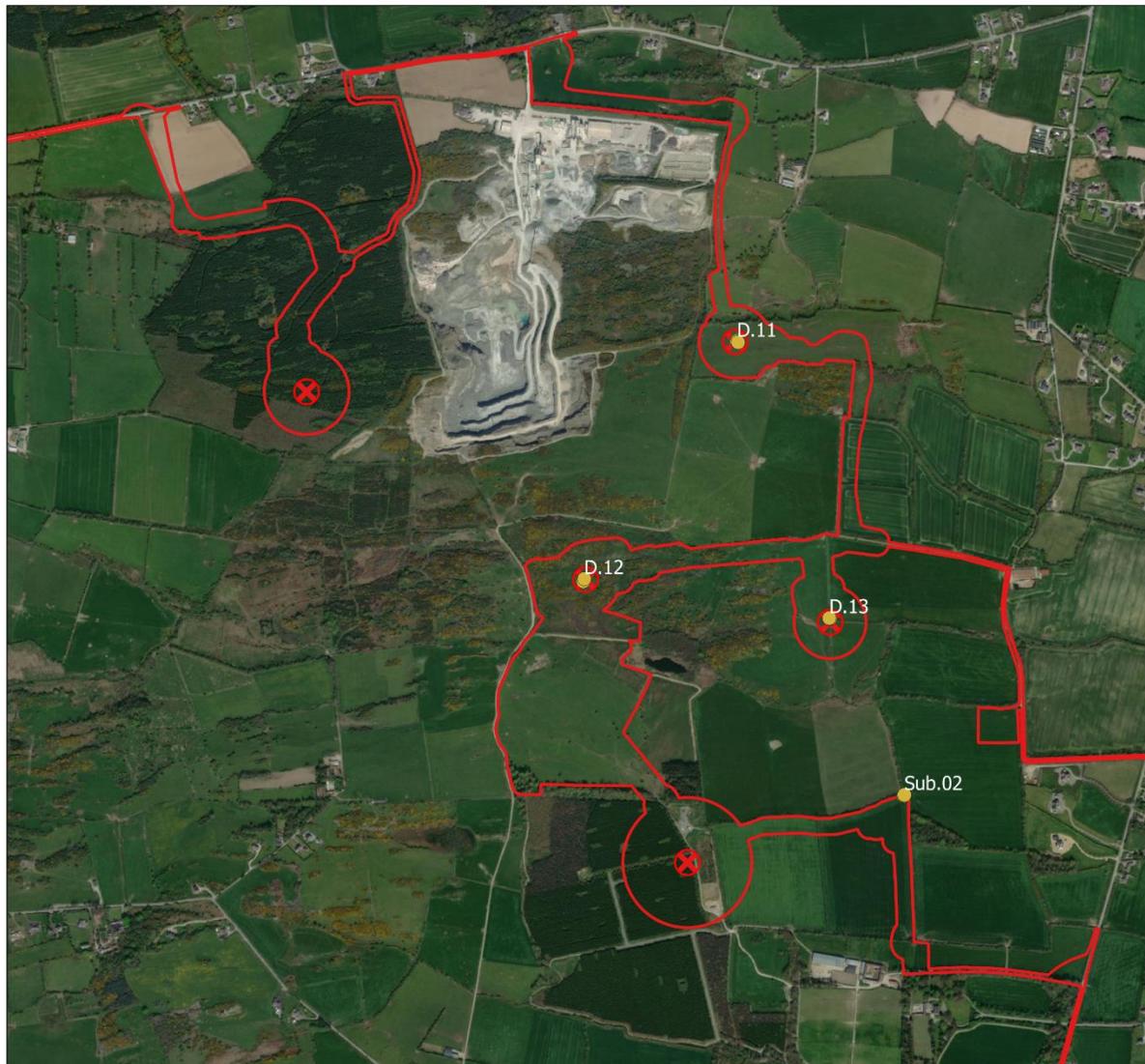


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Figure 7.3 Static detector locations 2024 in relation 2024 turbine layout and the substation and BESS location

Activity transects

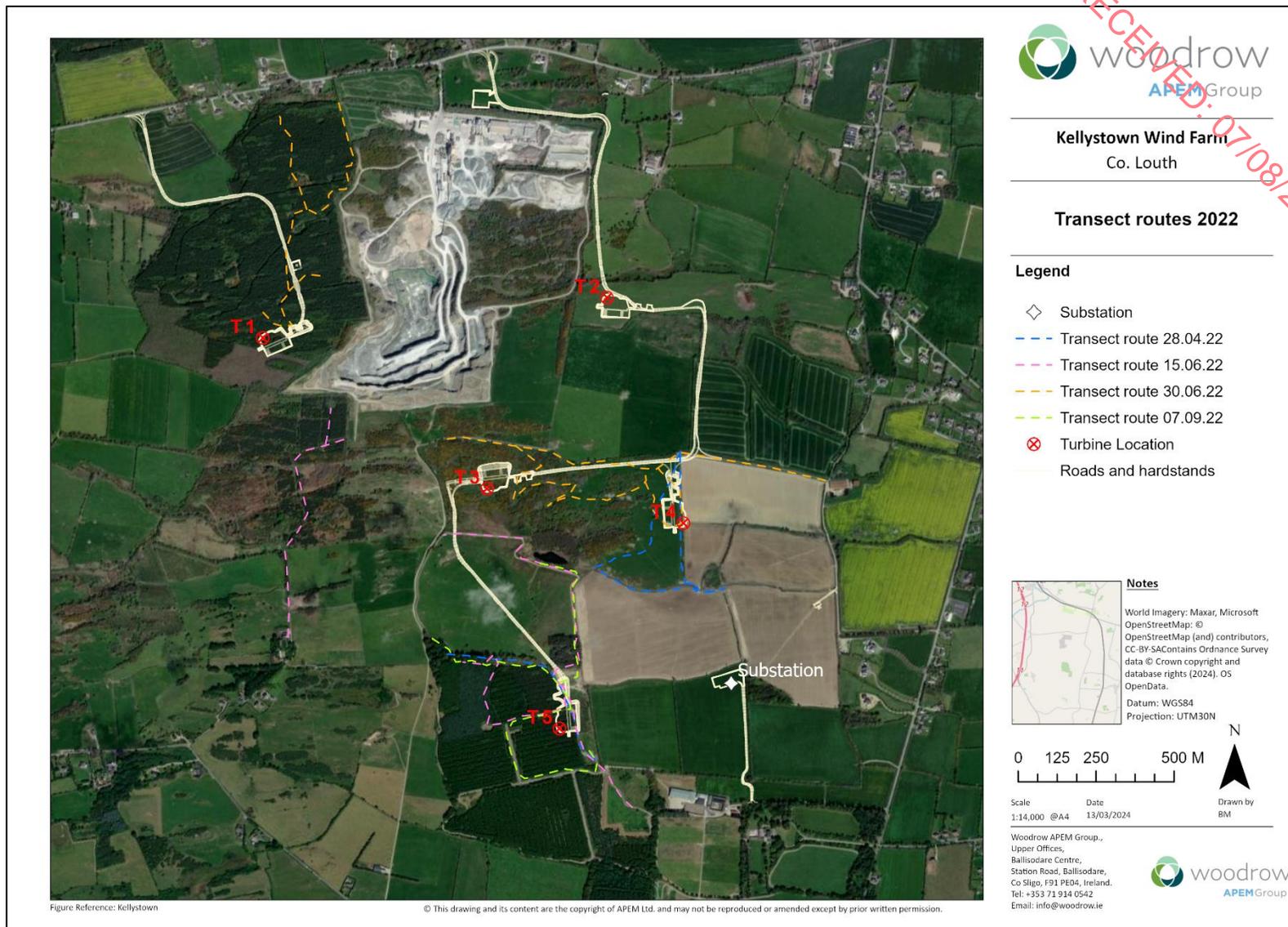
NatureScot *et al.* 2021 guidance considers the application of transect surveys to be discretionary, with survey requirements designed on a site-by-site basis. Transects are complementary to data collected from static bat detectors; and are important for identifying flight lines and for gaining understanding of bat activity within the survey area. Walked and driven transects can provide useful information on the wider landscape in the vicinity of the Proposed Development Site. If driven transects are undertaken, it is important that appropriate microphones are used and are directed above the vehicle. It is also important to remain at a constant low speed (< 10 km/h). Point counts (of a fixed duration) can be incorporated into transects to survey specific features to provide information on comparative density of use.

Four transects were completed in 2022 which entailed both walking and driving throughout the Proposed Development Site using Batlogger M detectors. Survey dates, weather conditions and survey coverage for transects conducted in 2022 are provided in Table 7.7 with the transect routes illustrated on Figure 7.3. Field records were made of bat species encountered, number of bat passes, activity where known e.g., foraging, commuting, advertising, travelling direction, and approximate height. Temperature and wind speeds were measured at intervals throughout the survey. Batlogger M detectors recorded temperature throughout the surveys.

Table 7.7 Activity transect survey details 2022

Date	Start time	End time	Weather Conditions	Survey type - coverage (surveyors)
28th April 2022	22:22	23:26	Wind speed: 2 m/s Cloud: 1 Oktas Dry Temp: 4°C	Dusk transects: Walked/driven transect coverage of turbine locations around T4 and then through the mature deciduous woodland that is adjacent to T5. (P. Power & O O'Sullivan).
15th June 2022	23:26	00:35	Wind speed: 2 m/s Cloud: 4 Oktas Dry Temp: 13°C	Dusk transects: Walked transects coverage of turbine locations from next to T3 to T5 and then coverage of the woodland in the southern side of the Development. (P. Power & O O'Sullivan).
30th June 2022	23:30	00:43	Wind speed: 1 m/s Cloud: 4 Oktas Dry Temp: 16°C	Dusk transects walked transects coverage of turbine locations from T4 – T3 and then transect coverage of the woodland in the northwestern side of the Development where T1 is located. (P. Power & O O'Sullivan).
7th September 2022	21:37	22:43	Wind speed: 3 m/s Cloud: 4 Oktas Dry Temp:14°C	Dusk transects: Walked transect coverage of the deciduous woodland where the swarming Development was located and overage of T5. (P. Power & O O'Sullivan).

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Figure 7.4 Activity transect coverage for 2022 in relation to current turbine layout and the substation and BESS location.

Swarming surveys

According to the NatureScot *et al.* 2021 guidelines, the use of swarming surveys is discretionary and should be tailored to individual Development characteristics. In response to significant foraging and social activity from the 2022 static detector survey and the identification of significant bat roosting features at the southern tree line (D.08), a sequence of four dusk (Table 7.8) and four dawn (Table 7.9) swarming surveys were conducted. These surveys were deliberately scheduled next to those roosting features between August and October 2023 to coincide with the bat swarming season. Dusk swarming surveys commenced 15 minutes prior to sunset and concluded 1.5 hours after sunset, while dawn surveys began 1.5 hours before sunrise and concluded 15 minutes after sunrise. These surveys were undertaken using Elekon Batlogger M bat detectors to collect geo-referenced records of bat activity, which were then analysed using BatExplorer software. Additionally, an infra-red (IR) camera was situated to record possible bat emergences or re-entries and other important events next to the roosting features under observation.

Table 7.8 Survey details of dusk swarming surveys 2023

Survey date	Start time	End time	Location	Weather Conditions
16 th August 2023	20:40	22:25	53.78532, -6.35811	Wind speed: 0 m/s Cloud: 5 Oktas Dry Temp: 17°C
12 th September 2023	19:40	21:25	53.785465, -6.359645	Wind speed: 1 m/s Cloud: 2 oktas Dry Temp: 15°C
02 nd October 2023	18:45	20:30	53.785518, -6.359665	Wind speed: 0 m/s Cloud: 7 Oktas Dry Temp: 14°C
09 th October 2023	18:30	20:15	53.785522, -6.359791	Wind speed: 0 m/s Cloud: 3 Oktas Dry Temp: 17-19°C

Table 7.9 Survey details of dawn swarming surveys undertaken 2023.

Survey date	Start time	End time	Location	Weather Conditions
17 th August 2023	04:29	06:15	53.78557, -6.359863	Wind speed: 1 m/s Cloud: 0 Oktas Dry Temp: 12°C
13 th September 2023	05:20	07:10	53.785325, -6.358123	Wind speed: 2 m/s Cloud: 0 oktas Dry Temp: 10°C
03 rd October 2023	05:59	07:44	53.785335, -6.358169	Wind speed: 4 m/s Cloud: 0 Oktas, mist Dry Temp: 10°C
10 th October 2023	06:15	08:00	53.785362, -6.358048	Wind speed: 3 m/s Cloud: Oktas Dry Temp: 16°C

Monitoring climatic conditions

Monitoring of climatic conditions was undertaken through the deployment of a fully automated weather station with 3G connectivity deployed on the Proposed Development Site throughout the 2022 survey season. The weather station was deployed on the 13 April 2022 at 53.790495, -6.352354. The Davis Vantage Vue wireless integrated sensor suite weather station, provided data on a real-time basis. This allows weather station functionality to be checked daily during the survey season and for action to be taken if a station fails or there are concerns regarding the data. This obviates the need for a second (backup) weather station. The weather station collected the full range of weather data, including temperature, wind speed and rainfall, which allows surveyors to determine whether deployments nights were compliant with the prescribed weather parameters ($\geq 8^{\circ}\text{C}$ at dusk, max. ground level wind speed of 5 m/s and minimal rainfall) (NatureScot *et al.*, 2021).

Deployment periods can then be adjusted to ensure 10 nights of compliant data are captured. In addition, weather data can be useful for investigating the recorded patterns of habitat usage by bats, for instance exposed, open area can receive an influx of foraging bats during nights that are warm and relatively still, especially towards the end of the summer and into the autumn, as bats disperse from maternity roosts (Woodrow per. obs.).

Acoustic Analysis

For data collected using SM4BAT-FS and SMmini-Bat, analysis of sound recordings was undertaken using Kaleidoscope software to confirm species (or genus for *Myotis* spp. or *Pipistrellus* spp. social calls) and exact number of bat passes for each detector location and transect survey. For data collected using Batloggers, analysis of sound recordings was undertaken using BatExplorer software. This analysis aimed to confirm species (or genus for *Myotis* species) and exact number of bat passes for each detector location and transect survey.

Sound files that were run through Kaleidoscope Pro's auto-identification, were also subject to manual verification by trained ecologists. Russ (2012) and Middleton *et al.* (2014) were used to aid species identification of bat calls during data analysis. Recordings of common and soprano pipistrelles for which Kaleidoscope determined a match ratio of 100% (meaning every recorded call matched the known species call parameters) were deemed accurate to a degree that did not necessitate manual verification. All other automatically identified bat species were subjected to manual verification. Recordings automatically identified as noise were determined to fall outside of the recording parameters for the survey and were classified as noise.

Bat activity was measured by the number of bat passes recorded. Bat passes are commonly used as a metric for bat activity and determine species presence but can be interpreted in a variety of ways (Kerbiriou *et al.*, 2019). During our analysis a bat pass is defined as the detection of one or more bat calls from a single species within a 15 second sound file. Recordings in which multiple species were recorded, separate files were produced as a pass for each species. Average bat passes per hour were generated in R¹. The packages tidyverse (v1.3.0; Wickham *et al.*, 2019), suncalc (datastorm-open, 2019), lubridate (Grolemund & Wickham 2011), and ggplot (Wickham 2016) were used during this analysis.

Bat activity levels were assessed using an adaptation of the criteria applied by Matthews *et al.* (2016) in a study that examined the risk of European bats to wind energy developments in the UK. The bat activity level scale used in this report (Table 7.10) has been adapted to be applied to average bat passes per hour. This adaptation uses an average figure of 10 hours per night across the active bat season to determine the cut-off of 'high' activity.

