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ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED COUMNAGAPPUL WIND FARM, CO. WATERFORD

VOLUME 2 – MAIN EIAR

CHAPTER 9 - BIODIVERSITY

Prepared for:

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9. BIODIVERSITY

9.1 Introduction

This chapter has been prepared to describe the existing ecological environment of the Proposed Development and examines the potential effects that the Proposed Development (described in Chapter 2) may have on biodiversity, flora and fauna (excluding ornithology, see Chapter 10). This assessment considers the potential effects with regard to each phase of the development: construction phase, operational phase and decommissioning phase. Appropriate mitigation measures are described to avoid, reduce or offset potential significant effect(s) on biodiversity.

A detailed description of the Proposed Development assessed in this EIAR is provided in Chapter 2 and is comprised of the following main elements:

- The wind farm Site (referred to in this EIAR as '**the Site**')
- The grid connection route (referred to in this EIAR as the '**GCR'**)
- The turbine delivery route (referred to in this EIAR as the '**TDR'**)

The general layouts of the proposed wind farm Site (Site), grid connection (GCR) and turbine delivery route (TDR) are presented in Figures 2.2 to 2.4 in Volume IV.

The Site includes the wind turbines, internal access tracks, hard standings, the permanent meteorological mast, onsite substation, internal electrical and communications cabling, temporary construction compounds, drainage infrastructure and all associated works related to the construction of the wind farm.

The GCR includes the buried grid connection cable route from the on-Site substation to the 110 kV substation at Dungarvan, Co. Waterford.

The TDR includes all aspects of the route from the port of Belview in Co. Kilkenny to the Site entrance including proposed temporary accommodation works to facilitate the delivery of wind turbine components.

This assessment assesses the Vestas V162 wind turbine model as described in Chapter 1 - Introduction and Chapter 2 - Development Description. The plans and particulars submitted with this application for consent provide dimensions for the turbine structures. The turbine specifications will have a hub height of 104 m and a rotor diameter of 162 m with a tip height of 185 m.

Common acronyms used throughout this EIAR can be found in Chapter 1 - Introduction.

This chapter of the EIAR is supported by the following Appendices documents provided in Volume III of this EIAR and by Figures provided in Volume IV:

- Appendix 9.1: Biodiversity Enhancement and Management Plan (BEMP)
- Appendix 9.2: Invasive Species Management Plan
- Appendix 9.3: Aquatic Survey reports

Ornithological impact assessment is described under separate chapter (Chapter 10 - Ornithology). Discussion in relation to SPA / RAMSAR Sites within this chapter is in relation to the assessment of effects on the structure and function of habitats within such designated areas. The assessment of effects on bird species is presented in the Chapter 10 - Ornithology.

As per the EPA Guidance (2022), "a biodiversity section of an EIAR, should not repeat the detailed assessment of potential effects on European Sites contained in a Natura Impact Statement" but should "incorporate their key findings as available and appropriate". As such the potential for the Proposed Development to have adverse effects on the integrity of any European (Natura 2000) Site has been assessed within a Natura Impact Statement (NIS) and summarised herein.

9.2 Legislation and Policy

The species and habitats provided National and International protection under the following legislative and policy documents have been considered in this Impact Assessment.

European Legislation

The EU Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna) (as amended) (the 'Habitats Directive') together with the Birds Directive (Council Directive 2009/147/EC on the Conservation of Wild Birds) (as amended) (the 'Birds Directive') are the main legislative instrument for the protection and conservation of biodiversity within the European Union (EU).

The Habitats Directive lists habitats and species that must be protected within Special Areas of Conservation (SAC) within Annexes I and II, respectively. The Habitats Directive also identifies plant and animal species within Annex IV which are subject to strict protection anywhere they occur.

The Birds Directive provides for the identification of a network of Sites in all member states to protect birds at their breeding, feeding, or roosting areas. The Birds Directive identifies in Annex I species that are rare, in danger of extinction, or vulnerable to changes in habitat and which require special protection and areas for ther conservation: Special Protection Areas (SPA).

The Habitats Directive and Birds Directive have been transposed into Irish law, by Part XAB of the Planning and Development Act 2000 (as amended) and by the European Communities (Birds and Natural Habitats) Regulations 2011, as amended.

The EU Water Framework Directive (2000/60/EC) (as amended) requires all Member States to protect and improve water quality in all waters in order to achieve good ecological status by 2015 or, at the latest, by 2027. This was transposed into Irish Law by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) and by the European Communities Environmental Objectives (Surface Waters) Regulations 2009 as amended and European Union Environmental Objectives (Freshwater Pearl Mussel) (Amendment) Regulations 2009 as amended. The Directive applies to rivers, lakes, groundwater, and transitional coastal waters. The Directive requires management plans to be prepared on a river basin basis and specifies a structured method for developing these plans. The third cycle River Basin Management Plan 2022-2027 is currently under preparation.

National Legislation

The primary domestic statute providing for wildlife protection in Ireland is the Wildlife Act of 1976 as amended (the 'Wildlife Act'). All bird species are protected under the Wildlife Acts from offences including intentional killing or injury and disturbance during the breeding season (to include eggs, young, and nests which are also protected). A range of mammal species, two amphibian species, one butterfly species, and one reptile species are all similarly protected from intentional killing or injury, whilst the breeding or resting Sites of these species are also protected. The amendment to the Act in 2000 broadens its scope to include fish and aquatic invertebrate species. The Act also provides a mechanism to give statutory protection to Natural Heritage Areas (NHAs).

A number of vascular (i.e. flowering) and non-vascular plant species (i.e. nonflowering) are afforded legal protection under the Flora (Protection) Order, 2022 enacted under Section 21 of the Wildlife Act, 1976. It is an offence to cut, pick, collect, uproot, or otherwise take, injure, damage, or destroy any specimens of the species listed under the Flora Protection Order.

Beyond the national statutes which transpose the Water Framework Directive into national law, there are several older national Acts which are intended for the protection of fisheries and the aquatic environment as follows:

- Section 171 of the Fisheries (Consolidation) Act 1959 creates the offence of throwing, emptying, permitting or causing to fall onto any waters deleterious matter. Deleterious matter is defined as not only as any substance that is liable to injure fish but is also liable to damage their spawning grounds or the food of any fish or to injure fish in their value as human food or to impair the usefulness of the bed and soil of any waters as spawning grounds or other capacity to produce the food of fish.
- Under Section 3 of the Local Government (Water Pollution) Act, 1977 (as amended by Sections 3 and 24 of the 1990 Act) it is an offence to cause or permit any polluting matter to enter waters.

National Policy

Ireland's third National Biodiversity Plan (2017-2021) was launched in 2017. This plan includes 119 targeted actions for public authorities in relation to their obligations for biodiversity. One particularly important policy change in the plan (Objective 1) relates to the 'mainstreaming' of biodiversity into decision-making across all sectors. Specifically, there is an obligation on all Public Authorities to "move towards no net loss of biodiversity through strategies, planning, mitigation measures, appropriate offsetting, and/or investment in Blue-Green infrastructure". This and other relevant policies in the plan have informed the valuation of ecological features, assessment of potential effects, and development of mitigation in this EIAR.

The fourth National Biodiversity Action Plan (2023-2027) is currently in draft format and undergoing public consultation.

9.3 Consultation

The full list of the bodies consulted as part of the environmental assessment of the Project are presented in Chapter 5 - EIA Scoping and Consultation. Specific to biodiversity, the following environmental stakeholders were contacted:

- The Development Application Unit (DAU)/ National Parks and Wildlife Service (NPWS)
- Inland Fisheries Ireland (IFI)
- Birdwatch Ireland
- The Environmental Protection Agency (EPA)
- An Taisce
- Irish Peatland Conservation Council
- Irish Raptor Study Group
- Irish Red Grouse Association
- Irish Wildlife Trust (IWT)
- Bat Conservation Ireland
- Waterford City & County Council Environmental Office
- Comeragh Upland Communtities EIP Project

The majority of consultees did not provide a response with many stating that they do not have the administrative capacity to review scoping consultation / planning applications.

A response from Development Applications Unit (DAU) of the Department of Housing, Local Government and Heritage office was received on 24th September 2021, which identified the Comeragh Mountains Special Area of Conservation as a key ecological receptor. The response sought that the EIAR should consider the conservation value of the habitats present on the wind farm Site (particularly any habitats listed in Annex I of the Habitats Directive) and assess the potential for these to support the achievement of favourable conservation status for the qualifying interests of the nearby SAC. The submission encouraged mitigation by design through avoidance and highlighted the need to consider peat stability. Mitigation for habitat loss and opportunities for habitat enhancement should be considered. A Biodiversity Enhancement and Management Plan (BEMP) has been prepared for the Propose Development and is included in Appendix 9.1, Volume III.

A response to scoping consultation was received from Waterford City & County Council on 18th May 2022 which highlighted the need for the EIAR to address the potential for direct and indirect impacts on water quality from excavation and soil stability as the upper reaches of the River Colligan are within a Blue Dot Catchment. The EIAR needs to demonstrate how the proposed development will impact on the objectives for protection of Blue Dot Catchments under the Water Framework Directive. Potential impacts to water quality and WFD status are addressed in Chapter 12- Hydrology and Water Quality.

A response to consultation was received in the form of the 'July 2021-September 2022' Final Project Report - from the Comeragh Upland Communities EIP Project. The biodiversity enhancement measures outlined in the BEMP (Appendix 9.1) have had regard to the habitat improvement measures set out in the Comeragh Upland Communities EIP Project report - such as reduce grazing pressure and restore wet heath/ turf.

9.4 Statement of Authority

An ecological appraisal of the proposed project was undertaken by Fehily Timoney and Company (FT) to inform this chapter. The lead author of this chapter is David Daly (FT Ecologist, BSc. Ecology; MSc. Species Identification and Survey Skills). The chapter was reviewed by Rita Mansfield (FT Ecologist, BSc Applied Ecology [Hons]; H.Dip Environmental Protection and Pollution Control (Hons)).

Ecological walkover surveys, habitat surveys, botanical surveys, invasive species surveys and mammal surveys were carried out by David Daly.

Bat activity and bat roost surveys were undertaken by Karen Banks (BSc. Environment and Development, MCIEEM; NPWS Bat Disturbance Licence holder);

Triturus Environmental Services (Ross Macklin BSc. Applied Ecology; Ph.D. candidate in fish ecology, H.Dip GIS, Dip. Integrated Pest management, MCIEEM, MIFM and Bill Brazier B.Sc. Freshwater Biology, Ph.D. candidate in fish ecology & genetics, MIFM) undertook surveys of the aquatic ecology in 2020 and 2021 (walkover surveys, catchment wide electro-fishing, White-clawed Crayfish survey, biological water quality surveys) as well the evaluation of the impact of the proposed development on aquatic ecology. Background information and biographies of surveyors listed above are detailed in Table 9-1:

Table 9-1: Surveyor Biographies

Surveyor	Surveys Completed	Biography
Bill Brazier	Aquatic surveys	Bill is an aquatic ecologist with over 9 years' professional experience in Ireland. He specialises in freshwater fisheries ecology, biology and water quality. He has considerable experience in a wide range of ecological and environmental projects including EIAR, EcIA and AA/NIS reporting, as well as biodiversity, invasive species and fisheries management. His diverse project list includes work on wind farm developments, flood relief schemes, road schemes, blueways/greenways and biodiversity projects. He is currently completing his Ph.D. on the genetics, reproductive biology and invasive potential impact of common carp (Cyprinus carpio) in Irish waters. Bill holds a B.Sc. (Hons) in Applied Freshwater & Marine Biology from Galway-Mayo IT. Bill completed aquatic surveys and reporting for the Coumnagappul Project.
David Daly	Habitat surveys, botanical surveys, invasive species surveys and mammal surveys; static bat detectors surveys (deployment)	David Daly is a Project Ecologist with Fehily Timoney and Company. He holds a Bachelor of Science (BSc) in Ecology from University College Cork, and a Master of Science (MSc) in Species Identification and Survey Skills from University of Reading. David's work focused on the survey and assessment of proposed wind and solar energy development Sites, and he has carried out comprehensive ecological work on numerous Sites. He has carried out numerous mammal surveys including bat, badger, otter, and general mammal surveys, and acted as ecological clerk of works on a cable route construction project. Ben is the Author of the Biodiversity chapter and completed many of the ecological surveys for the Coumnagappul Project, including habitat surveys, botanical surveys, invasive species surveys, mammal surveys and static bat detectors surveys (deployment of detectors).

Surveyor	Surveys Completed	Biography
Karen Banks	Bat activity and bat roost surveys	Karen is an ecologist with 15 years' experience in the field of ecological assessment. She holds a BSc in Environment and Development from Durham University and is a full member of the Chartered Institute of Ecology and Environmental Management. Karen is an experienced and skilled bat surveyor, first gaining a scientific licence to disturb bats from Natural England, UK in 2008. Karen is trained in bat handling and capture methods and currently holds a bat disturbance licence granted by the NPWS. Karen has undertaken bat survey and assessment for numerous projects, including bridge repair and replacement works, domestic dwelling repair and demolition works, wind farm developments and large-scale infrastructure projects such as flood relief schemes, road developments and pipeline schemes. Karen has also represented Cork County Council as an expert witness for bats at an Oral Hearing. Karen completed the Bat activity and bat roost surveys for the Coumnagappul Project.
Rita Mansfield	Reviewer	Rita is an experienced Project Manager and Principal Ecologist at FT. She specialises in statutory consent and environmental assessment for large scale public infrastructure projects in the energy, water (including flood relief schemes) and transport sectors. Rita provides technical advisory services through all stages of project delivery from feasibility assessment, impact assessment, CPO, design, expert witness, contract administration and construction.
Ross Macklin	Aquatic surveys	Ross is a principal ecologist with Triturus Environmental Ltd. Ross is currently completing a Ph.D. in Environmental Science from University College Cork and holds a B.Sc. (Hons) in Applied Ecology from University College Cork. Ross is a member of Chartered Institute of Ecology and Environmental Management and a registered member Institute of Fisheries Management. Ross has over 15 years' professional experience in Ireland. He specialises in freshwater fisheries ecology, biology and water quality. He has considerable experience in a wide range of ecological and environmental projects including EIAR, EcIA and AA/NIS reporting, as well as biodiversity, water quality monitoring, invasive species and fisheries management. He also has expert identification skills in macrophytes, freshwater invertebrates, protected aquatic habitats and protected aquatic species including freshwater pearl mussel. His diverse project list includes work on renewable energy developments, flood relief schemes, road schemes, blueways/greenways, biodiversity projects, fisheries management projects and catchment wide water quality management. Ross completed the aquatic surveys and reporting for the Coumnagappul Project.

9.5 Methodology

9.5.1 Relevant Guidance

The methodology for this appraisal has been devised in accordance with the following relevant guidance published by the Environmental Protection Agency (EPA) including '*Guidelines on the information to be contained in Environmental Impact Statements* (2022), and '*Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*' (DoHPLG, 2018).

Additional guidance available from the EU such as '*Guidance document on wind energy developments and EU nature legislation*' (2020) and '*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*' (2013) has also been adhered to. The appraisal also adheres to *CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* (Version 1.2) published by the Chartered Institute of Ecology and Environmental Management (CIEEM) (2018; last updated April 2022).

The Heritage Council publication '*Best Practice Guidance for Habitat Survey and Mapping*' (Smith *et al*., 2011) was applied in the completion of habitat surveys and production of habitat mapping.

Relevant guidance published by the National Roads Authority (NRA) such as '*Guidelines for Assessment of Ecological Impacts of National Road Schemes*' (2009a), and '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' (2008a) have also been followed.

The Inland Fisheries Ireland publication '*Guidelines on protection of fisheries during construction works in and adjacent to waters*' (IFI, 2016) has been applied.

Relevant guidance from Scottish Natural Heritage (SNH) in relation to birds such as SNH *Recommended bird survey methods to inform impact assessment of onshore windfarms* (2017). '*Survey Methods for use in assessing the impacts of onshore wind farms on bird communities (2010)*' and '*Assessing the cumulative impact of onshore wind energy developments (2012)*' have also been applied.

The following guidelines in relation to bats were adhered to:

- *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation* (SNH, 2019 and NatureScot 2021)
- *Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland (NIEA, May 2022)*
- *Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. (Marnell et. al, 2022)*
- *Bat Survey Guidelines: Traditional Farm Buildings Scheme (Aughney et al., 2008)*
- *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). (BCT/Collins, 2016) The Bat Conservation Trust, London. (noting that the approach to surveys equally align to 4th edition published in 2023)*
- *Wind Turbine/Wind Farm Development Bat Survey Guidelines (Bat Conservation Ireland, 2012);*
- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes (NRA, 2006a);*
- *Bats and Onshore Wind Turbines – Interim Guidance (3nd Edition) (Carlin, 2014);*
- *Guidelines for the Treatment of Bats during the Construction of National Road Schemes (NRA, 2006b);*
- *Bat survey – NIEA Specific Requirements for wind farm (NIEA, 2014);*
- *Guidelines for Consideration of Bats in Wind Farm Projects (Rodrigues, 2008).*

Relevant guidance published by the National Roads Authority (NRA), and applicable to assessing biodiversity, was also followed, including '*Guidelines for the Assessment of Ecological Impacts of National Road Schemes – Revision 2*' (NRA 2009a), '*Ecological surveying techniques for protected flora and fauna during the planning of National Road Schemes – Version 2*' (NRA 2009b), '*Environmental Impact Assessment of National Road Schemes – A practical guide*' (NRA 2008b),'*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' (NRA 2008a) and '*Guidelines on protection of fisheries during construction works in and adjacent to waters*' (IFI, 2016).

9.5.2 Desktop Study

9.5.2.1 Designated Nature Conservation Sites

Special Areas of Conservation (SACs) and Special Protection Areas for Birds (SPAs) are designated under the EU Habitats Directive and EU Birds Directive, respectively and are collectively known as 'European Sites'.

In relation to European Sites, a Natura Impact Statement has been prepared to provide the Competent Authority with the information necessary to complete an Appropriate Assessment of the Proposed Development in compliance with Article 6(3) of the Habitats Directive. The potential for significant effects on European Sites and adverse impacts on the integrity of European Sites is fully assessed within the AA Screening Report (AASR) and Natura Impact Statement (NIS), respectively, that accompanies this application.

Natural Heritage Areas (NHAs) are designated under Section 18 the Wildlife (Amendment) Act 2000 and their management and protection is provided for by this legislation and planning policy. Proposed Natural Heritage Areas (pNHAs) were designated on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. Nationally designated Sites that are also designated as European Sites have been assessed as those designations within the Appropriate Assessment Screening Report and NIS, with the relevant conclusions are recorded and referenced in this chapter.