¹ R is a statistical programming software which can take large amounts of data and convert it into graphs giving visual representation of the data gathered.

Table 7.10 Activity level classification as per Matthews et al. (2016) adapted to hourly activity levels.

Classification	Bat passes per hour
Low	<2
Moderate	2 – 4.99
High	≥5

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Survey Limitations

In the case of bat surveys, most survey limitations often relate to weather conditions at the time of the surveying and equipment failing in the field, for example microphones can be damaged by livestock or can lose sensitivity when exposed to prolonged episodes of heavy rainfall. Additionally, project layout changes over time can introduce further limitations and complexities to the interpretation of survey results. The following section provides details of any potential limitations to bat surveys conducted in 2022 2023, and 2024.

Equipment

In 2022, one detector experienced a failure during the autumn deployment at location D.05. This detector failed to record any data.

Despite this technical issue it is considered that the data collected during this survey period in 2022 remains robust and compliant with NatureScot *et al.* 2021. For the summer deployment period there were two additional context detectors added to the deployment. One deployed at D.08 and one at D.09 (Figure 7.2). These were initially deployed to cover a turbine move but also acted to provide contextual data for the specific habitat located at this location within the development.

During the 2023 static deployment, the permanent detector stationed at Sub.01 failed to record data from 3 September to 3 October. Although this detector failed to record for one month, data had been collected between 16 August and 3 September of the autumn season providing sufficient data to assess bat activity within this area at the substation and BESS.

Survey coverage

It is considered that static bat detector coverage of the Proposed Development Site for bat activity in 2022, 2023, and 2024 culminates with a level of data gathering that is in line with the NatureScot *et al.* 2021 guidelines based on the design layout provided at the time of surveys. The initial 2022 layout determined the detectors during that year. Due to reasons relating to access and habitat structure, bat equipment could not always be setup at exact proposed

turbine locations, e.g., when proposed turbine locations are in dense conifer plantations. This was not considered to limit the robustness of the data set, as deploying units away from proposed turbine locations within plantations and along the edge of habitat features could imitate the new habitat landscape available post-construction and provide information on how bat activity may be post-construction, as stated in NatureScot *et al.* 2021.

Subsequently, due to changes in the turbine layout after 2022, updated data for T2, T3, and T4 were collected in 2024 (Figure 7.3) and a robust data set has been gathered across 3 years of survey.

7.3 IMPACT ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

There are three turbine models being assessed for this Development. The selected model for this assessment is the Nordex N149. Any deviation or lack thereof in terms of impact or mitigation will be addressed for alternate turbine models Nordex N163 and Siemens-Gamesa SG155. The turbines vary in terms of rotor diameters; The Nordex N149 has a 149-meter rotor diameter, The Nordex N163 features a larger 163-meter rotor diameter, the Siemens-Gamesa SG155 has a 155-meter rotor diameter. Potential differences in impacts based on alternate models are considered in the assessment of potential effects.

7.3.1 Assessment Methodology Bat Biodiversity

The impact assessment methodology used in this chapter deviates from other EIAR chapters in that it does not follow the EPA (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Report as set out in Chapter 1.

With the exception of confirmed roosts, bat surveys on site primarily assess activity rather than population. This can lead to a large amount of unknowns surrounding the potential sensitivities and magnitudes of impacts. For this reason the impact assessment follows the guidance document Impact Assessment and Mitigation for Bats at Onshore Wind Turbines (NatureScot *et al.*, 2021) and Guidelines for ecological impact assessment in the UK and Ireland (CIEEM 2018). The NatureScot *et al.* 2021 guidelines are the acknowledged reference on impact assessment for bats for ecological practitioners in Ireland while there is no Irish guidance. This section outlines the approach used to evaluate the importance of the habitats and bat species present within the Development and the steps followed for the evaluation and characterisation of potential impacts from the Development.

7.3.1.1 Assessment Limitations

Displacement and attraction effects of operating turbines

Turbines have the potential to influence the distribution of bats throughout a Development through attraction or displacement effects. Across all guilds in the absence of nearby features activity can increase at turbine locations in the open and decrease at turbines near features (Leroux *et al.* 2022, Guest *et al.* 2022). Leroux *et al.* 2022 found that this effect occurs when turbines are located 43 – 100 m from hedgerows and that there was no effect detected in any guild under turbines greater than 100 m from a feature. The reason for this effect is still undetermined in the literature. However, it is still accepted that bat activity decreases in an open agricultural setting versus along linear features (Finch *et al.* 2020). Despite not knowing exactly causes potential attraction a precautionary approach was taken with regards to this effect and the potential for effects.

Ecobat

Although NatureScot *et al.* 2021 suggests using Ecobat for bat activity assessment, it's important to note that the Ecobat application has been offline for several years with no prospect of returning. Therefore, Table 7.17 has been adapted to utilize the hourly average of bat passes as a measure of bat activity, as detailed in Section 7.2.1.2 under Acoustic Analysis. The generation of in-house species activity indices is also acceptable within the NatureScot *et al.* 2021 guidance.

7.3.2 Ecological Evaluation and Impact Assessment Methodology

Bat surveys for the proposed development were undertaken following specific guidelines for habitats and species, as outlined in the preceding sections, to establish the ecological baseline for the Proposed Development Site. The importance of the habitats and species present is evaluated using the guidance document Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal, and Marine published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018). This document outlines an accepted approach for the evaluation of potential impacts from such developments. This approach is outlined in the following sections.

7.3.2.1 Identifying Ecological Features within the Zone of Influence

Information obtained during the desk study and field surveys identifies ecological features which have the potential to be affected by the proposal and as such, occur within the 'zone of influence' of the proposed development. Refer to Section 7.2 for a description of ZOI and how it has been determined.

7.3.2.2 Evaluating Ecological Features within the Zone of Influence

Those ecological features which occur within the zone of influence, such as nature conservation sites, habitat or species are then evaluated in geographic hierarchy of importance. The categories used for this evaluation with regards to bats are listed in

Table 7.11.

The status of a species requiring protection at an international level does not necessarily impose an 'International' conservation value on any single example of that species found at a Proposed Development Site. Approaches to attributing nature conservation value to species have been previously developed for groups such as birds and bats. Specific assessment criteria employed for assessing bat populations (NatureScot *et al.* 2021) are detailed towards the end of this section.

'Important ecological features' (also referred to as key ecology receptors – KERs) are defined as those features which are within the zone of influence and are evaluated as being of Local Importance or greater. Due to the status of bats in Ireland, all bat species are considered KERs for this impact assessment.

Table 7.11 Geographic frame of reference used to determine ecological value (adapted CIEEM 2018)

Importance Criteria
<p>International Importance</p> <ul style="list-style-type: none"> • Sites, habitats and species populations of importance in a European context. • 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. • Resident or regularly occurring populations (assessed to be important at the <u>national level</u>) of species of animal and plants listed in Annex II and/or IV of the Habitats Directive and/or Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive. • Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). • Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).
<p>National Importance</p> <ul style="list-style-type: none"> • Sites, habitats and species populations of importance in a national context, including any site designated or proposed as a Natural Heritage Area (NHA), Statutory Nature Reserve, Refuge for Fauna and Flora protected under the Wildlife Acts and/or National Park. • Undesignated site fulfilling the criteria for designation as a NHA, Statutory Nature Reserve, Refuge for Fauna and Flora protected under the Wildlife Act and/or a National Park. • Resident or regularly occurring populations (assessed to be important at the national level) of the following: <ul style="list-style-type: none"> • Species protected under the Wildlife Acts; and/or • Species listed on the relevant Red Data list
<p>County (Regional) Importance</p> <ul style="list-style-type: none"> • Resident or regularly occurring populations (assessed to be important at the County level² of the following: <ul style="list-style-type: none"> - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; - Species protected under the Wildlife Acts; and/or - Species listed on the relevant Red Data list. • County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local Biodiversity Action Plans (BAP), if this has been prepared. • Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
<p>Local Importance</p> <ul style="list-style-type: none"> • Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared. • Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality. • Resident or regularly occurring populations (assessed to be important at the Local level) of the following: <ul style="list-style-type: none"> - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; - Species protected under the Wildlife Acts; and/or - Species listed on the relevant Red Data list.
<p>Site</p>

² It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle

- Habitats and species populations of less than local importance but of some value.

7.3.2.3 Identification and characterisation of impacts

When describing ecological impacts, reference should be made to the following characteristics:

- Positive or negative;
- Extent;
- Magnitude;
- Duration;
- Timing;
- Frequency; and
- Reversibility.

The assessment will describe those characteristics that are relevant to understanding the ecological effect and determining the significance, and as such does not need to incorporate all stated characteristics (CIEEM 2018).

7.3.2.4 Significant Effects on Important Ecological Features

For the purpose of this EIAR a 'significant effect', in ecological terms (whether negative or positive), is an outcome to an important ecological feature resulting from an impact, that either supports or undermines biodiversity conservation objectives for that ecological feature. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. National / local nature conservation policy). As such, effects can be considered significant in a wide range of geographic scales, from 'International' to 'Local'. Consequently, 'significant effects' should be qualified with reference to the appropriate geographic scale (CIEEM 2018).

7.3.2.5 Assessment of Residual Impacts and Effects

After characterising the potential impacts of the proposed development and assessing the potential effects of these impacts on the 'Important Ecological Features', mitigation measures are proposed to avoid and/or mitigate the identified ecological effects. Once measures to avoid and mitigate ecological effects have been finalised, assessment of the residual impacts and effects should be undertaken, to determine the overall significance of effects on the Important Ecological Features.

7.3.2.6 Assessment of Cumulative Impacts and Effects

Cumulative effects can result from individually insignificant, but collectively significant, actions occurring over a period of time or concentrated in a location (CIEEM 2018). Different types of

actions can cause cumulative impacts and effects. As such, these types of impacts may be characterised as:

- Additive/incremental – in which multiple activities/projects (each with potentially insignificant effects) add together to contribute to a significant effect due to their proximity in time and space (CIEEM 2018); or
- Associated/connected – where a development activity ‘enables’ another development activity e.g. phased development as part of separate planning applications. Associated developments may include different aspects of the project which may be authorised under different consent processes. It is important to assess the potential impacts of the ‘project’ as a whole and not ignore impacts that fall under a separate consent process (CIEEM 2018).

7.3.2.7 Bat species vulnerability

To effectively evaluate the potential impact of the proposed development on bats, it is crucial to consider not only the species composition and bat activity at the Development but also their vulnerability to wind turbine impacts, particularly concerning Irish bat populations.

While NatureScot *et al.* (2021) offers guidance on assessing the risk to bat species on wind farms, its direct applicability to Irish bat populations remains somewhat unclear as it primarily focuses on British bat species found in England, Scotland and Wales. Therefore, the desk study assessment of the proposed development draws upon the sources outlined in Table 7.12 to align with the NatureScot *et al.* 2021 guidance. These sources are Marnell, Looney & Lawton (2019) and Reason & Wray (2023) for insights into bat population assessments in Ireland, and NatureScot *et al.* 2021 for understanding the collision risk of bat species with wind turbines (Table 7.12).

Table 7.12 Red list status, rarity, and collision risk potential of Irish bat species

Species	Red list status (Marnell, Looney & Lawton, 2019)	Rarity category (adapted from Reason & Wray, 2023)	Turbine collision risk (NatureScot <i>et al.</i> , 2021)
Daubenton’s bat <i>Myotis daubentonii</i>	Least concern	Rarer	Low risk
Whiskered bat <i>Myotis mystacinus</i>	Least concern	Rarest species	Low risk
Natterer’s bat <i>Myotis nattereri</i>	Least concern	Rarer species	Low risk
Leisler’s bat <i>Nyctalus leisleri</i>	Least concern	Rarer species*	High risk

Common pipistrelle <i>Pipistrellus pipistrellus</i>	Least concern	Common species	High risk
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	Least concern	Common species	High risk
Nathusius' pipistrelle <i>Pipistrellus nathusii</i>	Least concern	Rarest species	High risk
Brown long-eared bat <i>Plecotus auritus</i>	Least concern	Rarer species	Low risk

*In Ireland Leisler's bat are not as rare as in a UK context as described in Reason & Wray, 2023 (Stebbins 1988)

Considering the population status in Ireland and the assessed risk level concerning adverse interactions with turbines, it is crucial to determine which bat populations may face threats due to wind turbine impacts, as illustrated in Table 7.13

Level of potential vulnerability of bat populations in Ireland to wind turbine developments (low vulnerability = green; medium vulnerability = yellow; high vulnerability = red). Adapted from NatureScot *et al.* 2021 and Reason & Wray 2023.

Table 7.13 Species vulnerability based on rarity (Reason & Wray 2023) and collision risk (NatureScot *et al.* 2021)

Vulnerability of populations		Turbine collision risk		
		Low risk	Medium risk	High risk
Relative abundance	Common species			Common pipistrelle Soprano pipistrelle
	Rarer species	Daubenton's bat Natterer's bat Brown long-eared bat		Leisler's bat
	Rarest species	Whiskered bat		Nathusius' pipistrelle

In the context of wind developments in Ireland, Table 7.13 underscores the importance of giving specific attention to Leisler's bats and Nathusius' pipistrelles, given their susceptibility to turbine impacts and their high population vulnerability. Leisler's bats are known to forage at heights in open landscapes and are less reliant on specific habitat features, while Nathusius' pipistrelles are migratory species that may fly at altitude during migration. Common and soprano pipistrelles are assessed to have medium population vulnerability to wind farm

developments in Ireland due to their behaviour in relation to turbines. Whiskered bats are also categorized as moderately vulnerable, primarily due to their rarity, while brown long-eared bats and the two other Irish Myotis species (Daubenton's bat and Natterer's bat) are considered to have low vulnerability to wind farm developments in Ireland (Table 7.13).

7.3.2.8 Characterising impacts

Assessing impacts and determining appropriate mitigation measures at a Development involves considering various factors, including bat activity and the presence of high-risk species. However, it is essential to recognize that other Development-specific risk factors also significantly influence decision-making processes (NatureScot et al., 2021). As recommended by NatureScot *et al.* 2021, this necessitates a thorough review of habitat risks alongside detected bat activities at a proposed Wind Farm Site, conducted in a two-stage process.

Stage 1 Site Level Assessment

The first stage involves assessing habitat risks (Table 7.14) and considering project size (Table 7.15) to determine the Development's initial collision risk level (Table 7.16). Site collision risk levels are categorized on a scale from 1 to 5, where 1-2 indicate low risk, 3 indicates medium risk, and 4-5 indicate high risk (Table 7.17).

Table 7.14 Habitat risk level classification (NatureScot et al. 2021).

Habitat Risk	Description
Low	Small number of potential roost features, of low quality. Low quality foraging habitat that could be used by small numbers of foraging bats. Isolated site not connected to the wider landscape by prominent linear features.
Moderate	Buildings, trees, or other structures with moderate-high potential as roost sites on or near the site. Habitat could be used extensively by foraging bats. Site is connected to the wider landscape by linear features such as scrub, tree lines and streams.
High	Numerous suitable buildings, trees (particularly mature ancient woodland) or other structures with moderate-high potential as roost sites on or near the site, and/or confirmed roosts present close to or on the site. Extensive and diverse habitat mosaic of high quality for foraging bats. Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows. At/near edge of range and/or on an important flyway. Close to key roost and/or swarming site.

Table 7.15 Project size classification (NatureScot et al., 2021).

Project Size	Description
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Small	Small scale development (≤ 10 turbines). No other wind energy developments within 10 km. Comprising turbines < 50 m in height.
Medium	Larger developments (between 10 and 40 turbines). May have some other wind developments within 5 km. Comprising turbines 50-100 m in height.
Large	Largest developments (> 40 turbines) with other wind energy developments within 5 km. Comprising turbines > 100 m in height.

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Table 7.16 Site risk level assessment table [(1-2) = low risk, (3) = medium risk, (4-5) = high risk], as from NatureScot *et al.* 2021.