The following methodology was used to establish which protected sites designated for nature conservation are within the Likely Zone of Influence of the Proposed Development and have the potential to be impacted by the Proposed Development:

- Initially the most up to date GIS spatial datasets for European and Nationally designated sites and water catchments were downloaded from the NPWS website (www.npws.ie) and the EPA website (www.epa.ie) on the 28/03/2023. The datasets were utilised to identify Designated Sites which could feasibly be affected by the Proposed Development. All Designated Sites that could potentially be affected were identified using a source-pathway-receptor model. To provide context for the assessment, Designated Sites surrounding the Proposed Development Site are shown on Figure 9.2 and Figure 9.3, Volume IV.
- Waterbody catchment mapping was used to establish or discount potential hydrological connectivity between the Proposed Development and any designated sites. The hydrological catchments are also shown in Figures 12.2 and Figure 12.3, Volume IV.

9.5.2.2 Flora and Fauna

A desk study was carried out to collate and review available information, datasets and documentation sources pertaining to the natural environment in which the proposed project is situated.

Records available on the NPWS and the National Biodiversity Data Centre websites were reviewed, in addition to records of rare/sensitive species within the 10km grid squares which contain the Site obtained by request from NPWS (received 28th March 2023). NBDC data for the 1 km grid squares overlapping the GCR and TDR accommodation works provided desktop information for these locations.

Botanical species were assessed in accordance with their occurrence on the Flora Protection Order 2022 and the '*Ireland Red List No. 10: Vascular Plants*' (Wyse *et al.*, 2016).

Other sources included:

- Waterford City and County Development Plan 2022-2028
- OSI Aerial photography and 1:50000 mapping;
- NPWS website (mapviewer; Article 17 reporting; FPO Bryophyte viewer)
- NPWS rare and protected species records obtained by request on 28th March 2023;
- National Biodiversity Data Centre (NBDC) website and data obtained on 28th February 2023;
- Teagasc Soil area maps;
- Bat Conservation Ireland records obtained by request on 24th March 2023;
- Geological Survey Ireland (GSI) area maps;
- OPW drainage maps
- EPA website datasets (soil, surface water quality, ground water quality, designated sites);
- IFI website & guidance documents
- Botanical Society of Britain and Ireland online maps and data

Bats

A desk-based review of habitat availability in the environs of the proposed development, and the available bat data was used to inform the scope of the bat surveys required. As recommended by both BCI (2012), SNH (2021) and NIEA (2021), the area covered by the desk-based review was extended to 10 km surrounding the Site. The desk-based study included:

- Reviewing distances from closest European Sites designated for bats (the only bat SACs in Ireland are for lesser horseshoe bat *Rhinolophus hipposideros*).
- Examining aerial imagery and 6-inch maps to identify potential bat foraging and roosting habitats.
- Lundy et al. (2011) provides a high-level assessment of potential habitat suitability for different species of bat occurring in Ireland.
- Review of data received from BCI within 10 km of the wind farm Site and the results of Biodiversity Maps report for the 10-km squares covering the Site [S20], including species recorded and known roosting Sites.

9.5.3 Field Study

9.5.3.1 Habitats

Detailed botanical surveys and habitat classification for all wind farm infrastructure, including turbine, road infrastructure, sub-station, borrow pit, grid connection, met mast and turbine delivery accommodation works were undertaken on 27th and 28th July 2020, 07th and 08th September 2021 and 07th June 2022.

The methodology used during this survey was based on the Heritage Council's Best Practice Guidance for Habitat Survey and Mapping (2011) and CIEEM 'Good Practice Guidance for Habitats and Species' Version 3 May 2021.

The classification of habitats recorded during the field survey is based on the A Guide to Habitats in Ireland (Fossitt, 2000). The Guide to Habitats in Ireland classifies habitats according to a hierarchical framework with Level 1 habitats representing broad habitat groups, Level 2 representing habitat subgroups and Level 3 representing individual habitat types. The Field Survey focused on identifying habitats to Level 3 of the Guide to Habitats in Ireland. Any other records of interest (e.g., invasive plant species) were also marked on field maps and locations were recorded using GPS handheld units. The annotation of vegetation occurring within Sites was undertaken using the DAFOR scale. This scale refers to plant species in terms of dominance, abundance, frequency, occasional and rare (DAFOR). All species were readily identifiable during the survey. Plant nomenclature for vascular plants follows 'New Flora of the British Isles' (Stace, 2019), while mosses and liverworts nomenclature follows 'Mosses and Liverworts of Britain and Ireland - a field guide' (British Bryological Society, 2010).

Vegetation was sampled by taking botanical quadrats/relevés which were undertaken to analyse potential links with Annex I habitat types. The Interpretation Manual of European Union Habitats [EUR28] and Article 17 reports were used to evaluate whether links with Annex I habitats exist. These surveys were carried out on 07th September 2021. Methodology was based on the National Survey of Native Woodlands 2003-2008 (Perrin et. al, 2008).

In addition to habitat identification, each habitat was assessed for its ecological significance, based on the NRA Guidelines for Ecological Impact Assessment of National Road Projects (NRA, 2009).

During habitat surveys, a search for non-native invasive species was undertaken. The survey focused on the identification of invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (As Amended).

Habitat boundaries and associated attribute data were mapped using desk-based GIS software, namely ArcGIS 10.4.1, which was also used to calculate habitat areas and lengths.

Additionally, the habitats within the Proposed Development boundary were evaluated to determine their suitability to support protected species, in particular suitable areas of habitat for marsh fritillary, common lizard and common frog and having regard to the following guidelines:

- Edgar P, Foster J and Baker J (2010) Reptile Habitat Management Handbook. Amphibian and Reptile Conservation, Bournemouth.
- Griffiths RA, Raper SJ and Brady LD (1996). Evaluation of a Standard Method for Surveying Common Frogs (Rana temporaria) and Newts (Triturus cristatus, T. helveticus and T. vulgaris). JNCC, Peterborough.

9.5.3.2 Marsh Fritillary Surveys

During walkover surveys undertaken in 2020 areas of potential suitable habitat for marsh fritillary were identified within the Proposed Development Site. Targeted larval web surveys for the species were undertaken within these areas on the 08th September 2021. The surveys were undertaken within the optimal period for undertaking marsh fritillary larval web surveys, i.e. August – September, on dry days, with no rain and no to little wind. The survey methodology followed that described in the NRA (2009) best practice guidance document and Marsh Fritillary Butterfly Surveys NIEA Specific Requirements (NIEA, 2017).

9.5.3.3 Mammals

Mammal surveys of the Proposed Development were undertaken on 27th and 28th July 2020 and revisited on 07th and 08th September 2021. The mammal survey covered the entire development footprint and surrounding suitable habitats in the application boundary and were undertaken to determine the presence or absence protected mammal species in close proximity to the development footprint.

Sightings, tracks or signs (including droppings, resting places, burrows and setts) of mammals occurring within, or in the vicinity, of the development footprint were recorded using field notes and/or handheld GPS units subsequently digitised using ArcGIS.

The mammal survey also included a drey search. Trees were also examined for their potential to host dreys.

Surveys were undertaken in accordance with the NRA's (2009b) '*Ecological Surveying Techniques for Protected Flora and Fauna During the Planning of National Road Schemes*' and the JNCC's (2004) '*Common Standards Monitoring Guidance for Mammals*'. Regard was also had to the following:

- Harris S, Cresswell P and Jefferies D (1989) Surveying Badgers, Mammal Society.
- O'Mahony D, O'Reilly C and Turner P (2006). National Pine Marten Survey of Ireland 2005.
- Gurnell J and Pepper H (1994) Red squirrel conservation: Field study methods. Research Information Note 255. Forestry Commission, Edinburgh.
- Reid N, Harrison AT and Robb GN (2009) Northern Ireland Irish hare survey 2009. Northern Ireland Environment Agency Research and Development Series No. 09/04.
- Morris PA (2006) The New Hedgehog Book. Whittet Book, Stowmarket

Otter surveys were conducted as part of the aquatic ecology surveys and this is described in Section 9.5.3.5.

9.5.3.4 Bats

Bat surveys have been completed within the study area (wind farm Site land ownership boundary plus 275m buffer) during the 2020. The surveys encompassed preliminary roost assessments, summer roost inspections, activity surveys (transects) and static detector surveys.

These surveys followed the specific guidelines set out by the Bat Conservation Trust in Bat Surveys: Good Practice Guidelines (Hundt, 2012 and Collins, 2016[1]). The locations of static detectors and methodology for static detector surveys followed the requirements of 'Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation' (SNH, 2019; NatureScot 2021).

Preliminary Ecological Appraisal for Bats

A walkover survey of areas identified as potential roosting habitats during the desk top study were undertaken on 31st August 2020 by Karen Banks. Inspections of the exterior of trees and structures were undertaken to look for features that bats could use for roosting (Potential Roost Features, or PRFs) from ground level. This survey was repeated again on 09th September 2021 and 07th June 2022 by David Daly and included areas surveyed in 2020 and also trees at the proposed accommodation works on the TDR. The existing crossing structures (culverts and bridges) located along GCR and TDR accommodation works locations were inspected and assessed by David Daly for potential roosting bats on 09th September 2021.