Site Risk Level (1-5)		Project size (Table 7.15)		
		Small	Medium	Large
Habitat risk (Table 7.14)	Low	1	2	3
	Moderate	2	3	4
	High	3	4	5

Stage 2 Bat Risk Assessment

Following the completion of the first stage, an overall bat risk assessment (second stage) is conducted, incorporating both the site risk level (Table 7.16) and the recorded bat activity level (refer to Table 7.26 in Section 7.12) using the guidelines provided by NatureScot *et al.* 2021 (Table 7.17). The overall bat collision risk assessment for the Development is then determined on a scale from 0 to 25, with 0-4 considered low risk (green), 5-12 classified as medium risk (yellow), and 15-25 indicating high risk (red) (Table 7.17).

Table 7.17 Overall bat risk assessment table [green (0-4) = low risk, yellow (5-12) = medium risk, orange (15-25) = high risk], adapted from NatureScot *et al.* 2021.

Overall bat risk assessment (0-25)		Bat activity level (Table 7.10)			
		Nil (0 bp/h)	Low (< 2 bp/h)	Moderate (2 - 4.99 bp/h)	High (≥ 5 bp/h)
Site risk level (Table 7.15)	Lowest (1)	0	1	3	5
	Low (2)	0	2	6	10
	Medium (3)	0	3	9	15
	High (4)	0	4	12	20
	Highest (5)	0	5	15	25

Following the recommendation of NatureScot *et al.* 2021, the assessment was conducted individually for each high collision risk species identified on the Proposed Development Site. However, due to the heterogeneous nature habitats and varying bat usage patterns, performing a singular overall bat risk assessment would oversimplify the process and potentially introduce bias. Consequently, in addition to the overall bat site risk assessment, a bat risk level evaluation was conducted for each turbine location (based on the static deployments by season), utilizing the same assessment framework outlined

7.4 BASELINE DESCRIPTION

This section details key features for bats based on habitat suitability.

7.4.1 Desk Study

A total of seven species were recorded within 10 km of the central location within the Development from a total 96 historical bat records provided by Bat Conservation Ireland (BCI). Table 7.18 shows bat species recorded in roosts, transect and ad hoc surveys within the 10 km search radius (BCI, 2023), in addition to Lundy *et al.* (2011) individual species' habitat suitability index and level scores (NBDC, 2023). All of this information is presented in Table 7.18.

Table 7.18 Historical bat species records within 10 km search radius with information on legal and Irish red list status, NBDC suitability index and type of record.

Species name	Roost records within 10 km? (BCI)	Transect/ad hoc records within 10 km? (BCI)	Habitat Directive (Annex IV)	Irish Red List Status (Marnell, Looney & Lawton, 2019)	NBDC suitability index (level)
Common pipistrelle	Yes	Yes	Yes	LC (Least Concern)	40 (High)
Soprano pipistrelle	Yes	Yes	Yes	LC	39 (High)
Leisler's bat	Yes	Yes	Yes	LC	37 (Moderate)
Brown long-eared bat	Yes	Yes	Yes	LC	30 (Moderate)
Whiskered bat	Yes	Yes	Yes	LC	20

					(Low)
Daubenton's bat	No	Yes	Yes	LC	25 (Moderate)
Natterer's bat	No	Yes	Yes	LC	31 (Moderate)
Nathusius' pipistrelle	No	No	Yes	LC	9 (Low)
Lesser horseshoe bat	No	No	Yes	LC	0 (Very Low)

7.4.2 Bat Habitat Suitability

7.4.2.1 Proposed Site

The habitat within the Development is comprised of acidic grassland, improved grassland, tilled land (arable crops), scrub (gorse), mixed commercial coniferous forestry (larch & spruce) and linear area of mature beech woodland (beech pine, ash and hawthorn).

From surveys undertaken, as detailed in Section 7.2.4, the most important features for bats within the Development include:

- Mature tree lines, woodlands, and hedgerows:
 - An essential mature treeline for the bat populations is situated north of turbine T5 and partially within its 300 meter study area (above 170 m north west of T5 at it's closest), where the context static detector D.08 and the 2023 swarming surveys were situated/conducted (Figure 7.2). This tree line comprises multiple trees with moderate to high suitability as potential roost features (refer to Figure 7.1). The importance of preserving this feature is shown by the significant richness and activity of bats detected, especially during the autumn.
 - Turbine T1 is situated in a conifer plantation featuring multiple breaks containing fragmented patches of hawthorn and scrub (Figure 7.2)
 - These breaks form particularly interesting linear features used by commuting and foraging bats, as indicated by D.01 static detector recordings and transects conducted in its vicinity.
 - Hedgerows play a role in habitat connectivity for rarer slow-flight bat species, such as brown long-eared bats and some *Myotis* species.
- Lakes and streams:

- Beyond the 300 m study area and southeast to T3, Drumshallon Lough is present, feeding a small stream (Drumshallon stream) that runs to the east and 300 m south of T4. Water bodies like these are commonly utilised by bats for drinking water and foraging on emerging arthropods. The high activity and bat richness noted during the static surveys, particularly D.06, and transects in the region underscore their important role in supporting the local bat populations.
- Turbine T2 is planned to be situated next to a small stream with riparian vegetation and hedgerows adjacent. Although no data has been collected in this specific area, it is conceivable that local bats may utilise it in a manner like the observed behaviour in D.06 at Drumshallon stream.

7.4.2.2 Turbine Delivery & Grid Connection Routes

The TDR is detailed in Chapter 2. There is only one section which requires the removal of hedgerow and no areas require the removal of trees or tree lines (Chapter 2). This area has been assessed by Woodrow ecologists as having moderate foraging potential on an ad-hoc basis while surveys were taking place. Given that this location is approximately 2 km from D.01, D.02, D.09, and D.10 and is of moderate foraging potential we would assess that this feature is utilised by the same species assemblage given that this fits within the core sustenance zone for all Irish bats (with the exception of whiskered bats, which, if present, are a subset of recorded *Myotis* spp.). The GCR was also assessed on an ad-hoc basis with driven transects to classify habitat suitability while surveyors worked in the wider area. The foraging suitability ranges from moderate to high along sections of the public road network with adjacent hedgerows and treelines.

7.4.2.3 Roosting Habitat

No confirmed roosts were identified within the Development. Table 7.2 and Table 7.3 provides a concise overview of the roost surveys conducted in 2022, outlining the survey locations. The mature woodland segment where detector D.08 was deployed (refer to Figure 7.2) emerged as an important habitat for the local bat population. Numerous potential roost features (PRFs) were documented in this woodland section, with some PRFs classified as highly suitable for multiple roosting bats. Photographic evidence and further details for these features is provided in the Bat Survey Technical Report, Appendix 7.1. During the deployment period of detector D.08, the roost emergence window revealed activity from at least four bat species: soprano pipistrelle, common pipistrelle, Leisler's bat, and *Myotis* spp. Beyond its recognition as a potential roosting site during the 2022 surveys, the data strongly suggested the area's suitability as a bat swarming site. Identifying swarming events poses challenges due to their transient nature. While the tree line was not a confirmed swarming site, the results from the

2023 surveys emphasize the locations significance as an area of high social and foraging activity for three bat species (common and soprano pipistrelles and Leisler's bats). Swarming sites play a pivotal role in bat mating behaviour, fostering social interactions within local populations. Consequently, the high importance of this tree line habitat as a pivotal environment in supporting crucial ecological processes and the bat life cycle, underscores the necessity for larger turbine buffers to safeguard this habitat feature, a proposition aligned with the recommendations by NatureScot *et al.* 2021.

Considering the suitability of PRFs within the proposed development and surrounding wider area which represents similar habitats, along with the potential swarming site(s), roosting potential for bats occurring within the proposed development has been valued as local ecological importance.

7.4.3 Roost Surveys

Roost surveys did not establish the presence of any active roosts. While no confirmed roosts were identified in the surveys, there remains a likelihood that bats may utilise the trees in the mature tree line on a transitional basis (Figure 7.1). The December 2022 issue of CIEEM's In Practice (Hinds & Davidson-Watts, 2022) describes the fission and fusion behaviour of tree-dwelling bats. Fusion behaviour involves the entire colony occupying a single roost, while fission behaviour entails bats switching between roosts, dispersing, or interacting with other populations or colonies. This roost-switching behaviour is likely influenced by changes in microclimatic conditions, seasonal and phenological variations, parasite avoidance, and other factors. Therefore, the dynamic nature of this behaviour makes it challenging to definitively rule out the existence of bat roosts during specific observations or surveys. Consequently, trees with potential roost features should be regarded as likely roosts, necessitating appropriate mitigation measures and licensing should be applied should likely impacts be determined.

Considering the suitability of PRFs within the proposed development and surrounding wider area which represents similar habitats, roosting potential for bats occurring within the proposed development has been valued as local ecological importance.

7.4.4 Bat Activity Surveys

7.4.4.1 Species activity within the Site

During the 2022 and 2023 seasons, bat activity was recorded for a minimum of six species, including common pipistrelle, soprano pipistrelle, Leisler's bat, *Myotis* species, brown long-eared bat, and Nathusius' pipistrelle.

Most of the bat activity was attributed to common pipistrelle, soprano pipistrelle, and Leisler's bat (Table 7.19). These three species were recorded during all acoustic surveys performed.. All the remaining species accounted for less than 1% of the bat activity recorded. No bat species showed high activity in 2022 spring survey, during the 2023 substation and BESS survey, or 2024 additional coverage surveys.

The following subsections provide accounts for the species recorded, giving details of any seasonal or distributional patterns that emerged. Note that D numbers refer to deployment location and do not necessarily translate to turbine location, which are referred to with the notation T.

Pipistrellus species

Common and soprano pipistrelles exhibited consistent presence and activity recorded, during all deployments at every location in both 2022, 2023, and 2024. In contrast, the presence and activity of Nathusius' pipistrelle was a once off occasion, as evidenced by minimal activity, with only one bat pass observed in all years of study.

Common pipistrelle

Common pipistrelle was overall the most active species across the recorded and was most active during summer deployments (Table 7.19). In 2022 this species was the most active species at D.03, D.05, D.08, D.09, and D.10 locations. During spring season, common pipistrelles did not exhibit high at any of the sampled deployment locations with the exception of Sub.02 during the 2024 deployment. (Table 7.26). Common pipistrelles showed high activity at D.05, D.06, D.08, and D.09 during summer, and at D.03, D.08, and D.09 during autumn season (Table 7.26).

This species was the third most active species and exhibited low activity at the former substation and BESS location (Sub.01), during the permanent detector 2023 deployment (Table 7.26).

In 2024 the only species to have high mean activity across all locations was common pipistrelles in summer and autumn (Table 7.19). Common pipistrelles had high activity at all locations with the exception of D.11 in summer, with Sub.02 being the highest activity (27.90 bp/h) by almost 4 times the activity of the next most active location, D.12 (7.08 bp/h).

Considering the activity within the Development for common pipistrelles an ecological value of local ecological importance has been assigned for this species.

Soprano pipistrelle

Overall, soprano pipistrelle was the second most active species across the Site, with a total 11380 bat passes recorded, and was more active during autumn (Table 7.19). This species was the most active species at D.07 location. During spring season, soprano pipistrelles did not show high or moderate activity at any of the sampled deployment locations at the Site (Table 7.26). This species exhibited high activity at D.08 during summer and at D.06 and D.08 during autumn (Table 7.26) Soprano pipistrelle was the second most active species and exhibited low activity at the former substation and BESS location (Sub.01), during the 2023 deployment.

Unlike the previous three season deployment in 2022, soprano pipistrelles had low activity in autumn in 2024 (Table 7.19). Soprano pipistrelles exclusively had high activity at Sub.02 in summer, with moderate activity at D.12 and D.13 in all seasons.

Considering the activity within the Development for soprano pipistrelles an ecological value of local ecological importance has been assigned for this species.

Nathusius' pipistrelle

Nathusius' pipistrelle activity was very low, being recorded only once during the surveys conducted (at Sub.01 location during the 2023 static survey) (Table 7.13 and Table 7.26). According to Lundy et al. (2010), Nathusius' pipistrelles may be experiencing an expansion in their range due to increased availability of suitable habitats throughout Europe. The species' distribution is influenced by a positive association with high average minimum temperatures, urbanization, waterbodies, and the absence of peat/heathland and woodland, in descending order of importance.

Considering the activity within the Development for Nathusius' pipistrelle an ecological value of Negligible ecological importance has been assigned for this species.

Leisler's bat

Leisler's bat was overall the third most active species across the Development, with a total 7124 bat passes recorded, and was more active during summer (Table 7.13). This species was the most active species at D.01, D.02, D.04, and D.06 locations during the 2022 static surveys and at Sub.01 during the 2023 permanent static deployment (Table 7.26). During spring season, Leisler's bat did not show high or moderate activity at any of the deployment

locations (Table 7.26). This species exhibited high activity at D.04, D.06, and D.08 during summer and autumn (Table 7.26).

Leisler's bat was the most active species and exhibited low activity at the former substation location (Sub.1), during the permanent detector 2023 deployment (Table 7.26). In 2024 Leisler's bat did not have high activity at any location. They had moderate activity at D.12 and Sub.02 in spring, moderate activity at all locations in summer, and moderate activity at all locations excluding Sub.02 in autumn (Table 7.26).

Considering the activity within the Development for Leisler's bats an ecological value of local ecological importance has been assigned for this species.

Myotis species

Myotis spp. were the fourth most active recorded, with a total 181 bat passes recorded, and were more active during summer (Table 7.19). Overall activity of this species group was higher at D.02, D.06, D.05, and D.08, but no high or moderate activity of these species was detected at any of deployment locations (Table 7.26). While present at all locations, *Myotis* spp. activity was low at all locations throughout recording in 2024.

Considering the activity within the Development for *Myotis* species an ecological value of site ecological importance has been assigned for this group of species.

Brown long-eared bat

Brown long-eared bat was the least active species recorded, with a total 87 bat passes recorded, and was more active during the 2023 substation and BESS survey (Table 7.19). Overall activity of this species was higher at D.10, D.05, and D.04, but no high or moderate activity of these species was detected at any of the deployment locations (Table 7.26). In 2024 brown long-eared bats were recorded as having low activity at all locations and seasons, with the exception D.11 in summer, where there were no passes of the species recorded.

Considering the activity within the Development for brown long-eared bats an ecological value of local ecological importance has been assigned for this species.

7.4.4.2 Bat activity at T1

The proposed turbine location is currently situated within a conifer plantation, approximately 220 m west to an operational quarry. This woodland comprises multiple breaks, each hosting fragmented patches of hawthorn and various scrub species. The monitoring unit (D.01) was positioned inside this plantation, approximately 160 m northeast of turbine T1 location. Overall activity at this location was low, including for high collision risk species. Further away from T1 (c. 350 m southeast), D.02 was located over a semi-natural woodland adjacent to a commercial plantation activity at this location was low, however was moderate for the high collision risk species Leisler's bat during summer.

7.4.4.3 Bat activity at T2

The turbine location is proposed to be positioned in a field of improved grassland with a hedgerow approximately 50 m to the north and another two approximately 100 m to the south and west. The monitoring unit D.11 was placed covering this location in 2024. Pipistrelle activity was low at this location throughout all deployments. However, this location had moderate activity for Leisler's bat during the summer and autumn.

7.4.4.4 Bat activity at T3

The proposed turbine location is within a densely vegetated scrubland interspersed with fragmented patches of hawthorn and other diverse tree species surrounded by an access track and hedgerows and other linear features. An operational quarry is situated approximately 270 m north, while Drumshallon Lough and Drumshallon stream are situated c. 250 m and 380 m southeast, respectively.

The monitoring unit D.03, was positioned c. 175 m north current proposed position at the scrubland edge with the access track and provides baseline data for this location before the scrubland removal for the turbine installation. Overall activity at this location was low, however, it was high for the high collision risk species common pipistrelle, especially during autumn.

Detector D.04, despite positioned c. 500 m east from T3, is situated on the scrubland edge with an area of acidic grassland and provide a similar baseline condition of D.03 after the scrubland removal for the turbine installation. Overall activity at this location was low, however, it was moderate for the high collision risk species Leisler's bat and common pipistrelle.

The additional survey in 2024 covered this location much more accurately with D.12. At this location moderate Leisler's bat activity was recorded during spring, summer, and autumn. This

location also recorded high activity for common pipistrelle in summer and moderate activity in autumn. Soprano pipistrelles had moderate activity at this location in summer and autumn.

7.4.4.5 Bat activity at T4

The proposed turbine location is over a hedgerow predominantly composed by hawthorn and other mixed species. Adjacent to this hedgerow on the western side lies an acidic grassland habitat characterized by scattered rock outcrops, while improved grasslands are present on the eastern side. Southern to T4 turbine is Drumshallon Lough (c. 380 m southwest) and Drumshallon stream that runs (c. 180 south) from the lake towards the eastern side of the turbine (c. 150m east from T4).

The monitoring unit D.04, originally designed for T4, was located approximately 185 meters northwest of its current proposed position, within the acidic grassland habitat that borders the scrubland where T3 is predicted to be installed. Overall activity at this location was low, however, it was moderate for the high collision risk species Leisler's bat and common pipistrelle. The activity of Leisler's bat was high during summer at this location.

Since turbine movements, D.06 functions as a context detector for bat richness and activity along the Drumshallon stream and serves as a representative for other streams at the Proposed Development Site. D.06 was positioned approximately 215 meters southeast of turbine T4. Consequently, the turbine is intended to be positioned between D.04 and D.06. Overall activity at D.06 was high, including for the high collision risk species such as Leisler's bat, common and soprano pipistrelles.

This location was much more accurately covered in 2024 by D.13. This recorded moderate Leisler's bat activity in summer and autumn. Common pipistrelle activity at D.13 was high in summer and moderate in autumn, while soprano pipistrelle activity was moderate in summer and autumn. All other seasons and season had low activity for all species.

7.4.4.6 Bat activity at T5

The proposed turbine location is within an area currently occupied by a commercial conifer forest plantation. The monitoring unit D.07, designed for T5, was located approximately 65 m southeast of its current proposed position, within the same commercial plantation. This unit provides baseline data for this location before the woodland removal. Overall activity at this location was low, including for high collision risk species.

Situated to the north, approximately 170 m from T5, there is a mature tree line featuring multiple trees assessed with moderate and high suitability roost features that was monitored by D.08. Overall activity at this location was (very) high, including for the high turbine collision risk species such as Leisler's bat, common and soprano pipistrelles.

7.4.4.7 Bat activity at Substation

The footprint is situated within an improved grassland field, encompassed by hedgerows predominantly comprised of hawthorn, ash, ivy, and other mixed species. The monitoring unit Sub.01, originally designed for a former substation location, was positioned approximately 415 m southeast of the current proposed substation location, over hedgerow between two improved agricultural grassland fields. Overall activity at this location was low, however, it was in this location that the Nathusius' pipistrelle was recorded.

Less than 50 m to the east of the substation and BESS location, there is a mature forest patch. However, no suitable potential roost features were visible at this location. Given the tree species present at this woodland, unit D.08 might indicate similar bat activity and species composition. However, the detector at Sub.01 did not record activity levels as high as those at D.08. This location was more closely covered by Sub.02 in 2024 and had high common pipistrelle activity throughout all seasons.

Overall, when considering bat activity recorded and habitat suitability for foraging and commuting bats within the Proposed Development Site of the proposed development, an ecological value of local ecological importance has been assigned.

Table 7.19 Aggregate activity levels for bat species for all locations

(As per Table 7-10 low activity is denoted by **light green**, moderate activity is denoted with **green**, and high activity is denoted by **dark green**).

Deployment	Common pipistrelle	Soprano pipistrelle	Pipistrellus spp.	Nathusius' pipistrelle	Leisler's bat	Myotis spp.	Brown long-eared bat	All bats
Spring 2022 April	0.73 bp/h (n= 684 bp)	0.38 bp/h (n= 466 bp)	0.01 bp/h (n= 6 bp)	0.00 bp/h (n= 0 bp)	0.24 bp/h (n= 234 bp)	0.04 bp/h (n= 46 bp)	0.01 bp/h (n= 9 bp)	1.50 bp/h (n= 1445 bp)
Summer 2022 June	8.19 bp/h (n= 7782 bp)	3.79 bp/h (n= 3607 bp)	0.03 bp/h (n= 26 bp)	0.00 bp/h (n= 0 bp)	3.48 bp/h (n= 3359 bp)	0.08 bp/h (n= 74 bp)	0.01 bp/h (n= 9 bp)	13.01 bp/h (n= 14857 bp)
Autumn 2022 August/September	7.60 bp/h (n= 9359 bp)	6.43 bp/h (n= 7972 bp)	0.10 bp/h (n= 126 bp)	0.00 bp/h (n= 0 bp)	2.38 bp/h (n= 3089 bp)	0.04 bp/h (n= 48 bp)	0.04 bp/h (n= 49 bp)	13.98 bp/h (n= 20643 bp)
Substation 2023 August/October	1.21 bp/h (n= 305 bp)	1.23 bp/h (n= 335 bp)	0.01 bp/h (n= 2 bp)	0.005 bp/h (n= 1 bp)	1.25 bp/h (n= 442 bp)	0.03 bp/h (n= 13 bp)	0.05 bp/h (n= 20 bp)	3.54 bp/h (n= 1118 bp)
Spring 2024 April	1.83 bp/h (n= 1571 bp)	1.06 bp/h (n= 909 bp)	0.001 bp/h (n= 2 bp)	0.00 bp/h (n= 0 bp)	1.01 bp/h (n= 833 bp)	0.01 bp/h (n= 11 bp)	0.007 bp/h (n= 6 bp)	0.49 bp/h (n= 3331 bp)
Summer 2024 June	10.32 bp/h (n= 5703 bp)	3.49 bp/h (n= 3.49 bp)0	0.00 bp/h (n= 0 bp)	0.00 bp/h (n= 0 bp)	2.41 bp/h (n= 1330)	0.03 bp/h (n= 14)	0.01 bp/h (n= 6)	2.03 bp/h (n= 8981 bp)
Autumn 2024 August/September	7.56 bp/h (n= 6621 bp)	1.53 bp/h (n= 1342)	0.003 bp/h (n= 3 bp)	0.00 bp/h (n= 0 bp)	1.31 bp/h (n= 1148 bp)	0.06 bp/h (n= 49 bp)	0.03 bp/h (n= 30 bp)	1.31 bp/h (n= 9194 bp)

7.5 ASSESSMENT OF POTENTIAL EFFECTS ON BATS

7.5.1 Likely evolution of the baseline in the absence of the proposed development

The baseline conditions within the Development are described in Section 7.4. In the absence of this development agricultural activity would continue in areas of improved grassland and tilled fields. There would be no change in the described use of linear features by foraging and commuting bats. The area of scrub where T3 is situated would likely expand as there is currently no grazing occurring on that land. The baseline surveys found that this habitat is not of particular foraging value to bats. The value of the mature treeline north of T5 would remain and it would increase in its capacity as a roost feature resource as trees continued to experience veteranisation and exhibit more damage and diseased roost features. The forestry plantation where T1 is located would continue to grow and likely be harvested once tree heights reach an average of 25 m (assuming standard forestry practices are being applied). This would also apply to the forestry where T5 would be situated in the southwest of the Development.

7.5.2 Construction Phase Potential Effects

A full description of the Development (including met mast, substation, BESS, GCR and TDR) is given in **Chapter 2: Project Description**. A summary of potential impacts during the construction phase include:

Direct impact

- Habitat loss and fragmentation (roosting habitat)

Indirect impacts

- Habitat loss and fragmentation (foraging habitat)
- Disturbance and displacement with artificial lights at night (ALAN) and noise.

7.5.2.1 Direct Impacts

Habitat loss

Vegetation clearance will be necessary during the construction of access route to enable access and construction activities, including intersecting hedgerows and tree removal.

Proposed vegetation removal is to consist of

- The removal of scrub vegetation in the access route sector between turbine T4 and T3
- The felling of conifer trees for access between the main public road and turbine T1.
- The installation of turbine bases and hardstand areas for T2 and T4 will require the removal of hedgerow and scrub.

- Temporary hedgerow removal undertaken at the R162 / L-6274-0 Junction for the turbine delivery route.

The area assessed in the baseline surveys to be of the highest importance for roosting bats is the mature broadleaf treeline north of T5, where detector D.08 was positioned. There is no planned felling of trees in this area. During the design phase of the project the importance of this feature for roosting bats was acknowledged and turbines and infrastructure were positioned to ensure no tree felling would be required in this area. No potential roost features are present in areas which are proposed for tree felling and hedgerow clearance. There is no tree felling or building demolition proposed along the turbine delivery or grid connection route so no impact on roosting bats is anticipated. Therefore, there will be no significant effect on bat roosting, roosting habitats due to habitat removal associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155 as there is still no felling planned for areas with roost potential as planned felling at construction is the same for all models.

7.5.2.2 Indirect impacts

Habitat loss

One of the likely secondary impacts on bats resulting from construction works is the loss of foraging and commuting habitats/features utilised by bats. The proposed development includes several hedgerows, treelines and woodland that are known to be used by foraging and commuting bats. The survey data shows that the linear features, particularly the mature tree line with moderate to high bat roost potential, surveyed by the static detector D.08 has high levels of social and foraging activity. This habitat features falls within 30 meters of the proposed access route. However, due to the confined scope of the proposed works in this access route section (along existing tracks and agricultural fields), no tree felling is proposed. Furthermore, due to the findings of the surveys turbines and infrastructure are positioned to ensure no tree felling is required in this area.

Vegetation removal as a result of the proposed felling detailed in the previous section (Section 7.5.1) will also impact on bat foraging patterns within the Proposed Development Site, particularly given the relatively high levels of activity seen at linear features (D.04, D.06, D.08, D.12, D.13, and Sub.02 during various seasons throughout the 3 years of survey Figure 7.2 and Figure 7.3). However, the proposed tree felling strategy seeks to avoid the disruption of linear features for commuting bats. The removal of habitats primarily targets commercial trees with low ecological value for bats, such as the plantations around T1 and T5, for which

compensation will not be necessary. However, certain areas have been identified where vegetation removal could impact foraging and commuting bats. These areas include:

- lengths of hedgerows within bat feature buffers for T2, T4, and T5
- scrubland vegetation within the bat feature buffer for T3.

The detectors D.04 and D.13 were in close proximity to T4 while D.11 covered the location of T2. While the detector D.11 recorded primarily low activity in the location where T2 is expected to be installed, based on data from D.06 and D.08 in 2022 it is expected that activity would be higher at the feature to be removed.

There will also be large amounts of habitat removal for mitigation purposes as described in Section 7.6.3.1, to reduce bat foraging features around turbines primarily in the removal of scrub, hedgerow, and conifer plantation amounting to a total of 0.32 ha as assessed on maximum potential bat feature turbine buffers.

Hedgerows serve as important commuting and foraging grounds for the local bat populations and are essential components for habitat connectivity within the Development. Therefore, without mitigation measures, the temporary and permanent removal of hedgerows and trees associated with turbine model Nordex N148 is considered to be a likely significant indirect effect at a local geographical scale.

The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155 as the felling plan at construction is the same for these models.

Although the substation and BESS are expected to be installed within an improved grassland field, it will be situated within 30-meters from a mature forest patch with characteristics similar to those of the mature tree line with high foraging and social activity. However, there is no tree removal anticipated for the construction of the substation and BESS. Therefore there will be no significant indirect effect due to habitat removal associated with the substation and BESS.

The GCR and TDR are detailed in Chapter 2. As detailed in this section the planned GCR does not require tree felling or the removal of hedgerows. As detailed in the previous section the TDR will require a hedgerow removal undertaken at the R162 / L-6274-0 Junction. This constitutes a temporary removal of a short section of hedgerow. Therefore, there will be no significant indirect effect due to habitat removal associated with GCR and TDR.

Disturbance and displacement with ALAN and noise

Mentioned in this section the survey data shows that the linear features, particularly the mature tree line with moderate to high bat roost potential, surveyed by the static detector D.08 showed the high levels of social and foraging activity. This habitat features is also within 30 meters of the proposed access route. Although no actual roosts were confirmed in this location, roosting features of moderate and high suitability need to be considered as potential active roosts (BCT 2023 and BTHK 2018). The substation and BESS are to be installed within an improved grassland field (Adjacent to Sub.02), it will be situated well within 30-meters from a mature forest patch with age and species characteristics similar to those of the mature tree line with high foraging and social activity.

The species utilising this location the most – namely Leisler's bat, soprano pipistrelle and common pipistrelle, are all less sensitive to light pollution (Matthews *et al.* 2015) than the less commonly recorded species, brown long-eared bats and Myotis species (BCT, 2018, Mathews, et al. 2015).

T, the closest turbine, is approximately 170 m south of a mature tree line with moderate and high potential roost features, which was surveyed by the static detector D.08 and found the area to have particularly high foraging and social activity.

Due to the proximity of the construction work to the aforementioned areas, there is potential for light spill from ALAN and noise to cause disturbance. Therefore, without mitigation measures, ALAN and noise associated with turbine model Nordex N148 and the substation and BESS is considered to be a likely significant indirect effect at a local geographical scale specifically for Myotis spp. and brown long-eared bats. Given that Leisler's bats and pipistrelles are not as light sensitive (Matthews *et al.* 2015) it is considered likely that there will be no significant effect.

The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155 with the substation and BESS as there is no planned difference in lighting regime based on the different models.

7.5.3 Operational Phase Potential Effects

Operational phase impacts that are expected to result in likely significant effects on bats are:

Direct

- Collision or barotrauma.

Indirect

- Displacement and attraction effects of operating turbines.
- Disturbance due to ALAN.

7.5.3.1 Direct Effects

Collision or barotrauma

Among these potential impacts, direct turbine collision and barotrauma are extensively documented to cause major injuries and fatalities if no mitigation measures are put in place (e.g., Cryan & Barclay, 2009; Rydell et al., 2010; Cryan et al., 2014; Arnett et al., 2016; Matthews et al., 2016). The Irish bat species at risk are detailed in Table 7.12, considering their likelihood of flying at turbine blade height. Turbines installed in open habitat without any linear feature nearby, such as turbine T3, will have lower potential for significant impacts due to collision and barotrauma due to the lower activity rate within these areas (Finch et al., 2020). However, if turbines are located within proximity to linear features such as hedgerows, tree lines, and rivers/streams, as T4, there is potential for a greater occurrence of bats within the turbine-swept area, resulting in increased potential for bat fatalities and, therefore, significant direct impacts on bats (Finch et al., 2020). As the proportion of fatalities attributed to direct collisions versus barotrauma can be difficult to determine the assessment in this section refers to both as collisions in line with the NatureScot *et al.* 2021 guidance.

Furthermore, the operation of turbines in locations such as dense conifer forests, as observed with T1 and T5, will require tree felling around the turbines to mitigate turbulence. This action creates new edge ecology and may attract bats.