The suitability of the Proposed Development for bats, in terms of roosting, commuting and foraging was initially assessed using the criteria set out in Collins, 2016 and was considered again against Collins, 2023 following the publication 4th edition revision of the 'Bat Surveys for Professional Ecologists: Good Practice Guidelines'.

The aim of the surveys was to determine the actual or potential presence of bats and the need mitigation.

Tree inspections and identification of PRFs had regard to '*A Guide to Identification and Assessment for Tree-Care and Ecology Professionals*' (Bat Tree Habitat Key, 2018). Buildings and structures within the Site and including a 500m setback thereof were assessed for their suitability to support bats having regard to '*Bats in Buildings Guidance Notes for: Planners, engineers, architects and developers*' (Bat Conservation Ireland December 2010, Updated in September 2014).

The exterior of the trees and structures were visually assessed for potential bat access points and evidence of bat activity using binoculars, a high-powered torch and an endoscope (Explorer Premium 8803 with 9mm camera). Features such as tree rot holes, crevices and small gaps, such as between the brick or stonework, which had potential as bat roosts or as bat access points into the buildings were inspected for evidence of usage by bats.

Emergence Roost Survey

No structures were identified as having potential for bats during the roost inspection surveys, therefore, emergence and/or re-entry surveys were not considered necessary.

Bat Activity/Transect Surveys

Transects of bat favourable habitats within the Site were walked and activity recorded using an Echo Meter Touch Pro (Full Spectrum). Transects were undertaken in April, July and August 2020 (Table 9-2).

Surveys targeted a range of foraging and commuting habitats present within the study area, those associated with linear features such as roadside margins, woodland plantation edges, hedgerows, treelines and waterbodies. Full details of transects are shown in Table 9-2 and Figure 9.1, Volume IV.

1 Noting that Collins, 2016 was updated in October 2023 with no material change in how the assessment of the suitability of the Proposed Development to support bats should be carried out.

Bat surveying was conducted using a Frequency Division Detector System. Frequency Division detectors record bat ultrasonic calls on a continuous basis and stores the information onto an internal SD memory card. Frequency Division is a technique used to convert the inaudible bat echolocation calls to audible sounds. The bat detectors used a Full Spectrum Analysis to make the real-time recorded calls visible for display purposes. It is these sonograms (2-d sound pictures) that are digitally stored on a SD card and downloaded for analysis. Each time a bat is detected, an individual time and GPS stamped (date and time to the second) file is recorded.

Bat activity is governed by the activity of their insect prey and insect abundance is in turn governed by weather conditions and climate. Insects, and therefore bats, are unlikely to be present at temperatures below 7°C or during periods of strong winds or heavy rainfall so surveying in such conditions is not possible. All field surveys were undertaken within the active bat season and during good weather conditions (dry conditions and temperature at 8°C and greater).

Nocturnal bat activity is mainly bi-modal taking advantage of increased insect numbers on the wing in the periods after dusk and before dawn, with a lull in activity in the middle of the night. This is particularly true of 'hawking' species – i.e. bats which capture prey in the open air. However, 'gleaning' species remain active throughout the night as prey is available on foliage for longer periods. Gleaning is the term for taking prey from foliage or the ground.

Bats were identified by their ultrasonic calls coupled with behavioural and flight observations and on computer by sound analysis of recorded echolocation and social calls with dedicated software (BatExplorer spectrogram sound analysis software Version 2.1.6.0).

Table 9-2: Bat Activity Survey Details 2020

Transect Visit	Date	Start Time	End Time
1	24/04/2020	20:45	22:30
2	30/07/2020	21:20	23:15
3	29/08/2020	20:10	22:30

Static Detector Surveys

Passive Static Bat Surveys involve leaving a static bat detector unit (with ultrasonic microphone) in a specific location and set to record for a specified period of time (i.e. a bat detector is left in the field, there is no observer present and bats which pass the monitoring unit are recorded and their calls are stored for analysis post surveying). The bat detector is effectively used as a bat activity data logger. This results in a far greater sampling effort over a shorter period of time. Bat detectors with ultrasonic microphones are used as the ultrasonic calls produced by bats cannot be heard by human hearing.

Song Meter SM4BAT Full spectrum bat recorders use Real Time recording as a technique to record bat echolocation calls and using specific software, the recorded calls are identified. It is these sonograms (2-d sound pictures) that are digitally stored on the SD card (or micro SD cards depending on the model) and downloaded for analysis. Full spectrum bat recorders were utilised for all of the static surveys as recommended in the revised SNH (2021) guidelines. These results are depicted on a graph showing the number of bat passes per species per hour/night. Each bat pass does not correlate to an individual bat but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame is one individual bat. On the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence or bat pass is more likely to be indicative of individual bats.

Per NatureScot (2021) guidance, static units (Song Meter SM4BAT) were programmed to commence half an hour before sunset and finish half an hour after sunrise to ensure that bat species that emerge early in the evening and return to roosts late are recorded. Detectors were left out for a minimum of 10 consecutive nights across three survey periods: spring (April-May), summer (June-mid-August) and autumn (mid-August-October). See Table 9-3 below for further details.

NatureScot (2021) guidance states that "Detectors should be placed at all known turbine locations at wind farms containing less than ten proposed turbines. Where developments have more than ten turbines, detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine Sites up to a maximum of 40 detectors for the largest developments".

It should be noted that, due to the ongoing development of the project, the location for the proposed turbines changed since the 2020 static detector surveys. It was considered that the updated proposed turbine locations represented similar habitat types and landscape features, and therefore the 2020 static data was still applicable, as per NatureScot (2021) guidance. In 2021, CG5 was deployed, for one survey period each, to account for a variation in turbine layout that included habitats not yet surveyed, wet grassland. The data was analysed with Kaleidoscope 5.3.9g software (Bats of Europe 5.2.1). The locations of the static detectors are presented in Figure 9.1, Volume IV.

Table 9-3: Details of static detector deployment 2020/2021

Static Detector ID.	Habitat types at static location	Closest turbine number (final design)	Habitat types at turbine location	Spring		Summer		Autumn	
				Start Date	Number of nights deployed[2]	Start Date	Number of nights deployed	Start Date	Number of nights deployed
CG1	Wet heath	1	Wet heath	23/04/20	12	24/06/20	11	15/08/20	13
CG2	Wet heath	2	Wet heath	23/04/20	12	24/06/20	11	15/08/20	13
CG3	Wet heath/ grassland	5	Wet grassland	23/04/20	12	24/06/20	11	15/08/20	13
CG4	Wet heath	6	Wet heath	23/04/20	12	24/06/20	11	15/08/20	13
CG5	Bracken, adjacent to conifer plantation	5	Wet heath	23/04/20	12	24/06/20	11	15/08/20	13
CG6	Wet heath	7	Wet heath	23/04/20	12	24/06/20	11	15/08/20	13
CG7	Wet heath	8	Dry siliceous heath with dense bracken	23/04/20	12	24/06/20	11	15/08/20	13
CG8	Dry siliceous heath with dense bracken	7	Wet heath	23/04/20	12	N/A	0	15/08/20	13
CG9	Dry siliceous heath with dense bracken	10	Dry siliceous heath with dense bracken	23/04/20	12	24/06/20	11	15/08/20	13
CG10	Dense bracken and heath	11	Dense bracken and heath	23/04/20	12	24/06/20	11	15/08/20	13

[2] Note that data will be recorded for the morning on the date of collection. Thus, if a detector was left out on 09/05/2020 and collected on 20/05/2020, the detector will have been left out for a total of 11 complete nights. However, there will be 12 unique dates where data was (potentially) recorded.

Static Detector ID.	Habitat types at static location	Closest turbine number (final design)	Habitat types at turbine location	Spring		Summer		Autumn	
				Start Date	Number of nights deployed[2]	Start Date	Number of nights deployed	Start Date	Number of nights deployed
CG5 (2021)	Improved grassland adjacent to drainage ditch & wet heath	5	Wet grassland	-	-	26/07/21	10	-	-

Survey at Height

A stationary passive detector was affixed to a temporary met mast on the survey Site during the survey period 20th May to 09th October 2022 (a total of 142 days) to assess the collision risk to bat species. It was placed at 50m, within the rotor swept height.

A met mast is a tower equipped with meteorological instruments, installed on potential wind turbine Sites for a period, to assess wind conditions and allows developers to determine if a Site will generate enough power for a project to be economically viable. As the anemometers are mounted at a range of heights, it is a suitable place to affix a stationary passive detector to assess the potential impact on bat species flying within the rotor swept height.

Static Detector Survey Analysis

All recordings were made in full spectrum, retaining all amplitude and harmonic information from the original bat call for subsequent analysis. Bat calls were analysed using Kaleidoscope Pro (5.3.9) Software. All files were split to a maximum duration of 15 seconds and automatically identified to species level, or genus level as appropriate, using auto-ID bat classifiers (Bats of Europe 5.2.1).

In order to determine appropriate quality assurance a randomly generated 10% sample of the files were manually checked (including noise and noID files).

The data was then entered into Ecobat[3] and a report was subsequently generated. Ecobat is an online tool which makes assessments of bat activity levels by comparing data entered by the user with bat survey information from similar areas at the same time of year. Specifically, a median bat activity level is calculated which corresponds to a bat activity category (Table 9-4).