NatureScot et al. 2021 Site risk level assessment (stage 1)

Analysis of the baseline data collected during the 2022, 2023, and 2024 surveys reveal a notable heterogeneity in bat habitat suitability across the Development. While much of the area exhibits low-quality features for bat foraging and roosting, certain specific habitats within the Development are heavily utilised by commuting and foraging bats. Although no confirmed roosts were identified during the surveys, several moderate to high potential roosting features were observed, suggesting a likelihood of bats utilising these on a transitional basis. Key features supporting bat populations within the Development include mature tree lines, hedgerows, and water bodies and water courses. Additionally, the 2023 surveys identified in the southern section of the Development, located approximately 170 meters north of the proposed Turbine T5 location, had high levels of foraging and social activity. Based on the criteria outlined in Table 7.13, the overall habitat risk of the Proposed Development Site is assessed as Moderate (Table 7.20).

However, given the highly heterogeneous nature of the Proposed Development Site, habitat risk levels may vary from Low to High depending on specific locations within the area. In Table 7.26, habitat risk assessment of turbine (T points), Substation, and detector (D. or Sub. points) locations are presented.

Table 7.20 - Habitat risk assessment for overall site and specific locations within the Proposed Development Site.

Location	Covered primarily by	Habitat risk assessment	Rationale	Habitat
Overall Site	All detectors	Moderate	Heterogeneous area with features presenting risk levels from low to high.	The habitat within the proposed wind farm site is comprised of mosaic of acidic grassland, improved grassland, tilled land (arable crops), scrub, mixed commercial coniferous forestry and linear area of mature beech woodland
T1	D.01	Low	No potential moderate/high roost features nearby and low foraging quality habitat.	Located in a commercial conifer plantation, the detector is situated along a ride line in the forest. This ride line has high foraging and high commuting potential as, there is good connectivity with the adjoining commercial conifer woodland.
T2	D.11	Low	No potential moderate/high roost features and low foraging quality habitat.	Detector located in the middle of an improved grassland. To the north is a hedgerow and to the south is a small stream. Both of which are greater than 80 m away.
T3	D.12	Moderate	No potential moderate/high roost features. Habitat that could be used by foraging bats and connected by linear features	Located along in an area that is covered densely with scrub species that consists of mainly gorse with some fragmented areas of hawthorn and other fragmented tree species. Adjacent to this scrub coverage is a track that provides access to the land to the north of this scrub. This track provides moderate foraging and commuting suitability for bats as it has connectivity to the adjoining woodlands to the west of the site.
T4	D.13	Moderate	No potential moderate/high roost features. Habitat that could be used by foraging bats and connected by linear features	Located along a stone wall. To the east of this wall is a field of tilled land and to the west is an open area of improved grassland which borders the area of dense scrub consisting of hawthorn and gorse..
T5	D.07	Moderate	No potential moderate/high roost features nearby and low foraging quality habitat.	Located in a commercial conifer forest plantation. The forestry rides located within the forest offers high foraging and commuting habitat for bats. Located within 300 m of this detector is the mature treeline which has multiple moderate and

				high suitability PRF trees. To the southeast of this detector location is the low roost potential portacabin office building.
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According to the criteria outlined in Table 7.15 for classifying project size, the proposed wind farm would be categorized as a small project, regarding only to the number of turbines (< 10 turbines). However, considering that all turbine models considered in this assessment exceed 100 meters in height, it would be deemed a large project. Therefore, the project size for all turbine options is assessed as Medium.

Following both habitat risk and project size assessments, the overall collision risk for the Site was categorized as medium risk (3). Considering the heterogeneity within the Site mentioned above, different locations have different levels of collision risk associated. Table 7.21 presents the site collision risk assessment of turbine (T points) and Substation locations.

Table 7.21 - Site collision risk assessment ((1-2) = lowest/low risk, (3) = medium risk, (4-5) = high/highest risk) for overall site and specific locations within the Site.

Location	Habitat risk assessment	Project size	Site risk level (1-5)
Overall Site	Moderate	Medium	Medium (3)
T1	Low	Medium	Low (2)
T2	Low	Medium	Low (2)
T3	Moderate	Medium	Medium (3)
T4	Moderate	Medium	Medium (3)
T5	Moderate	Medium	Medium (3)

Nature Scot et al. 2021 Overall site bat risk level assessment (stage 2)

Based on the full survey in 2022, the overall bat collision risk level for the site was determined to be 3 (medium risk) in accordance with the stage 1 assessment. With regards to the high and moderate collision risk species, Leisler’s bat, common pipistrelles, and soprano pipistrelles were assessed as having a medium risk level of 9, while Nathusius’ pipistrelle was assessed as a low risk level of 3 (Table 7.22). Refer to Table 7.26 and Table 7.27 in Section 7.12 of this report which shows location specific activity levels and the collision risk assessment for the static detector locations by season, highlighting the

individual risk assessment for each high collision risk species identified on the Development.

However, this outcome is influenced by the heterogeneous nature of the Site landscape. Certain specific sampled deployment locations within the Site exhibit very high bat activity, most of which have no planned turbines nearby, thus biasing the overall Site bat collision risk assessment giving some insight into the local bat population within the Proposed Development Site. Collision risk varied substantially by season and turbine location (Table 7.22 and Table 7.27). For example, the overall Site collision risk during spring is low (3) but escalates to high (15) during summer and autumn. This is primarily attributed to the introduction of location D.08 during these seasons, characterised by exceptionally high bat activity compared to the rest of the detector locations, and a general seasonal increase in bat activity at other locations. Notably common pipistrelles, soprano pipistrelles, and Leisler's bat, which are particularly active at locations D.04, D.05, D.06, and D.08.

Table 7.22 Turbine collision risk assessment ((0-4) = low risk, (5-12) = risk, (15-25) = high risk) specific static detector locations by season. Data on collision risk at secondary detectors for turbine locations are presented in Section 7.12.

	Bat risk level					
	Turbine	Closest detector	Leisler's bat	Nathusius' pipistrelle	Common pipistrelle	Soprano pipistrelle
Spring	T1	D.01	2	0	2	2
	T2	D.11	2	0	2	2
	T3	D.12	3	0	3	3
	T4	D.13	3	0	3	3
	T5	D.07	3	0	3	3
Summer	T1	D.01	2	0	2	2
	T2	D.11	6	0	2	2
	T3	D.12	9	0	15	9
	T4	D.13	9	0	15	9
	T5	D.07	3	0	3	3
Autumn	T1	D.01	2	0	2	2
	T2	D.11	6	0	2	2
	T3	D.12	9	0	9	9
	T4	D.13	9	0	9	9
	T5	D.07	3	0	3	3

In the subsequent subsections, a collision risk level evaluation was performed for each turbine location.

Collision risk evaluation at turbine T1

Turbine T1 is located close to the area monitored by detector D.01, indicating a comparable collision risk level to that assessed for D.01. Consequently, in accordance with the findings outlined in Table 7.22 in all seasons the risk assessment for Leisler's bat, common pipistrelles, and soprano pipistrelles all yielded a score of 2, indicative of low risk. Due to the absence of bat activity recorded, the risk assessment for Nathusius' pipistrelle was determined to be 0, signifying low risk.

In conclusion, this location is deemed not to pose a low risk even for high collision risk bat species, such as Leisler's bat or Nathusius' pipistrelle.

Collision risk evaluation of turbine T2

Turbine T2 will be located in improved grassland in the northeastern section of the Development. This location was covered most closely in 2024 by D.11. The assessment for D.11 for Leisler's bat for spring and summer returned a score of 6 (medium). Soprano and common pipistrelles had a score of 2 in all seasons, indicating a low collision risk.

The assessment for Leisler's bat returned a medium score of 6 again in the 2024 season. In conclusion this turbine constitutes a low collision risk for pipistrelles throughout all seasons but is a medium risk to Leisler's bats in summer and autumn.

Collision risk evaluation of turbine T3

Using the 2024 D.12 data (Table 7.22), in spring the collision risk for all species scored between 3 and 2 (low). In the summer period Leisler's bat and soprano pipistrelles all scored 9 (medium) for collision risk while common pipistrelle collision risk scored 15 (high). In autumn Leisler's bat, common pipistrelle and soprano pipistrelle all scored 9 (medium).

In conclusion, the overall collision risk may be considered low (including for high collision risk bat species such as Leisler's bat and Nathusius' pipistrelle).

Collision risk evaluation of turbine T4

The location of T4 was most closely covered with the D.13 detector in 2024.

In spring, as presented in Table 7.22, T4 is expected to present a low collision risk to bat species, with an overall score of 3 across all species. Summer data from 2024 shows that the collision risk for Leisler's bat and soprano pipistrelle scored 9 (medium) for collision risk while common pipistrelle scored 15 (high).

In autumn then collision risk for all species assessed was 9 (medium). In conclusion T4 poses a medium to high risk for high collision risk bat species such as Leisler's bat and common pipistrelle during the summer and autumn seasons.

Collision risk evaluation of turbine T5

Turbine T5 was most closely covered by detector D.07, suggesting a comparable collision risk to that assessed for D.07. In accordance with the findings presented in Table 7.22, T5 is expected to present a low collision risk to bat species, with a score of 3 across all seasons for all species assessed, including for Leisler's bat, common pipistrelle, and soprano

pipistrelle. There is no expected escalation of collision risk for the individual seasons (spring, summer or autumn) for high collision risk species. However, there is the mature treeline on which data was gathered by D.08, which had the highest activity recorded. This treeline is situated approximately 170 m north of turbine T5 and slightly within the 300 meter turbine buffer zone. This treeline is also comprised of multiple trees with moderate to high suitability as potential roost features (refer to Figure 7.1). The importance of preserving this feature is shown by the significant species richness (the presence of all different species recorded during surveys) and activity of bats detected, especially during the autumn. It should be noted, however, that the much lower activity recorded at D.07 would indicate that the species associated with the mature woodland do not use the area immediately surrounding T5 to the same extent. In conclusion T5 poses a low collision risk for high collision risk bat species such as Leisler's bat and common pipistrelle during all seasons recorded

Potential direct operational impacts on common and soprano pipistrelles

As listed in Table 7.12, both common pipistrelle and soprano pipistrelle are classified as being at high risk of collision, based on their flight and ecological behaviour. These species are often observed to be attracted to turbines, with various hypotheses proposed to explain this phenomenon (Richardson et al., 2021). Common and soprano pipistrelles typically exhibit a preference for linear habitat features such as woodland/plantation edges, scrub, tree lines, hedgerows, and rivers/streams, although pipistrelles are also known to occasionally forage in open habitat (Finch et al. 2020).

Recorded activity levels of these species at the Development were observed to be high in similar habitats or near turbines T3, and T4, particularly during the summer and autumn seasons. Therefore, without mitigation measures, potential direct impacts of the turbines operational phase associated with turbine model Nordex N148 on common pipistrelle and soprano pipistrelle are considered to have a likely significant effect at a local geographical scale. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

Potential direct operational impacts on Nathusius' pipistrelles

As indicated in Table 7.12, Nathusius' pipistrelle is classified as being at high risk of injury or fatality from turbines, attributed to either barotrauma or collision. A recent study suggests also this migratory species may be drawn to the red aviation safety lighting, and then be

particularly at risk from operating turbines (Voigt et al., 2018a). A review of turbine-related bat fatalities in Europe (Rydell et al., 2010, Korner Nievergelt et al., 2013; Arnett et al., 2016) found that 13% of the casualties were *Nathusius' pipistrelles*. This species regularly flies in open habitats and at height, furthermore *Nathusius' pipistrelles* are strong flyers and known to be migratory, potentially flying at height during migration.

Nathusius' pipistrelle was recorded only once during a static survey undertaken in 2023, leading to the collision risk assessment of this species for the Development being classified as low. Given this species almost complete absence in survey outside of one 15 seconds window there will be no significant effect on this species as a result of collision associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

Potential direct operational impacts on Leisler's bat

As indicated in Table 7.12, *Leisler's bat* is classified as being at high risk of injury or fatality from turbines, attributed to either barotrauma or collision. Along with their sibling species common noctule (*Nyctalus noctula*), they are amongst the most commonly recorded casualties during bat fatalities monitoring in Europe (Voigt et al., 2022). *Leisler's bats* are usually tree-dwellers and feature strong and fast in flight, regularly foraging over the tree canopy or taking direct flights across open habitats (Vincent Wildlife Trust, Bat Conservation Ireland and Bat Conservation Trust accessed May 2024) and strong linear features like rivers. Recorded activity levels of *Leisler's bat* were observed to be high in similar habitats or near turbines T4 and T5, particularly during the summer and autumn seasons. Therefore, without mitigation measures, potential direct impacts of the operational phase associated with turbine model Nordex N148 on *Leisler's bat* are considered to have a likely significant effect at a local geographical scale. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

Potential direct operational impacts on Myotis species

As indicated in Table 7.12, bats of the genus *Myotis* are considered as being at low risk of collision and barotrauma impacts from wind turbines, attributed to their ecological behaviour of flying at low heights and slow speeds within cluttered habitats or over water (Vincent Wildlife Trust, Bat Conservation Ireland and Bat Conservation Trust accessed May 2024). Therefore, there will be no significant effect on this species as a result of collision and barotrauma associated with turbine model Nordex N148 during the operational phase on

these species. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

Potential direct operational impacts on brown long-eared bats

Similar to *Myotis* species, brown long-eared bats are considered as being at low risk of collision and barotrauma impact from wind turbines (Table 7.12), attributed to their ecological behaviour of flying at low heights and slow speeds within cluttered habitats or forest edges (Vincent Wildlife Trust, Bat Conservation Ireland and Bat Conservation Trust accessed May 2024). Therefore, there will be no significant effect on this species as a result of collision and barotrauma associated with turbine model Nordex N148 during the operational phase on these species. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

Overall potential impacts on bats

Overall, due to the species present within the Site, without mitigation measures, collision and barotrauma associated with turbine model Nordex N148 is considered to be a likely significant effect at a local geographical scale. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

7.5.3.2 Indirect Effects

Lighting

There will be minimal lighting installed within the Development. There will, however, be additional lighting on the substation and BESS location, which in the absence of mitigation has the potential to result in the displacement of light sensitive species. The species recorded most regularly at the substation and BESS location, namely Leisler's bat, soprano pipistrelle and common pipistrelle, are all less sensitive to light pollution (Casia Villehas *et al.* 2023, Matthews *et al.* 2015) than the less commonly recorded species, brown long-eared bats and *Myotis* species (BCT, 2018, Mathews, *et al.* 2015). While recorded as having lower activity the two more light sensitive species are examined. Therefore, there will be no significant effect on Leisler's bat, common pipistrelle, and soprano pipistrelle associated with the substation and BESS.

Myotis bats are light-sensitive (light-averse) species that have shown to significantly reduce in activity levels and avoid areas that are illuminated with white and amber lighting (Guidance Note GN08/23). Lighting during operation of the substation and BESS may cause a barrier to movement should the light spill impose on areas used by the species for

foraging or commuting which are directly adjacent. Therefore, without mitigation, impacts due to lighting associated with the substation and BESS are considered to have a likely significant effect at a local geographical scale on *Myotis* spp.

In terms of indirect effects, brown long-eared bats are particularly light-sensitive (light-averse) and has shown to significantly reduce in activity levels and avoid areas that are illuminated with white and amber lighting (Guidance Note GN08/23). Lighting during substation and BESS operation may cause a barrier to movement should the light spill impose on areas used by this species for foraging or commuting. Therefore, without mitigation, impacts due to lighting associated with the substation and BESS are considered to have a likely significant effect at a local geographical scale on brown long-eared bats.