An individual bat can pass a particular feature on several occasions while foraging. It is therefore not possible to estimate the number of individual bats. In accordance with best practice guidance (Collins, 2016) an activity index is used; calculated from bat records per hour which allows analysis of bat activity to estimate abundance and/ or activity. The calculation is as follows:

BAI (Bat Activity Index) = Total number of bat records / number of hours of recording.

Table 9-4: Median percentile range and corresponding bat activity category

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

The Ecobat analysis is presented in Section 9.7.6.9

[3] http://www.ecobat.org.uk/

9.5.3.5 Aquatic Ecology

The following section summaries the results of aquatic surveys carried out for the proposed Coumnagappul wind farm project. The full reports are included in Appendix 9.3, Volume III.

Surveys to inform the aquatic ecology assessment were completed in 2020. The surveys included walkover surveys, catchment wide electro-fishing, White-clawed Crayfish Surveys (conventional methods and eDNA survey), Freshwater Pearl Mussel Survey, biological water quality surveys.

The wind farm Site is located almost entirely within the Colligan River sub- basin, with the exception of a short section of internal access road which will be in the upper boundary of the Nire sub-basin. The focus of the aquatic ecology assessment was therefore on the Colligal catchment with a section of the Nire included also.

A total of n=9 watercourses were selected for detailed aquatic assessment: within the Colligan Main Channel, Coumduane Stream, Lalisheen Stream (and tributary), and Knockanpower Stream.

The nomenclature for the watercourses surveyed is as per the Environmental Protection Agency's (EPA) online map viewer.

Surveys at each of these watercourses included habitat appraisal, white-clawed crayfish survey (sweep netting, hand searching) and biological water quality sampling (Q-sampling). A Stage 1 freshwater pearl mussel survey was undertaken in September 2020.

Fishery Assessment

A fisheries assessment (electro-fishing) was undertaken on 23rd to 26th September 2020, under authorisation from the Department of Communications, Climate Action & Environment (DCCAE). The survey was undertaken in accordance with best practice: *Water Quality - Sampling of Fish with Electricity* (CEN, 2003); *Methods for the Water Framework Directive. Electric Fishing in Wadeable Reaches* (CFB, 2008) and *Moving from multiple pass depletion to single pass timed electrofishing for fish community assessment in wadeable streams* (Matson et al, 2018) and Section 14 licencing requirements.

A total of n=23 Sites were selected for detailed aquatic assessment (see Table 9-5 and Image 9-3).

Fisheries habitat appraisal was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The baseline assessment considered the quality of spawning, nursery and holding habitat within the vicinity of the survey Sites using Life Cycle Unit (salmonids) and Lamprey Habitat Quality Index scores (lamprey). Fisheries habitat appraisal in accordance with Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003) and the Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000).

White-clawed crayfish survey

White-clawed crayfish (*Austropotamobius pallipes*) surveys were undertaken in September 2020 under a National Parks and Wildlife (NPWS) open licence (no. C29/2020). Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). Trapping of crayfish was not feasible given the small nature of most aquatic survey Sites sampled.

An appraisal of white-clawed crayfish habitat at each Site was also carried out based on physical channel attributes, water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider Colligan River and Colligan_SC_010 sub-catchment was undertaken.

Freshwater pearl mussel survey

A freshwater pearl mussel (*Margaritifera margaritifera*) survey was undertaken in September 2020 at the aquatic survey sites. Two sections of the Colligan where the most suitable habitat was found, were surveyed for mussels, the upper section is both upstream and downstream of Lackandarra Bridge and the lower section is downstream of Colligan Bridge (under NPWS licence C15/2020). Methodology followed NPWS guidance (Anon, 2004) on a minimum of 500m of river. In addition, a bank of gravel at Kildangan Bridge at the lower end of the Colligan was searched for mussel shell fragments. Assessments were made of the habitat suitability for freshwater pearl mussels, based on the criteria of Hastie et al. (2000) and Skinner et al. (2003).

Biological water quality (Q-sampling)

Given the unsuitability of some Sites (lack of flow, lack of water or too deep), biological water quality was assessed at a total of n=12 aquatic survey Sites through Q-sampling during September 2020 (refer to Appendix 9.3 for further details). Macro-invertebrate samples were converted to Q-ratings as per Toner et al. (2005). All riverine samples were taken with a standard kick sampling hand net from areas of riffle/glide utilising a two-to-three-minute sample. Large cobble was also hand searched for a further one minute to located attached macroinvertebrates. Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012), stoneflies (Feeley et al., 2020) and other relevant taxa (i.e. Byrne et al., 2009; Nelson et al., 2011).

Otter signs

The presence of otter (*Lutra lutra*) at each aquatic survey Site was determined through the recording of otter signs within 150m upstream and downstream of each watercourse monitoring location. Otter survey followed Chanin P (2003) *Monitoring the Otter Lutra lutra. Conserving Natura 2000 Rivers Monitoring Series No 10.* English Nature, Peterborough.

Otter signs included holts, couches, spraints, latrines, slides and prints which are useful determinants of otter utilisation of watercourses. The location of signs was recorded via handheld GPS.

Aquatic ecological evaluation

The evaluation of aquatic ecological receptors contained within this report uses the geographic scale and criteria defined in the 'Guidelines for Assessment of Ecological Impacts of National Road Schemes' (NRA, 2009).

Biosecurity

A strict biosecurity protocol including the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey Sites. Surveys were undertaken at Sites in a downstream order to minimise the risk of upstream propagule mobilisation. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced.

9.5.3.6 Other Species

Observations of other species and groups including Herpetofauna and invertebrates were recorded during the ecological walkover, and any incidental observations of other species made during surveys were recorded.

Table 9-5: Location of the electro-fishing Sites assessed for the proposed Coumnagappul Wind Farm project

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
A1	Shanballyanne River	16S13	Knockavannia	623899	611637
A2	Kilkeany River	16K22	Kilkeany	622889	611517
A3	Reanadampaun Commons Stream	16R10	Curraghnagree	622323	611575
A4	Shanballyanne River	16S13	Graignagower	621864	613351
A5	Unnamed Stream	N/A	Knockavannia	625824	611293
B1	Skeheens Stream	17S01	Reanadampaun Commons	622549	609483
B2	Unnamed Stream	N/A	Reanadampaun Commons	621198	608421
B3	Skeheens Stream	17S01	Lagg Bridge	621895	606497
B4	Colligan River	17C01	Coumnagappul	624276	608932
B5	Glennaneanemountain River	17G23	Carrickbrack	624984	607579
B6	Colligan River	17C01	Scart Bridge	622924	604925
B7	Knockacaharna Stream	17K54	R672 crossing	621227	601612
B8	Greenane Stream	17G05	R672 crossing	620751	600491
B9	Colligan More Stream	17C11	R672 crossing	620912	599354
B10	Colligan River	17C01	Currabaha	621976	598017
B11	Colligan River	17C01	Kildangan Bridge	623167	595182
C1	Unnamed Stream	N/A	R672 crossing, Cahernaleague	620013	606645
C2	Ballynaguilkee Upper Stream	18B20	R672 crossing, Powers Cross Roads	620145	606453
C3	Tooraneena Stream	18T04	R672 crossing, Tooraneena	620318	606003
C4	Clooncogaile Stream	18C13	R672 crossing, Clooncogaile	620482	605316
C5	Clooncogaile Stream	18C13	Clooncogaile	619925	605273
C6	Tinalira Stream	18T05	R672 crossing, Kilcooney	620636	604571
C7	Ballynaguilkee Lower Stream	18B24	Tanalira	619692	603984

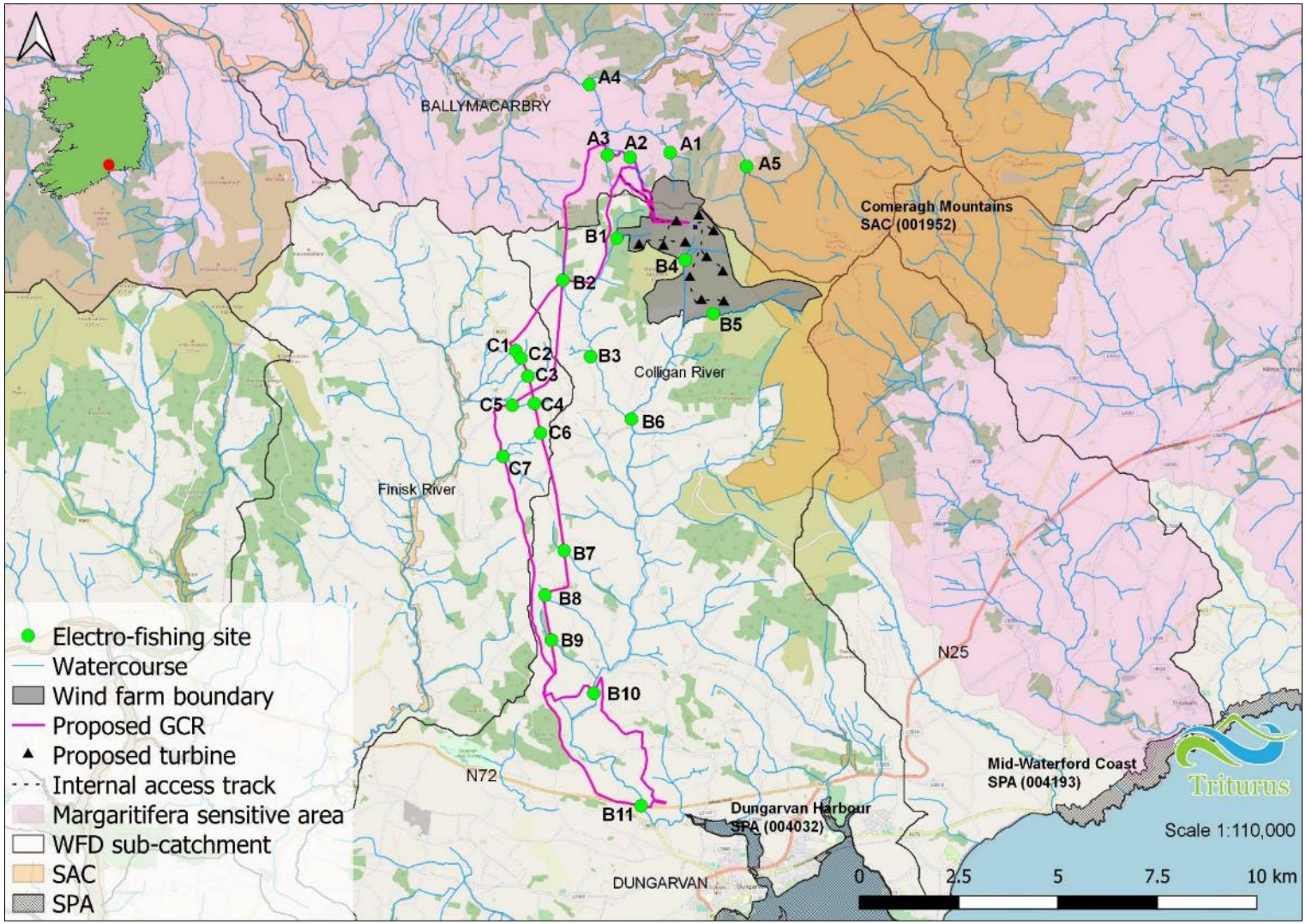


Image 9-1: Electro-fishing Survey Sites

9.5.4 Survey Limitations

General

Seasonal factors that affect distribution patterns and habits of species were taken into account when conducting the surveys. The potential of the site to support certain populations (in particular those of conservation importance that may not have been recorded during the field survey due to their seasonal absence or nocturnal/cryptic habits) was assessed.

The specialist studies, analysis and reporting have been undertaken in accordance with the appropriate guidelines. The habitats and species on the site were readily identifiable and comprehensive assessments were made during the field visit. No limitations in the scope, scale or context of the assessment have been identified.

Bat Survey and Analysis Limitations

It is not always possible to identify a bat call to species level due to the recorded call not being clear. Recorded files from automated detectors may contain only fragments of a call, or the bat may be calling from a distance (from the detector) in which case it may not be clear enough to assign the call to a specific species. In these cases the call has been assigned to genus level for the 2020/2021 survey results;

Some caution must be taken when comparing activity levels between species, as bias can be shown towards those species with 'louder' or 'lower frequency' echolocation calls.

For example, Nyctalus species have louder and low frequency echolocation calls which carry further than the quieter and more broad-band brown long-eared bat echolocation calls;

A bat contact is defined as a single detector file which contains at least one bat call. Multiple contacts at any given detector location do not necessarily indicate the presence of more than one bat and should therefore be interpreted as a level of activity rather than the number of bats recorded;

For the purposes of this analysis, if more than 1 species was present within the recorded files the prominent species was identified as the species for the Ecobat analysis, therefore some species numbers may be under recorded;

Guidelines in the use of Ecobat recommend a Reference Range of 200+ files of bat data to be confident in the relative activity level. The reference range is the stratified dataset of bat results recorded in the same region, at the same time of year, by which percentile outputs can be generated. This comprises all records of nightly bat activity across Ireland. Although there is an increased uptake in the use of Ecobat in Ireland, some of the reference ranges remain below 200, therefore the results are more conservative.

Static detector CG8 failed to record during the summer survey period, therefore there are no results available. The impact assessment of the 2020 results at this location is based on the spring and autumn results only.

9.6 Ecological Resource Evaluation

The value of the ecological resources/receptors was evaluated using the ecological evaluation guidance given in the NRA guidance on assessment of ecological impacts of National Road Schemes (NRA, 2009a).

This guidance provides ratings for resources based primarily on geographic context and allows for resources at International, National, County and Local (higher and lower value) levels. Key ecological receptors (for assessment) are those deemed to be above the 'Local Importance (lower value) evaluation. Aquatic Receptor Evaluation

Ecological features are assessed on a scale ranging from international-national-county-local. The local scale is approximately equivalent to one 10 km square but can be operationally defined to reflect the character of the area of interest.

Habitats and species were evaluated following the NRA (2009a) criteria on the basis of a number of characteristics and features defined as follows:

- The fisheries value of a watercourse refers to its suitability for fish, primarily Salmonids (Salmon and Trout), and to the associated value for recreational angling purposes.
- Annex II species are those that are listed under the EU Habitats Directive (92/43/EEC).
- Annex I habitats are those that are listed under the EU Habitats Directive, including Priority Habitats.
- Species protected under the Wildlife Acts 1976-2022 and associated orders.
- The evaluation of water quality uses a five-point biotic index (Q-value) based on the presence and relative abundance of various invertebrates using the Environmental Protection Agency's (EPA) standard technique.

9.6.1 Assessing Effect Significance

Once the value of the identified ecological receptors (features and resources) was determined, the next step was to assess the potential effect or impact of the project on the identified key ecological receptors, following the EPA evaluation criteria utilised in this appraisal of the Environmental Factor, Biodiversity. This criteria is included in the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA 2022).

Assessment of Effect Type and Magnitude

Assessment of effects takes into account construction, operational and decommissioning effects with reference to the potential for direct, indirect and cumulative effects. The assessment also takes account of any residual effects that may persist following the implementation of any mitigation or best practice design.

The characterisation of effects reflects the ecological structure and function upon which the key ecological receptors depend. Detailed assessment of effects takes into account the magnitude of effects affecting populations.

This EIAR uses the EPA (2022) classification of effects in order to describe the quality, significance, duration and type of effect. The magnitude of effect is based on probability of the likely effect occurring.

The ecological significance of the effects of the Proposed Development are determined following the precautionary principle and in accordance with the methodology set out in Section 5 of CIEEM (2018).

For the purpose of Ecological Impact Assessment (EcIA), 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local (CIEEM, 2018).

When determining significance, consideration is given to whether:

- Any processes or key characteristics of key ecological receptors will be removed or changed
- There will be an effect on the nature, extent, structure and function of important ecological features
- There is an effect on the average population size and viability of ecologically important species.
- There is an effect on the conservation status of important ecological habitats andspecies.

Assessment of Cumulative Effects

Cumulative effects can result from individually insignificant but collectively significant actions taking place 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); and,
- Associated/connected – 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).

Assessment of Residual Effects

After characterising the potential impacts of the 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 significance of their effects on the 'Important ecological features'.

9.7 Description of Baseline Environment

The ecology of the existing environment is described within this section.

9.7.1 Designated Sites

9.7.1.1 Sites of International Importance

An Appropriate Assessment (AA) Screening Report and Natura Impact Statement (NIS) have been completed in order to appraise the likely significant effects of the proposed development either alone or in combination with other plans or projects on European Sites (SACs, cSACs, SPAs and proposed SPAs); these accompany this planning application.

Candidate Special Areas of Conservation (SACs)

SACs are protected under the European Union (EU) 'Habitats Directive' (92/43/EEC), as implemented in Ireland by S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) and Part XAB of the Planning and Development Act 2000 (as amended).

There are five SACs within the potential Zone of Influence (ZoI) of the proposed Coumnagappul Wind Farm. One of these is also within the potential ZoI of the GCR due to a hydrological linkage. See Table 9-6 and Figure 9.2, Volume IV for details.

The full NPWS Site synopses for designated areas are available on www.NPWS.ie.

Special Protection Areas (SPAs)

SPAs are designated under the EU Birds Directive (2009/147/EC) ('The Birds Directive').

There are two SPAs within the potential Zone of Influence (ZoI) of the proposed Coumnagappul Wind Farm Study Area. See Table 9-6 and Figure 9.2, Volume IV for details.

The full NPWS Site synopses for designated areas are available on www.NPWS.ie.

9.7.1.2 Sites of National Importance

Sites of National Importance in Ireland are termed NHA and pNHA.

No NHAs and eight pNHAs are present within 15 km of the proposed wind farm (see Table 9-7 and Figure 9.3, Volume IV) for details.

9.7.1.3 Other Designated Sites

Nature Reserves

There are no nature reserves within 15 km of the Proposed Development. The closest nature reserve is Capel Island and Knockadoon Head Nature Reserve, c. 28km southwest.

Ramsar Sites

There is one Ramsar Site within 15 km of the Proposed Development, Dungaravan Harbour (Ramsar 839), located 12.74 km south of the Site and which is encompassed by the Dungarvan Harbour SPA (Site Code: 004032). The next closest Ramsar Site is the Blackwater Estuary (Ramsar 836), c. 27 km southwest of the proposed project.

9.7.1.4 Other Sites of Interest

Wetlands Survey Ireland has identified a number of wetland sites in the area, namely Lough Coumfea, Knockraha, and Lag Bridge, which are not hydrologically linked with the Proposed Development.