Displacement and attraction effects of operating turbines

Turbines have the potential to influence the distribution of bats throughout a Development through attraction or displacement effects. As explained in Section 7.3.1.1 Across all guilds in the absence of nearby features activity can increase at turbine locations in the open and decrease at turbines near features and that this effect occurs when turbines are located 43 – 100 m from hedgerows. Also, that there was no effect detected in any guild under turbines greater than 100 m from a feature. Therefore, this effect is most likely to occur where the highest level of bat activity was recorded, D.08, with the nearest turbine being T5 (approximately 170 m away). However, as the cause of this effect has still not been established in literature, non significance of effect can be determined. Based on the precautionary principal, location D.08 is still over 100 m from T5, therefore, there will be no significant effect as a result of attraction or displacement associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

The habitat improvement detailed in the Biodiversity and Environmental Management Plan (BEMP) will also result in a change in distribution of bat species, likely drawing them away from turbine locations. It is possible that operational turbines will have a slight indirect effect on the distribution of bats at a local population level. While the significance of this effect cannot be determined without further knowledge on the turbine attraction hypothesis for bats. Based on previous experience and according to NatureScot et al 2021 and NIEA 2021, the mitigation strategy of bat feature buffers has a high success rate. Therefore, there will be no significant effect as a result of attraction or displacement associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

7.5.4 Decommissioning Phase Potential Effects

A summary of potential impacts during the decommissioning phase include:

Direct impact

- Habitat loss and fragmentation (roosting habitat)

Indirect impacts

- Habitat loss and fragmentation (foraging habitat)
- Disturbance and displacement with artificial lights at night (ALAN) and noise.

Decommissioning phase impacts are likely to be broadly similar to construction phase impacts within the Proposed Development Site and along the GCR and TDR, in terms of disturbance through increased noise levels, ground clearance works, and reinstatement.

However, there are certain aspects of activities occurring during the construction phase which will occur at reduced levels during decommissioning. Access tracks will also remain for ongoing usage as farm and forestry tracks. In addition, the use of building materials, including concrete and aggregates will not be required. The GCR will be left in place.

7.5.4.1 Direct effects

Like the construction phase there may be the direct effect resulting from habitat removal that may be required at access routes. However, it is unlikely that any roost features will be directly affected as infrastructure has avoided these areas within the Proposed Development Site and no roost features were identified or anticipated to be felled along access routes. There will also not be felling conducted for bat buffers and there will not be features needing removal within the buffered range of hard stand areas.

Therefore, there will be no significant effect as a result of habitat loss during the decommissioning phase associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

7.5.4.2 Indirect effects

As with the construction phase there is the potential for some habitat features to be removed during decommissioning. As discussed in the construction phase the impacts of the temporary and permanent removal of hedgerows and trees is considered to be a likely significant indirect effect at a local geographical scale. However, as discussed above, the habitat loss will not be as consequential as for construction. Therefore, there will be no significant effect as a result of habitat loss during the decommissioning phase associated

with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

As also discussed within the construction phase impacts, there is the potential for lighting and noise impacts considered to be a likely significant indirect effect at a local geographical scale. As the decommissioning phase will require similar lighting as the construction phase similar effects are expected. Therefore, due to the proximity of the decommissioning work, there is potential for light spill from ALAN to cause disturbance. ALAN associated with the decommissioning of turbine model Nordex N148 is considered to be a likely significant indirect effect at a local geographical scale specifically for *Myotis* spp. and brown long-eared bats. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

As the noise levels will be significantly reduced during the decommissioning phase due to the foundations being left in place, there will be no significant effect as a result of indirect noise impacts during the decommissioning phase associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

7.6 MITIGATION MEASURES

7.6.1 Embedded Mitigation

During the project's design phase, measures were taken to avoid significant impacts on the local bat populations. These efforts included:

- reducing the initial layout of seven turbines to a final layout consisting of five turbines
- relocating turbines which in part was to ensure avoidance of direct impacts on important bat features such as areas of high foraging social activity, and roost potential
- Relocating the substation and BESS
- Reducing the level of habitat removal
- Avoiding removal of moderate to high potential roost features
- Avoid felling in areas moderate to high potential roost features
- Using existing tracks and roads where possible
- Siting new track and roads away from hedgerows and treelines
- Restrictions on construction works hours

7.6.2 Construction Phase Mitigation

As assessed in Section 7.5.2, the construction phase is expected to result in significant effects, primarily in the form of habitat loss due to hedgerow removal and indirect disturbance from lighting and noise. No significant direct effects are anticipated. Therefore, the mitigation measures during the construction phase will primarily focus on habitats/features essential for bat foraging and commuting and reducing ALAN and noise impacts. The approach to mitigating the indirect effects is detailed in further in this section.

7.6.2.1 Indirect effects

Habitat loss

Where the working area intersects a hedgerow, where practicable the hedgerow will be reinstated and replanted with similar species or native species of Irish provenance. This is detailed further in the Biodiversity Enhancement and Management Plan (BEMP). This will maintain connectivity of the linear features for use by bats. Where the loss is permanent, additional areas of hedgerow will be planted within appropriate locations within lands under the control of the applicant (this is also addressed in the BEMP).

To offset each loss of bat commuting and foraging habitat and to adhere to a biodiversity net gain approach, areas for compensatory habitat enhancement and replanting have been established and are outlined in the BEMP. Planting in the compensation area north west of the existing mature tree line will be approximately 0.5 ha in length. The regime and species will attempt to replicate the tree line north of T5 in terms of species composition. The compensation area will be planted as an extension to the north of the western end of the treeline, outside of all turbine felling buffers. The planting will be a mix of tree species in the identified compensatory habitats to offer a more resilient and holistic approach compared to relying solely on bat boxes (Reason & Wray, 2023). Additionally, the approach will include early senescent fruit trees in the species mixes, as they provide roosting features for bats more quickly than other tree species (Reason & Wray, 2023).

Tree lines and mature trees that are located immediately adjacent to proposed access routes will be avoided and retained intact as described in Section 7.6.1. Overall impacts on these areas have been reduced through modified design and sensitivity. Retained trees will be protected from root damage by an exclusion zone of at least 7 metres or equivalent to canopy height (whichever is greatest). Such protected trees will be fenced off by adequate temporary fencing prior to other works commencing. No works or material storage will take place within the root protection areas.

Disturbance and displacement with ALAN and noise

As detailed in Chapter 2 construction work will take place between 07:00 and 19:00 throughout the week with some operations taking place outside these hours when needed and agreed with the local authority. Where lighting is required, the following mitigation will be employed.

Lighting will be designed in accordance with EUROBATS 'Guidelines for the consideration of bats in lighting projects', as well as Bat Conservation Trusts' 'Bats and Artificial Lighting at Night: Guidance Note 08/23' (EUROBATS, 2018; BCT, 2023) and lighting mitigation included in the 'Bat mitigation guidelines for Ireland v2' by Marnell et al. (2022). Measures are proposed to reduce the potential for light spill impacts from temporary construction lighting, along hedgerows, treelines, scrub and grassland habitats:

- Motion sensors / timer triggers used;
- Column heights kept to a minimum as practicable;
- Lighting directed only to areas where lighting is needed (avoid unnecessary light spill);
- Luminaires used to prevent light spill;
- Warm colour temperatures used (2700K or less);
- Cowls, louvres, hoods or baffles used to direct lighting; and
- No upward facing lighting.

Chapter 13: Noise and Vibration identifies the noise mitigation measures that will be implemented. While none of these measures are required to reduce impacts on bats, the following measures will nonetheless significantly reduce noise disturbance to bats:

- All ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers.
- Machines will be shut down between work periods (or when not in use) or throttled down to a minimum.
- Regularly maintain all equipment used on site, including maintenance related to noise emissions.
- Vehicles will be loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and
- All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance and if necessary, temporary acoustic screens or enclosures will be provided.

7.6.3 Operational Phase Mitigation

7.6.3.1 Direct effects

Collision and barotrauma: Bat buffers around turbines

As recommended by existing guidance, a separation distance from habitat features used by bats and the tips of operational turbine blades must be maintained as a bat feature buffer. EUROBATS (Rodrigues et al., 2015) recommend buffers up to 200 m from the tips of operational turbine blades, while NatureScot *et al.*, 2021, recommend a minimum of 50m be used. This then elaborates to say *larger buffers may be appropriate when turbines are near important bat features such as swarming, maternity or hibernation sites* (NatureScot *et al.*, 2021). This report has completed the assessment of effect as per NatureScot *et al.*, 2021. However, due to the area of higher activity and social behaviour near T5, the assessment has gone above and beyond the recommended minimum guidance of NatureScot *et al.*, 2021 and imposed a bat feature buffer of 100 m. This is considered appropriate for the scale of the Development and potential effects identified. The Development does not warrant the EUROBATS (Rodrigues et al., 2015) recommend buffers up to 200 m. NatureScot *et al.* 2021 are considered to be more applicable in an Irish context as we have species assemblages and climates closer to that of Scotland. Table 7.23 provides the bat feature buffer (at 50m, 100m and 200m from the tips of operational turbine blades) for the three turbine models assessed for the Development.

Table 7.23 Turbine buffer distances to reduce bat fatalities at operational turbine locations

Turbine model	Feature height (m)	Turbine buffer distance (m)		
		NatureScot (50 m)	NatureScot "extended" (100 m)	EUROBATS (200 m)
Nordex N149	0	67.0	139.4	253.7
	2	70.0	140.9	254.5
	5	74.2	143.1	255.7
	15	86.1	149.6	259.4
	25	95.5	155.1	262.6
Nordex N163	0	87.7	152.8	263.9
	2	89.9	154.0	264.6
	5	93.0	155.9	265.7
	15	102.0	161.4	269.0
	25	109.4	166.2	271.9
Siemens-Gamesa SG155	0	75.8	144.9	257.9
	2	78.5	146.3	258.7
	5	82.2	148.3	259.8

	15	92.7	154.4	263.3
	25	101.2	159.7	266.5

The area where trees/scrub are cleared to create the bat feature buffers will be rendered as unsuitable as early possible and maintained as such throughout the lifetime of the Development. To achieve this, felled timber and branches will be removed, and stumps will be brushed to ground level. Any excess spoil from excavation works during construction will be broadcast to cover over any ground stumps, creating a more homogeneous surface. Additionally, the area will be prevented from scrubbing up again through a mowing or grazing regime. Based on calculations informed by Table 7.23, the minimum bat feature buffers (varying based on turbine dimensions) required to reduce bat fatalities by collision and/or barotrauma to levels which are not significant for each proposed turbine are as follows:

- T1 – Sited in a commercial plantation area with a maximum feature height of 25 meters (usually the point at which trees are harvested). The minimum required bat buffer (NatureScot *et al.* 2021) for each turbine model was assessed to be:
 - 95.5 m for Nordex N149
 - 109.4 m for Nordex N163
 - 101.2 m for Siemens-Gamsea SG155.

- T2 – Sited in a grassland in an improved grassland with a hedgerow within approximately 50 m to the north, with a maximum feature height of 5 meters (hedgerow). The minimum required bat buffer (NatureScot *et al.* 2021) for each turbine model was assessed to be:
 - 74.2 m for Nordex N149
 - 93 m for Nordex N163
 - 82.2 m for Siemens-Gamsea SG155.

- T3 – Sited within a dense scrubland with a maximum feature height of 2 meters. The minimum required bat buffer (NatureScot *et al.* 2021) for each turbine model was assessed to be:
 - 70 m for Nordex N149
 - 89.9 m for Nordex N163
 - 75.8 m for Siemens-Gamsea SG155

- T4 – Sited between a tillage field and scrub dominated area with a maximum feature height of 5 meters (hedgerow). The minimum required bat buffer (NatureScot *et al.* 2021) for each turbine model was assessed to be.
 - 74.2 m for Nordex N149
 - 93 m for Nordex N163
 - 82.2 m for Siemens-Gamsea SG155

- T5 – Sited in a commercial plantation area with a maximum feature height of 25 meters. As this is an area of higher activity and social behaviour, the minimum bat buffer (NatureScot “extended”) for each turbine model was assessed to be.
 - 155.1 m for Nordex N149
 - 166.2 m for Nordex N163
 - 159.7 m for Siemens-Gamsea SG155

While the minimum feature buffer per turbine was assessed and defined here, the maximum buffer will be applied in all cases to ensure that there is a reduction bat activity at turbine locations. In summary the following buffers will be applied:

- At T1 a 109.1 m buffer will be implemented
- At T2 a 93 m buffer will be implemented
- At T3 a 89.9 m buffer will be implemented
- At T4 a 93 m buffer will be implemented
- At T5 a 166.2 m buffer will be implemented

Collision and barotrauma: Turbine curtailment

Bat feature buffers are effective in reducing turbine collisions for high-risk collision bat species, such as common and soprano pipistrelles, which commute and forage along forest edges. However, they may be less effective for species like Leisler’s bat and Nathusius’ pipistrelle that regularly commute and forage at turbine height in open areas. While Nathusius’ pipistrelle have low activity levels (one pass in three years of data collection) a precautionary approach has been taken to include this species in the mitigation. Therefore, for Leisler’s bat and Nathusius’ pipistrelle species, a turbine curtailment regime will be implemented as a mitigation measure from the start of operation, as per NatureScot *et al.* 2021, EUROBATS (Rodrigues *et al.*, 2015) and CIEEM (Reason & Wray, 2023). This mitigation measure technique has been documented to reduce bat fatalities rates substantially and effectively at wind farms (Voigt *et al.* 2022) with minimal impact on power generation. A recent study in Canada estimated that feathering wind turbines when windspeed was lower than 5.5 m/s between 6 pm of one day and 6 am the following day would result in only a 0.43% loss of total energy production (Thurber *et al.*, 2023).

At the Development, Leisler's bats were notably more active during summer and autumn, particularly near the proposed T3 and T4 turbine locations, the Drumshallon stream (monitored by detector D.06), and the mature tree line north of T5 (monitored by detector D.08). Based on observed Leisler's bat activity levels, turbines seasonal condition based curtailment will be implemented at:

- T3 and T4 during the summer;
- T4 during the autumn;
- T2 during summer and autumn

T2 is included on a precautionary basis given the roost features being added as part of the Kilsaran Quarry development discussed further in Section 7.9.2. The requirement for curtailment of T2 specifically should be reviewed in tandem with bat box and activity monitoring at the location.

During the time periods outlined wind turbine blades will be feathered, meaning the angle of the blade will be adjusted to reduce rotational speeds to a minimum and reduce the potential for collision or barotrauma events.

Weather data (refer to Bat Survey Technical Report Appendix 7.1: technical bat report) indicates that 95% of Leisler's bat activity occurs within specific temperature and wind speed ranges during summer and autumn. Therefore, based on observed Leisler's bat activity in specific temperature and wind speed ranges, curtailment will be implemented to feather turbine blades and reduce turbine speeds at all turbines in the following circumstances:

- Nighttime (between sunset and sunrise) ground-level winds are equal to or less than 3 m/s in summer and autumn (June – October); and
- Nighttime temperatures exceed 9°C during summer (June – mid-August) and nighttime temperatures exceeding 11°C during autumn. (mid-August – October).

The effectiveness of this curtailment regime will be monitored for the first 3 years of the project as outlined in NatureScot *et al* 2021. Should the curtailment be successful result in a non-significant residual effect through collision avoidance, more specific "smart curtailment" will be implemented for the lifetime of the project.

Smart curtailment is implemented in the form of a Turbine Integrated Mortality Reduction (TIMR) system (Hayes et al., 2019). This system comprises three primary components aimed at facilitating smart curtailment (Hayes et al., 2019):

- Bat acoustic detectors installed on the turbine nacelle for detecting bats within the turbine-swept zone;
- A TIMR server responsible for analysing bat acoustic data in real-time alongside wind speed data obtained from the facility;
- A SCADA interface designed to initiate turbine shut down when bats are detected, and wind conditions are within the curtailment zone.

With this curtailment approach, turbines will only be feathered when bats are detected and wind conditions are within the curtailment zones, thereby minimizing power generation losses (Hayes et al., 2019, Rabie et al., 2022). Refer also to Section 7.8.1.

Evidence of Effectiveness

The TIMR system is a proven, adaptive turbine curtailment strategy designed to reduce bat fatalities by adjusting turbine operation based on environmental conditions such as wind speed, temperature, and bat activity. It uses pre-programmed algorithms and sensor data to trigger turbine shutdowns during periods of high bat activity risk, particularly at low wind speeds, when bats are most active.

In 2015, the Electric Power Research Institute (EPRI) funded the development of Turbine Integrated Mortality Reduction (TIMR) Technology, which employs a smart curtailment approach to reduce bat fatalities (Hayes et al., 2019). This initial study yielded promising results, demonstrating an 85% reduction in overall bat fatalities and a 91% reduction specifically for the little brown bat. This initial study was conducted in North America, however, the findings are considered applicable to Ireland based on shared behavioural patterns in bats such as their nocturnal behaviour, heightened activity during low wind speeds, seasonal patterns, and susceptibility to turbine collision. As TIMR systems operate on site specific sensor input they are adaptable to each sites environment independent of its location. Additionally, this study used methodologies widely accepted and routinely used in Ireland, such as acoustic monitoring and carcass searches. However, given that the results from this study were based on data from a single site, further validation and assessment of repeatability across different wind farm sites was deemed necessary.

Consequently, in 2021 and 2022, the EPRI funded subsequent research to validate the TIMR system's performance, drawing upon data from a second site within the U.S. This follow-up study aimed to: (1) estimate power production and bat mortality reduction at turbines equipped with TIMR systems, comparing them to turbines under blanket curtailment and fully operational turbines; (2) evaluate the TIMR system's effectiveness over two calendar years and during both summer and fall periods; and (3) assess the operational and commercial viability of the TIMR system for potential adoption by the wind industry. While the 2021 data did not provide

a sufficient sample size for robust analysis, the 2022 data revealed significant differences in fatality levels among the different treatment types and normally operating turbines. Specifically, blanket curtailment at a wind speed of 5.0 m/s cut-in reduced fatalities by 30.8% compared to normal operations, and the TIMR system used under the same conditions achieved an even greater reduction of 48.6%.

The TIMR system's implementation resulted in annual energy losses of 1.3% to 1.6% in 2021 and 1.0% to 1.2% in 2022, while blanket curtailment led to slightly lower annual energy losses. Ultimately, this research concluded that TIMR represents an effective technology for balancing bat fatality reduction with energy generation. These findings also support the broader application of other acoustic sensor-based technologies. For a comprehensive account of this research, refer to Newman et al. (2024).

Other studies investigating similar curtailment systems have produced comparable results. These include the work by Gottlieb et al. (2024) and Whitby et al. (2024). In the Gottlieb et al. (2024) study, the Renewable Energy Wildlife Institute (REWI) led a collaborative team of scientists, wind developers, and turbine manufacturers to develop and test a "smart curtailment" system designed to mitigate bat collisions with wind turbines. The results of this study indicated that turbines utilising both smart curtailment and blanket curtailment exhibited significantly lower bat fatality rates (32% and 31%, respectively) when compared to control turbines. However, the study did not find a significant difference in fatality rates between turbines employing smart curtailment and those using blanket curtailment.

Whitby et al. (2024) collated data from publicly available studies that evaluated curtailment strategies (including smart curtailment options) at six wind energy facilities in North America over a 10-year period. This analysis revealed that curtailment reduced total bat fatalities by 33% for every 1.0 m/s increase in the curtailment wind speed. Across multiple facilities and years, a 5.0 m/s cut-in speed was estimated to reduce total bat fatalities by an average of 62% (95% CI: 54%-69%). Mortality reductions at individual facilities in any given year were estimated¹ to range from 33% to 79% (95% prediction interval). The study also found that inter-annual differences, rather than variations between sites or turbine characteristics, accounted for the majority of the observed variation in efficacy rates. Overall, Whitby et al. (2024) concluded that curtailment, including smart curtailment approaches, is an effective strategy for reducing bat fatalities at wind energy facilities.

7.6.3.2 Indirect effects

Lighting

As per EUROBATS guidelines (Voigt et al., 2018b), “artificial lighting at night should be strictly avoided and installed only where and necessary, i.e when needed for safety reasons or to comply with the legal framework”.

The lighting installed on operational wind turbines include aviation safety lighting, which has been implicated in attracting certain bat species (Voigt et al., 2018a). Because the installation of these lights is mandatory for safety reasons, it is unavoidable that they may have attraction effects on bats. However, employing smart curtailment technologies, as discussed in the previous subsection, may help mitigate any potentially significant impacts on the local bat populations.

Most of the lighting issues from this project arise essentially from the lighting needed at the substation and BESS location, also for safety and legal reasons. Light pollution will impact the more light sensitive, rarer species, such as *Myotis* species and brown long-eared bat, as they will avoid areas exposed even with very low illuminance values and might attract other common species, such as common and soprano pipistrelles, promoting changes in the species communities/assemblages within the Proposed Development Site. Therefore, the mitigation measures identified in section 7.6.2.1 will also be implemented during the operational phase.

Displacement and attraction effects of operating turbines

Detailed in Section 7.5.2.2 displacement and attraction to turbine locations is a newly observed effect and a specific cause for it has yet to be determined in the literature. Some studies have suggested larger buffer sizes than NatureScot *et al.* 2021 based of this effect (Leroux *et al.* 2022). As described in section 7.5.2.2 the most likely location for this to occur is where bats are most active in the Proposed Development Site. As part of the mitigation for collision and barotrauma, the bat buffer for the nearest turbine, T5, has been extended to 100 m rotor distance separation (166.2 m), exceeding the limits of this effect described in Leroux *et al.* 2022 (100 m). This extended buffer will mitigate where this effect is most likely to occur.

7.6.4 Decommissioning Phase Mitigation

Decommissioning of the Development will be scheduled to take place after the proposed 35-year lifespan of the project. Decommissioning phase impacts for the proposed Development are likely to be broadly similar to construction phase impacts, in terms of potential surface impacts to bat foraging and roosting habitats. However, there will be a reduction in the amount of vegetation clearance required as buffers will not be implemented. While the impacts are expected to be significantly reduced during decommissioning compared to construction, based on a precautionary approach, all mitigation measures detailed for the construction phase will be adopted in full during the decommissioning phase. It is accepted that the baseline

conditions will be different by the decommissioning phase. The conclusion of no significant effect for the decommissioning phase in Section 7.5.4 will be confirmed by a bat specialist prior to decommissioning with a site walkover survey confirming roosting and foraging habitats are similar to the baseline assessed.

Restoration of the Proposed Development Site following decommissioning of infrastructure will require the prior establishment of the new baseline conditions at the Development which will have developed over the intervening 35 years life of the project. These studies will inform any modification or additional sensitivities that may need to be factored into restoration and habitat-specific measures.

7.7 RESIDUAL EFFECTS OF THE DEVELOPMENT

7.7.1 Construction Phase

7.7.1.1 Direct effects

Habitat loss

There will be no direct effects in the form of removal of bat roosting features. Through avoidance during the design stage, there will be no removal of features determined to have a likelihood of roosting bats such as those in the mature treeline where D.08 was positioned. With the implementation of mitigation measures outlined above, there will be no residual significant residual effect on bat roosting, foraging or commuting habitats due to habitat removal associated with turbine model Nordex N148 during the construction stage of the Development as a result of habitat removal. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

7.7.1.2 Indirect effects

Habitat loss

The hedgerow removal and replanting will have a short-term (approximately 5 years) negative effect on foraging and commuting habitat for bats significant at a local scale. This effect will end once replanting has matured. In the long term, with the implementation of the replanting mitigation there, will be no residual significant effect on a local scale from hedgerow removal during the construction phase associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

Disturbance and displacement with ALAN and noise

Carrying out construction work during the daylight hours avoids having an indirect impact on bats by ALAN. With the implementation of mitigation measures outlined to avoid light spill on bat foraging and commuting areas, there will be no residual significant effect on the relevant

light sensitive species, *Myotis spp.* and brown long-eared bats during the construction phase associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

With the implementation of mitigation measures outlined in Chapter 13: Noise and Vibration and Section 7.6.2.1, there will be no residual significant effect from noise during the construction phase associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

7.7.2 Operation phase

7.7.2.1 Direct effects

Collision and barotrauma

With the implementation of mitigation measures and embedded mitigation including bat buffers there will be no residual significant effect due to collision and barotrauma for common and soprano pipistrelles, *Myotis* sp., and brown long-eared bat at a local scale during the operational phase associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

Given that Nathusius' pipistrelles accounted for a single pass in three years of recording there is expected to be no residual significant effect due to collision for Nathusius' pipistrelle at a local scale. during the operational phase associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

Even after the implementation bat buffer mitigation measures, the Leisler's bat can still be at risk. This is due to their flight behaviour, as they like to commute and forage over open areas. Studies have shown that Leisler's bats in Ireland spend two-thirds of the recorded time of their foraging time was spent over pastures and drainage canals. It also states that some of their critical feeding areas include forest roads and clearing (EUROBATS, 2019). The use of the curtailment plan detailed in Section 7.6.3.1 will remove the collision risk for climatic and seasonal conditions during which 95% of the passes for this species were recorded. Therefore, there will be no residual significant effect due to collision for Leisler's bats at a local scale during the operational phase associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

7.7.2.2 Indirect effects

Lighting

Lighting in proximity to bat foraging habitats at this Development is exclusive to the substation and BESS location. The mitigation measures in place will limit the effects of lighting on foraging bats to only a few seconds at a given time using sensor-based security lights. Given that light spill on to the adjacent feature will be avoided, it will be reduced to timed sensor lights, and that light sensitive species were recorded at low activity levels at the substation and BESS location, there will be no residual significant effect due to lighting at a local scale during the operational phase associated with the substation and BESS..

Displacement and attraction effects of operating turbines

Detailed in Section 7.5.2.2 displacement and attraction to turbine locations is a newly observed effect and a specific cause for it has yet to be determined in the literature. As this effect is only newly researched it is not possible to anticipate the change in baseline and distribution of species within the Development. However, as a precautionary approach the Development, with the implementation of mitigation measures including extended bat buffers and BEMP features, There will be no residual significant effect due to displacement and disturbance at a local scale during the operational phase associated with with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

7.7.3 Decommissioning Phase

With the implementation of mitigation measures there will be no residual significant effect during the decommissioning phase associated with turbine model Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

7.8 MONITORING

7.8.1 Activity monitoring

The aim for bat feature buffers around turbines is to ensure that habitats are as featureless as possible to avoid bats flying next to operating turbines. However, due to the extensive habitat changes often necessary at Wind Farm Sites, particularly regarding vegetation removal and resulting edge effects and habitat connectivity disruptions, it is recognised that post-construction patterns of bat activity can be unpredictable (Rodrigues et al., 2015, NatureScot et al., 2021). Therefore, NatureScot et al. 2021 recommends a three-year post-construction monitoring program for bats, involving monitoring in each of the first three years to assess the effectiveness of the bat feature buffers and the curtailment plan.

Initially, regular monitoring will be conducted in Year 1, 2 & 3 to ensure that vegetation clearance measures and ongoing management efforts result in the desired habitat conditions. Annual compliance checks in spring (April) and late summer (August) will be undertaken for the first three years of the Development's operation with a check every 10 years for the remainder of the Development's lifespan to ensure that buffers are maintained in suitable conditions. The three-year post-construction monitoring also will include bat activity monitoring and carcass searching (NatureScot et al., 2021; NIEA 2022).

Bat activity monitoring in years 1, 2 & 3 will involve three seasonal deployments of 8 static bat detectors operating for a minimum of 10 nights under compliant weather conditions. Five detectors will be positioned at each of the turbine locations. Three secondary detectors will focus on monitoring activity at the mature tree line north of T5, at the Drumshallow stream east or south of T4, and at the hedgerow north of T2. Deployment will cover the following periods:

- early May and mid-June;
- mid-June and mid-August;
- early September;

A continuously recording bat detector will be deployed on the meteorological mast to simultaneously monitor bat activity at ground level (c. 2 m) and at height (approx. 50 m). Similar to pre-construction surveys, weather data will be collected. This can be supplemented with wind speed data collected from wind turbines.

7.8.2 Carcass searches

Whilst no significant residual impacts on bats are predicted, the proposed Development could provide an opportunity to gain baseline data on bat/turbine interaction. The scheme will be monitored for bat fatalities during years 1, 2, 3, 5, 10, 15 and 25 post construction. A comprehensive onsite fatality monitoring programme will be undertaken. The primary components of the mortality programme are outlined below.

- Carcass removal trials to establish levels of predator removal of possible fatalities. This will be done following best recommended practice and with due cognisance of published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results. No turbines which are used for carcass removal trials will be used for subsequent fatality monitoring.
- Turbine searches for fatalities will be undertaken following best practice in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates as determined by carcass removal trials in (a) above.
- A standardised approach with a possible control group and/or variation in search techniques such as straight line transects/ randomly selected spiral transects/ dog searches will be undertaken. This will provide a means of robustly estimating the post construction collision fatality impact (if any).
- Recorded fatalities will be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

7.9 CUMULATIVE EFFECTS

7.9.1 Other wind farm sites

Other projects identified in the wider area are displayed in Table 7.25. Given the core sustenance zones (the distance they will typically forage from a roost) of bat species (Table 7.24) and the distance of known operational wind farms (Table 7.25), the Development is not expected to have a cumulative impact on bats at a local level during the activity season. The identified projects are all small in scale (≤ 2 turbines) and in most cases are considered low risk in terms of wind farm guidance for bats. (NatureScot 2021, NIEA 2024). There is potential for bats to migrate between summer and winter roosts for much greater distances. However, given the current mitigation measures such as curtailment to reduce collisions for specifically high flying, migratory bats (Leisler's bat and Nathusius' pipistrelle) there is no anticipated cumulative significant effect at a county scale associated with turbine Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155..

Table 7.24 Irish bat species core sustenance zone (CSZ) estimate Collins *et al.* 2023

Species	CSZ (km)	No. of bat studies	No. of studies	Confidence in zone size
Lesser horseshoe bat	2	83	4	Good
Daubenton's bat	2	7	2	Poor
Whiskered/Brandt's bat	1	24	1	Poor
Natterer's bat	4	53	2	Good
Leisler's bat	3	20	2	Moderate
Common pipistrelle	2	23	1	Poor
Soprano pipistrelle	3	91	3	Good
Nathusius' pipistrelle	3	9	2	Poor
Brown long-eared bat	3	38	1	Poor

Table 7.25 Wind Farms within 20km of the proposed Development

Wind Farm Name	Number of Turbines	Distance and Direction from the Development Site Boundary	Status
Dunmore Wind Farm (Part 1)	2	11.4km west of the site	Operational
Dunmore Wind Farm (Part 2)	2	11.4km west of the site	Operational
Collon Wind Farm	1	12.9km west of the site	Operational
Meade Potato Company	1	17km west of the site	Operational
WuXi Biologics	1	19.5km north of the site	Permitted

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7.9.2 Kilsaran quarry

Directly bordering the Development is Kilsaran Quarry which currently has planning approved for an extension, described in Chapter 2. During bat surveys for the extension in 2020, activity was significantly lower than surveys carried out for the Development in 2022, 2023, and 2024. The Kilsaran Quarry survey data is limited to only 10 nights in late September to early October peaking with 3.2 bat passes per night for common pipistrelles. The substation detector also recorded late into the autumn season.

Surveys for the quarry extension concluded that the extension would only impact poorly connected low-quality habitat directly adjacent to the quarry.

Two aspects of mitigation for this extension need to be considered in cumulative effects:

- One of the mitigation measures for mammals details the instalment of 10 bat boxes to improve roosting potential around the margins of the land-holding. Dependant on the location of these bat boxes and should the installation of these bat boxes result in the establishment of roosts, there is potential for increased bat activity at turbine locations surrounding the quarry. (T2 and T3). However, based on landowner boundaries the nearest locations where these can be put is 100 m from the T2, and 150 m from T3.
- Mitigation for the Kilsaran quarry also details a decommissioning stage at the end of the 25-year life in the project. This will involve the restoration works on the quarry to create a lake with additional hedge and tree planting. These works would be planned

to take place over 2 years after the 25 years use of the active quarry. Given the proposed Development has a planned life span of 35 years there will be a 8 year period during which the Kilsaran quarry will be restored while the wind farm is still operational. It is highly likely that this habitat restoration will result in a higher level of bat activity surrounding the quarry (within 100 m of T2, and 150 m from T3).