Table 9-6: Summary of European Sites within potential ZoI of The Proposed Development

Designated Site (code)	Features of Interest	Distance: Direct line Measurement (km)			In Potential ZoI?
		to closest turbine	to GCR	to TDR Accommodation Works	
Comeragh Mountains SAC (001952)	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) [3110] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] Northern Atlantic wet heaths with Erica tetralix [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Blanket bogs (* if active bog) [7130] Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110] Calcareous rocky slopes with chasmophytic vegetation [8210] Siliceous rocky slopes with chasmophytic vegetation [8220] Hamatocaulis vernicosus (Slender Green Feather-moss) [6216]	0.76 km	>500m (3.56 km)	>500m (2.67 PoI 24)	No –no physical, ecological or hydrological connectivity between the Proposed Development and the SAC. No Annex I habitats within the Site. Proposed Development will not alter local hydrology.
Nier Valley Woodlands SAC (000668)	Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	2.9 km	>500m (3.81 km)	>500m (3.7 km)	No – No – no physical, ecological or hydrological connectivity between the Proposed Development and the SAC
Lower River Suir SAC (002137)	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]	4.29 km	>500m (4.24 km)	0m	Yes – A section of internal access road within the Site is to be located within the upper reaches of the Nier_020 sub-catchment, which ultimately flows into the SAC.

Designated Site (code)	Features of Interest	Distance: Direct line Measurement (km)			In Potential ZoI?
		to closest turbine	to GCR	to TDR Accommodation Works	
	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] Taxus baccata woods of the British Isles [91J0] Margaritifera margaritifera (Freshwater Pearl Mussel) [1029] Austropotamobius pallipes (White-clawed Crayfish) [1092] Petromyzon marinus (Sea Lamprey) [1095] Lampetra planeri (Brook Lamprey) [1096] Lampetra fluviatilis (River Lamprey) [1099] Alosa fallax fallax (Twaite Shad) [1103] Salmo salar (Salmon) [1106] Lutra lutra (Otter) [1355]				TDR PoI 1, while adjacent to the SAC, is within road and will have no connectivity to the SAC.
Blackwater River (Cork/Waterford) SAC (002170)	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Perennial vegetation of stony banks [1220] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] Water courses of plain to montane levels with the Ranunculion fluitantis and	5.48 km	>500m (1.64 km)	>500 m (1.48km)	Yes -The GCR crossing of the Ballynaguilkee lower stream will require instream works to replace an existing culvert. This stream ultimately flows into the SAC.

Designated Site (code)	Features of Interest	Distance: Direct line Measurement (km)			In Potential ZoI?
		to closest turbine	to GCR	to TDR Accommodation Works	
	Callitricho-Batrachion vegetation [3260] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] Margaritifera margaritifera (Freshwater Pearl Mussel) [1029] Austropotamobius pallipes (White-clawed Crayfish) [1092] Petromyzon marinus (Sea Lamprey) [1095] Lampetra planeri (Brook Lamprey) [1096] Lampetra fluviatilis (River Lamprey) [1099] Alosa fallax fallax (Twaite Shad) [1103] Salmo salar (Salmon) [1106] Lutra lutra (Otter) [1355] Trichomanes speciosum (Killarney Fern) [1421]				
Glendine Wood SAC (002324)	Trichomanes speciosum (Killarney Fern) [1421]	11.06 km	>500m (4.37 km)	132 m	No – no physical, ecological or hydrological connectivity between the Proposed Development and the SAC
Dungarvan Harbour SPA (004032)	Great Crested Grebe (Podiceps cristatus) [A005] Light-bellied Brent Goose (Branta bernicla hrota) [A046] Shelduck (Tadorna tadorna) [A048] Red-breasted Merganser (Mergus serrator) [A069]	12.74 km	>500m (0.67 km)	360 m	Yes – construction, operation and decommissioning stage site drainage is to the Colligan River catchment. There is hydrological connectivity to the Site via the Colligan River.

Designated Site (code)	Features of Interest	Distance: Direct line Measurement (km)			In Potential ZoI?
		to closest turbine	to GCR	to TDR Accommodation Works	
	Oystercatcher (Haematopus ostralegus) [A130] Golden Plover (Pluvialis apricaria) [A140] Grey Plover (Pluvialis squatarola) [A141] Lapwing (Vanellus vanellus) [A142] Knot (Calidris canutus) [A143] Dunlin (Calidris alpina) [A149] Black-tailed Godwit (Limosa limosa) [A156] Bar-tailed Godwit (Limosa lapponica) [A157] Curlew (Numenius arquata) [A160] Redshank (Tringa totanus) [A162] Turnstone (Arenaria interpres) [A169] Wetland and Waterbirds [A999]				Note: potential for effects on special conservation bird species are discussed in Chapter 10-Ornithology
Mid-Waterford Coast SPA (004193)	Cormorant (Phalacrocorax carbo) [A017] Peregrine (Falco peregrinus) [A103] Herring Gull (Larus argentatus) [A184] Chough (Pyrrhocorax pyrrhocorax) [A346]	>15 Km (15.17 km)	>500m (9.83 km)	>500m (3.35 km)	No- no physical, ecological or hydrological connectivity between the Proposed Development and the SPA Note: potential for effects on special conservation bird species are discussed in Chapter 10-Ornithology

Table 9-7: Summary of National Sites within Potential ZoI of wind farm and GCR and TDR

Designated Site	Features of Interest	Distance: Direct line Measurement (km)			Distance: Direct line Measurement (km)
		to closest turbine	to closest turbine	to closest turbine	
Comeragh Mountains pNHA (001952)	Oligotrophic Lakes Floating River Vegetation Wet Heath Dry Heath Blanket Bog Siliceous Scree Rocky Slopes (calcareous and siliceous) Slender Green Feather-moss	0.76 km	>500m (3.56 km)	>500m (2.67 to PoI 24)	No –no physical, ecological or hydrological connectivity between the Proposed Development and the SAC. No Annex I habitats within the Site. Proposed Development will not alter local hydrology.
Nier Valley Woodlands pNHA (000668)	Oak Woodland Remnants	2.9 km	>500m (3.81 km)	>500m (2.74 km straight line to PoI 24)	No – No connectivity between the Site and the terrestrial habitat
Toor Wood pNHA (001708)	Oak Woodland Remnants	9.71 km	>500m (11.41 km)	>500m (11.43 km)	No – No connectivity between the Site and the terrestrial habitat
Glenboy Wood pNHA (000952)	Oak Woodland Remnants	11.64 km	>500m (9.22 km)	>500m (8.29 km)	No – No connectivity between the Site and the terrestrial QI habitat
Dungarvan Harbour pNHA (000663)	Wetland and waterbirds	12.79 km	>500m (0.7 km)	257 m	Yes - 8.9 km downstream of the Site via the Colligan River.
Kilsheelin Lake pNHA (001701)	Waterbirds	12.9 km	>500m (14.15 km)	>500m (14.14km)	No – no hydrological connectivity between the Site and the pNHA. Outside foraging range for bird species.
Stradbally Woods pNHA (001707)	Woodland	13.45 km	>500m (11.12 km)	>500m (3.35 km)	No – No connectivity between the Site and the terrestrial QI habitat

Designated Site	Features of Interest	Distance: Direct line Measurement (km)			Distance: Direct line Measurement (km)
		to closest turbine	to closest turbine	to closest turbine	
Marlfield Lake pNHA (001981)	Wetland and waterbirds Woodland	13.6km	>500m (13.47km)	>500m (13.45km)	No – no hydrological connectivity between the Site and the pNHA.

9.7.2 Rare and Protected Flora

The Site is located within Ordnance Survey National Grid 10km Squares S20 an S21. These 10km grid squares were searched for records of plant species through the National Biodiversity Data Centre (NBDC) website (most recent search on 29th March 2023).

This list was then compared to the lists of species protected under the Flora (Protection) Order of 2022 the Ireland Red List No. 10: Vascular Plants (Wyse *et al*., 2016) and the Ireland Red List No. 8: Bryophytes (Lockhart *et al.*, 2012). In addition, data on rare/protected species recorded in 10km grid squares within a 5km radius of the Site was obtained from NPWS (received 28th March 2023); this encompassed grid squares S10, S11, S20, S21, S30 and S31.

The 1 km grid squares overlapping the GCR were also searched; there are no records of rare flora within these grid squares.

Table 9-8 presents details of the rare and protected plant species found within the 10km squares S10, S11, S20, S21, S30 and S31. Information on habitats was completed using; Streeter et al. '*Collins Wildflower Guide*' 2nd edition, 2018 and the British Bryological society's '*Mosses and Liverworts of Britain and Ireland a field guide*' 2010.

Records for five species are within the 10km grid squares (S20 and S21) which overlap the proposed wind farm Site; Fir Clubmoss *Huperzia selago*, Atlantic Pawwort *Barbilophozia atlantica*, Large White-moss *Leucobryum glaucum*, Small Mouse-tail Moss *Myurella julacea* and Varnished Hook-moss *Hamatocaulis vernicosus*.

Habitats broadly suitable for fir clubmoss, Atlantic pawwort, large white-moss, small mouse-tail moss and varnished hook-moss occur within the Proposed Development boundary. However, these species were not observed during the botanical survey. No rare or protected flora were found within the Site, the GCR or the TDR during surveys.

The NPWS FPO Bryophyte Sites map viewer was also consulted. There are no FPO Bryophyte Sites at the proposed Site (closest is Coumfea in the Comeragh Mountains, c. 3 km east).