Given the that the distance from the turbine locations T2 and T3 to both the restored lake and bat boxes meets the buffers outlined by NatureScot et al. 2021 it is not anticipated that there will be a significant cumulative effect as a result of the improvement activities at the quarry for both the establishment of bat boxes and end of life restoration proposed. However, once the suggested roost boxes are established the roosts will be assessed and characterised to ensure the current precautionary mitigation in place is proportional.

7.9.2.1 Mitigation

In order mitigate any impacts on possible roosts that may establish in the bat boxes proposed at Kilsaran quarry and the fact that the boxes will only be checked in year 5 of the project, turbine curtailment mitigation as per Section 7.6.3.1 will be implemented at T2. Curtailment at T3 is already proposed as outlined in Section 7.6.3.1.

7.9.2.2 Monitoring

As identified in Section 7.9.2, the outlined mitigation for the decommissioning of Kilsaran Quarry involves the improvement of habitat for roosting and foraging bats. This would constitute a large change in baseline activity for bats. The potential future impacts characterised in Section 7.5 is not based on the baseline information gathered for the Development and the change of baseline will need to be quantified and assessed when decommissioning is set to occur.

For the 2-year decommissioning phase of the quarry and 1 year after decommissioning is complete, monitoring of bat activity at the decommissioned quarry itself, T2, and T3 will be carried out. This monitoring at these turbines will follow the same methodology outlined in Section 7.8.1 with observation and amendments based on any successive guidance published between the construction of this project and the decommissioning of the quarry in 25 years. The results of this monitoring will determine if the current mitigation is appropriate and proportional. Amendments to mitigation based on the data gathered can be made by a bat specialist.

7.9.3 Residual Cumulative Effects

Due to the implementation of mitigation measures at the Development and as part of the projects assessed for cumulative impacts, there will be no residual cumulative significant effects associated with turbine Nordex N148. The same conclusion has been reached for turbine models Nordex N163 and Siemens-Gamesa SG155.

7.10 SUMMARY OF SIGNIFICANT EFFECTS

The proposed Development constitutes a site of low and moderate bat activity with high localised activity on a seasonal and geographic basis. The mature tree line (D.08) and stream (D.06) features within the Proposed Development Site have been identified as areas of high activity in summer and autumn. The mature tree line has also been identified as roost resource habitat and while no individual roosts were confirmed it is highly likely that some level of roosting behaviour occurs there on a transitional basis each year particularly in autumn. This tree line has also been identified as a location of heightened social activity during the autumn season.

The embedded and active mitigation measures outlined above have reduced/avoided impacts on moderate to high potential roost features, particularly those associated with high levels of foraging and social activity to the north of T5. There will be no direct significant effect on this treeline through the avoidance of any felling and by implementing increased buffers to turbines.

Construction activity has been identified as a potential indirect effect on foraging and commuting bats within the site. During the operational phase, there are weather based, temporal and species-based parameters underpinning collision risk. Collision or barotrauma is most likely in Leisler's bat, common pipistrelles, and soprano pipistrelles, along linear features and in favourable weather conditions in summer and autumn. The mitigation measures described in this chapter will avoid any will avoid any likely significant effects on bats due to collision and barotrauma within the Development and wider area and the wider area.

Decommissioning phase impacts are likely to be broadly similar to construction phase effects but to a lesser extent as building materials such as concrete and aggregates will not be required. The implementation of replanting of bat habitats and limiting light spill to mitigate habitat loss and light disturbance of bats detailed for the construction phase will be adopted in full during the decommissioning phase to ensure all such impacts are avoided. Subject to the full and successful implementation of mitigation measures, there has been no significant

residual effect identified as a result of the Development. The same conclusion has been reached for alternate turbine models Nordex N163 and Siemens-Gamesa SG155.

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7.12 TABLES

Table 7.26 Location specific activity levels

Season/deployment	Species	Location	Mean	Std dev	IQR
2022 Spring	<i>Myotis</i> spp.	D.01	0	0	0
		D.02	0.14	0.37	0
		D.03	0.04	0.19	0
		D.04	0.02	0.12	0
		D.05	0.09	0.31	0
		D.06	0.02	0.15	0
		D.07	0	0	0
	Leisler's bat	D.01	0.07	0.42	0
		D.02	0.1	0.56	0
		D.03	0.22	1.1	0
		D.04	0.5	2.07	0
		D.05	0.29	1.25	0
		D.06	0.5	1.99	0
		D.07	0.02	0.18	0
	<i>Pipistrellus</i> spp.	D.01	0	0	0
		D.02	0	0	0
		D.03	0	0	0
		D.04	0	0	0
		D.05	0	0	0
		D.06	0.05	0.25	0
		D.07	0	0	0
	Common pipistrelle	D.01	0.02	0.12	0
		D.02	0.06	0.3	0
		D.03	3.12	17.16	0
		D.04	0.08	0.3	0
		D.05	0.28	0.8	0
		D.06	0.63	1.23	1
		D.07	0.95	6.73	0
	Soprano pipistrelle	D.01	0.02	0.12	0
		D.02	0.05	0.31	0
		D.03	0.14	1.01	0
		D.04	0.16	0.46	0
		D.05	0.22	0.59	0
		D.06	0.8	1.58	1
		D.07	1.26	5.73	0
		D.01	0	0	0

2022 Summer	Brown long-eared bat	D.02	0.02	0.12	0
		D.03	0	0	0
		D.04	0	0	0
		D.05	0.05	0.46	0
		D.06	0	0	0
		D.07	0	0	0
	Myotis spp.	D.01	0.02	0.14	0
		D.02	0.07	0.29	0
		D.03	0.01	0.1	0
		D.04	0.04	0.19	0
		D.05	0.08	0.38	0
		D.06	0.29	1.2	0
		D.07	0.01	0.1	0
		D.08	0.1	0.41	0
		D.09	0.1	0.29	0
	Leisler's bat	D.01	1.02	2.68	1
		D.02	2.84	5.52	2
D.03		2.93	5.17	3	
D.04		5.01	9.46	6	
D.05		1.84	3.02	2	
D.06		7.96	16.04	5	
D.07		0.01	0.1	0	
D.08		7.03	9.9	8	
D.09		2.66	4.51	3	
Pipistrellus spp.	D.01	0.01	0.1	0	
	D.02	0	0	0	
	D.03	0	0	0	
	D.04	0.02	0.14	0	
	D.05	0.06	0.27	0	
	D.06	0	0	0	
	D.07	0	0	0	
	D.08	0.16	0.72	0	
	D.09	0	0	0	
Common pipistrelle	D.01	0.2	0.59	0	
	D.02	0.93	1.63	2	
	D.03	4.43	10.51	3	
	D.04	4.06	12.62	3	
	D.05	5.01	9.94	3	
	D.06	7.72	12.09	10	
	D.07	0.41	1.1	0	
	D.08	44.42	54.1	56	
	D.09	6.55	9.72	6	
Soprano pipistrelle	D.01	0.01	0.1	0	
	D.02	0.21	0.45	0	
	D.03	1.46	3.26	1	
	D.04	1.09	2.14	1	
	D.05	2.59	4.09	3	
	D.06	4.02	7.57	3	
	D.07	0.27	0.94	0	
	D.08	23.5	39.87	23	
	D.09	0.93	1.89	1	
Brown long-eared bat	D.01	0	0	0	
	D.02	0.03	0.17	0	
	D.03	0.01	0.1	0	
	D.04	0.01	0.1	0	
	D.05	0	0	0	

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2022 Autumn		D.06	0	0	0
		D.07	0	0	0
		D.08	0	0	0
		D.09	0.04	0.19	0
	<i>Myotis</i> spp.	D.01	0	0	0
		D.02	0.11	0.34	0
		D.03	0.04	0.2	0
		D.04	0.1	0.3	0
		D.06	0.04	0.19	0
		D.07	0	0	0
		D.08	0.04	0.2	0
		D.09	0	0	0
		D.10	0.01	0.12	0
		Leisler's bat	D.01	0.34	0.93
	D.02		0.74	1.52	1
	D.03		1.34	3.57	1
	D.04		5.75	12.27	5
	D.06		6.4	16.89	3
	D.07		0.64	1.33	1
	D.08		5.75	11.35	5
	D.09		0.6	1.39	1
	<i>Pipistrellus</i> spp.	D.01	0	0	0
		D.02	0	0	0
		D.03	0.02	0.19	0
		D.04	0	0	0
		D.06	0.05	0.25	0
		D.07	0	0	0
		D.08	0.83	1.87	1
		D.09	0	0	0
	Common pipistrelle	D.01	0.24	1.44	0
		D.02	1.15	2.07	2
		D.03	7.94	14.61	7
		D.04	1.87	4	2
		D.06	2.11	6.78	2
		D.07	0.3	0.76	0
		D.08	44.31	73.11	52
		D.09	5.66	9.62	6
	Soprano pipistrelle	D.01	0.06	0.27	0
		D.02	0.7	1.36	1
		D.03	4.86	12.36	3
D.04		0.59	1.05	1	
D.06		10.2	24.68	3	
D.07		0.16	0.48	0	
D.08		36.94	51.26	61.25	
D.09		3.08	6.04	3	
Brown long-eared bat	D.01	0	0	0	
	D.02	0.07	0.26	0	
	D.03	0.04	0.2	0	
	D.04	0.06	0.25	0	
	D.06	0.06	0.31	0	
	D.07	0	0	0	
	D.08	0.03	0.21	0	

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		D.09	0	0	0
		D.10	0.09	0.33	0
2023 substation survey	<i>Myotis</i> spp.	Sub.01	0.03	0.17	0
	Leisler's bat		1.25	1.91	2
	Nathusius' pipistrelle		0.005	0.07	0
	Common pipistrelle		1.21	1.58	2
	Soprano pipistrelle		1.23	1.58	2
	<i>Pipistrellus</i> spp.		0.01	0.1	0
	Brown long-eared bat		0.05	0.22	0
2024 Spring	<i>Myotis</i> sp.	D.11	0.02	0.17	0
		D.12	0.02	0.12	0
		D.13	0.01	0.07	0
		Sub.02	0.02	0.12	0
	Leisler's bat	D.11	0.59	1.81	0
		D.12	1.14	3.14	1
		D.13	0.59	2.04	0
		Sub.02	1.74	5.23	1
	<i>Pipistrellus</i> spp.	D.11	0.01	0.07	0
		D.12	0.00	0.00	0
		D.13	0.00	0.00	0
		Sub.02	0.00	0.00	0
	Common pipistrelle	D.11	0.14	0.41	0
		D.12	0.78	2.93	0
		D.13	0.66	3.13	0
		Sub.02	5.75	19.60	2
	Soprano pipistrelle	D.11	0.07	0.25	0
		D.12	0.42	1.05	0
		D.13	0.83	4.35	0
		Sub.02	2.95	13.98	1
	Brown long-eared bat	D.11	0.00	0.00	0
		D.12	0.01	0.07	0
		D.13	0.01	0.07	0
		Sub.02	0.02	0.22	0
2024 Summer	<i>Myotis</i> sp.	D.11	0.01	0.09	0
		D.12	0.05	0.22	0
		D.13	0.01	0.12	0
		Sub.02	0.03	0.21	0
	Leisler's bat	D.11	1.12	3.05	1
		D.12	4.29	7.10	5
		D.13	2.03	3.38	3
		Sub.02	2.19	4.07	3
	Common pipistrelle	D.11	0.41	1.27	0
		D.12	7.08	13.48	9
		D.13	5.93	9.02	9
		Sub.02	27.90	41.87	36
	Soprano pipistrelle	D.11	0.11	0.33	0
		D.12	2.20	3.40	3
		D.13	3.62	6.11	5
		Sub.02	8.05	15.51	9
	Brown long-eared bat	D.11	0.00	0.00	0
		D.12	0.02	0.15	0
		D.13	0.007	0.09	0
		Sub.02	0.01	0.12	0
2024 Autumn	<i>Myotis</i> sp.	D.11	0.06	0.28	0
		D.12	0.009	0.10	0

		D.13	0.06	0.26	0
		Sub.02	0.09	0.33	0
	Leisler's bat	D.11	1.79	4.16	2
		D.12	1.01	3.60	1
		D.13	1.53	4.24	1
		Sub.02	0.91	1.62	1
	Pipistrellus spp	D.11	0.009	0.10	0
		D.12	0.00	0.00	0
		D.13	0.004	0.07	0
		Sub.02	0.00	0.00	0
	Common pipistrelle	D.11	0.51	1.15	1
		D.12	3.56	8.32	4
		D.13	1.03	2.21	1
		Sub.02	25.13	53.29	19
	Soprano pipistrelle	D.11	0.23	0.55	0
		D.12	1.21	3.07	1
		D.13	1.58	4.79	1
		Sub.02	3.11	5.58	4
	Brown long-eared bat	D.11	0.03	0.19	0
D.12		0.02	0.13	0	
D.13		0.04	0.19	0	
Sub.02		0.05	0.26	0	

Table 7.27 Turbine collision risk at all recording locations.

		Bat risk level				
		All bat species	Leisler's bat	Nathusius' pipistrelle	Common pipistrelle	Soprano pipistrelle
2022 all seasons	Site overall	15	9	3	9	9
	D.01	2	2	0	2	2
	D.02	2	2	0	2	2
	D.03	3	3	0	15	9
	D.04	3	9	0	9	3
	D.05	3	3	0	9	3
	D.06	4	12	0	12	20
	D.07	3	3	0	3	3
	D.08	20	20	0	20	20
	D.09	2	2	0	10	6
	D.10	2	2	0	6	6
Sub.1	2	2	2	2	2	
2022 Spring	Site overall	3	3	0	3	3
	D.01	2	2	0	2	2
	D.02	2	2	0	2	2
	D.03	3	3	0	9	3
	D.04	3	3	0	3	3
	D.05	3	3	0	3	3

	D.06	4	4	0	4	4
	D.07	3	3	0	3	3
2022 Summer	Site overall	15	9	0	15	9
	D.01	2	2	0	2	2
	D.02	2	6	0	2	2
	D.03	3	9	0	9	3
	D.04	3	15	0	9	3
	D.05	3	3	0	15	9
	D.06	12	20	0	20	12
	D.07	3	3	0	3	3
	D.08	20	20	0	20	20
	D.09	2	6	0	10	2
2022 Autumn	Site overall	15	9	0	15	15
	D.01	2	2	0	2	2
	D.02	6	2	0	10	6
	D.03	9	3	0	15	9
	D.04	3	15	0	3	3
	D.06	12	20	0	12	20
	D.07	3	3	0	3	3
	D.08	20	20	0	20	20
	D.09	2	2	0	10	6
	D.10	2	2	0	6	6
2023	Sub.1	2	2	2	2	2
2024 Spring	Site overall	3	3	0	3	3
	D.11	2	2	0	2	2
	D.12	3	3	0	3	3
	D.13	3	3	0	3	3
	Sub.02	9	3	0	15	3
2024 Summer	Site overall	9	9	0	15	9
	D.11	2	6	0	2	2
	D.12	3	9	0	15	9
	D.13	3	9	0	15	9
	Sub.02	15	9	0	15	15
2024 Autumn	Site overall	3	3	0	15	3
	D.11	2	6	0	2	2
	D.12	3	9	0	9	9
	D.13	3	9	0	9	9
	Sub.02	9	3	0	15	9