Table 9-8: Historic Records of rare and protected flora within the 10km Grid Squares (S10, S11, S20, S21, S30 and S31) within 10km of the Study Area (supplied by NPWS)

Species	Grid Square	Year of Last Record	Survey/Dataset	Conservation Status	Habitat	Result of Field surveys for the Proposed Development
Green Field-speedwell *Veronica agrestis*	S10, S11	2022	The Flora of County Waterford Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	Near Threatened	Cultivated land, waysides, gardens and allotments with well drained neutral or mildly acidic soils	Not observed.
Fragrant Agrimony *Agrimonia procera*	S11, S21, S30, S31	2012	The Flora of County Waterford	Near Threatened	Hedgerows, woodland margins, scrub and roadside verges, with heavy, neutral soils	Not observed.
Corn Marigold *Glebionis segetum*	S11, S30	2022	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	Near Threatened	Arable fields with light sandy or loamy soils or waste ground with disturbed soils	Not observed.
Irish Whitebeam *Sorbus hibernica*	S11	2010	The Flora of County Waterford	Vulnerable	Rocks and cliffs, lake-shores, river gorges, rocky pastures, hedges and woodland on carboniferous limestones	Not observed.
Pale Flax *Linum bienne*	S11	2008	Species Data from the National Vegetation Database	Near Threatened	Dry grassy and scrub mosaics, typically drought-prone coastal soils	Not observed.
Vervain *Verbena officinalis*	S11,	2021	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	Near threatened	Open habitats or bare ground with free draining calcareous soils.	Not observed.

Species	Grid Square	Year of Last Record	Survey/Dataset	Conservation Status	Habitat	Result of Field surveys for the Proposed Development
Fir Clubmoss *Huperzia selago*	S20, S21, S30, S31	2009	The Flora of County Waterford	EU Habitats Directive: Annex V	Montane grasslands, heathlands, bog and scree and montane ledges with acidic, nutrient poor peaty soils	Not observed.
Moonwort *Botrychium lunaria*	S20, S21	2010	The Flora of County Waterford	Near Threatened	Upland tracksides and rock ledges with well-drained soils.	Not observed.
Ivy-leaved Bellflower *Wahlenbergia hederacea*	S20, S30	2004	The Flora of County Waterford	Near Threatened	Heathlands, pastures, open woodland, stream sides and flushes with damp boggy acidic soils.	Not observed.
Shrubby Cinquefoil *Potentilla fruticosa*	S20	2004	The Flora of County Waterford	Vulnerable	Rocky places subject to flooding	Not observed.
Atlantic Pawwort *Barbilophozia atlantica*	S20, S21	2007	Bryophytes of Ireland	Flora Protection Order 2015 Schedule C (Liverworts || Threatened)	Boulders and drystone walls	Not observed.
Cliff Scalewort *Porella cordaeana*	S20	2007	Bryophytes of Ireland	Near Threatened	Silty tree bases and rocks by rivers or lochs	Not observed.

Species	Grid Square	Year of Last Record	Survey/Dataset	Conservation Status	Habitat	Result of Field surveys for the Proposed Development
Speckled Rustwort *Marsupella sphacelata*	S20	2007	Bryophytes of Ireland	Vulnerable	Wet acidic rocks or gravels and flushes	Not observed.
Bent-leaved Beard-moss *Leptodontium flexifolium*	S20	2007	Bryophytes of Ireland	Near Threatened	Heaths, moorland, woodland with humus or well-drained peaty acidic soils	Not observed.
Great Grimmia *Grimmia decipiens*	S20	2007	Bryophytes of Ireland	Near Threatened	Variety of rock types	Not observed.
Large White-moss *Leucobryum glaucum*	S20	2007	Bryophytes of Ireland	Annex IV	Acidic woodlands, mires, wet heath, bogs and fens with	Not observed.
Pendulous Wing-moss *Antitrichia curtipendula*	S20, S21	2007	Bryophytes of Ireland	Near threatened	Upland rocks, cliff and scree, trees and grasslands	Not observed.
Pendulous Wing-moss *Antitrichia curtipendula*	S20	2007	Bryophytes of Ireland	Near threatened	Upland rocks, scree, cliffs, trees in open woodland	Not observed.
String Grimmia *Grimmia funalis*	S20, S31	2007	Bryophytes of Ireland	Near threatened	Variety of rocks, typically base rich	Not observed.

Species	Grid Square	Year of Last Record	Survey/Dataset	Conservation Status	Habitat	Result of Field surveys for the Proposed Development
Twisted Grimmia *Grimmia torquata*	S20, S30	2007	Bryophytes of Ireland	Near threatened	Damp rocks, cliffs and scree, base rich	Not observed.
Upright Brown Grimmia *Schistidium strictum*	S20, S31	2008	Bryophytes of Ireland	Near threatened	Upland exposed rocks, calcareous sandstone, schist or igneous rocks	Not observed.
Varnished Hook-moss *Hamatocaulis vernicosus*	S20, S21	2009	Bryophytes of Ireland	Flora Protection Order 2015 Schedule B (Mosses) || Threatened Species: Near threatened	Neutral flushes and fens	Not observed.
Dwarf Willow *Salix herbacea*	S21, S31	2004, 2008	The Flora of County Waterford	Near Threatened	Stony ground on scree	Not observed.
White Frostwort *Gymnomitrion obtusum*	S21	2007	Bryophytes of Ireland	Near Threatened	Sheltered acidic rocks, scree	Not observed.
Felted Thyme-moss *Rhizomnium pseudopunctatum*	S21	2007	Bryophytes of Ireland	Near Threatened	Fens and base rich marshes and flushes	Not observed.

Species	Grid Square	Year of Last Record	Survey/Dataset	Conservation Status	Habitat	Result of Field surveys for the Proposed Development
Girgensohn's Bog-moss *Sphagnum girgensohnii*	S21	2007	Bryophytes of Ireland	Near Threatened	Shaded habitats, damp woodland, banks and marshes	Not observed.
Pendulous Wing-moss *Antitrichia curtipendula*	S21	2007	Bryophytes of Ireland	Near Threatened	Upland rocks, scree, cliffs, trees in open woodland	Not observed.
Rigid Bog-moss *Sphagnum teres*	S21	2007	Bryophytes of Ireland	Near Threatened	Base rich flushes	Not observed.
Toothed Streak-moss *Rhabdoweisia crispata*	S21	2007	Bryophytes of Ireland	Near Threatened	Acidic crags and woodland	Not observed.
Wulfsberg's Tamarisk-moss *Heterocladium wulfsbergii*	S21	2007	Bryophytes of Ireland	Near Threatened	Shaded, fast flowing base poor watercourses	Not observed.
Corky-fruited Water-dropwort *Oenanthe pimpinelloides*	S30	2012	The Flora of County Waterford	Vulnerable	Hay meadows and pastures	Not observed.
Recurved Sandwort *Minuartia recurva*	S30	2008	The Flora of County Waterford	Vulnerable	Acid mountain rocks	Not observed.

Species	Grid Square	Year of Last Record	Survey/Dataset	Conservation Status	Habitat	Result of Field surveys for the Proposed Development
Round-leaved Crane's-bill Geranium rotundifolium	S30	2000	The Flora of County Waterford	Endangered	Hedgerows, roadside banks, walls	Not observed.
Alpine Clubmoss Diphasiastrum alpinum	S31	2010	The Flora of County Waterford	EU Habitats Directive: Annex V, Near threatened	Grassland and heathlands with moist peaty soils	Not observed.
Small Adder's-tongue Ophioglossum azoricum	S31	2006	The Flora of County Waterford	Near Threatened	Coastal grasslands, cliffs and dines with acidic and alkaline soils	Not observed.
Shining Flapwort Jungermannia paroica	S31	2007	Bryophytes of Ireland	Near Threatened	Rock ledges along streams and rivers, wet cliffs	Not observed.
White Frostwort Gymnomitrion obtusum	S31	2007	Bryophytes of Ireland	Near Threatened	Wet acidic rocks, flushes, snowbeds, open hillsides	Not observed.
Wood Fingerwort Kurzia sylvatica	S31	2007	Bryophytes of Ireland	Near Threatened	Bogs, wet heaths, flushes and fens	Not observed.
Alpine Silk-moss Plagiothecium platyphyllum	S31	2007	Bryophytes of Ireland	Vulnerable		Not observed.

Species	Grid Square	Year of Last Record	Survey/Dataset	Conservation Status	Habitat	Result of Field surveys for the Proposed Development
Big-spored Rock-moss Andreaea megistospora	S31	2010	Bryophytes of Ireland	Vulnerable	Acid rock, bogs	Not observed.
Green Hoar-moss Hedwigia integrifolia	S31	2007	Bryophytes of Ireland	Flora Protection Order 2015 Schedule B (Mosses), Vulnerable	Exposed boulders, scree and below cliffs	Not observed.
Pendulous Wing-moss Antitrichia curtipendula	S31	2008	Bryophytes of Ireland	Near Threatened	Upland rocks, scree, cliffs, trees in open woodland	Not observed.
Straight-leaved Apple-moss Bartramia ithyphylla	S31	2007	Bryophytes of Ireland	Vulnerable	Base rich rock crevices, hedge banks	Not observed.

9.7.3 Invasive Non-native Flora

Unless specified otherwise, the term "invasive species" in this EIAR refers to Third schedule species to the European Communities (Bird and Natural Habitat) Regulations 2011 (as amended). The Regulations make it an offence to plant, disperse, allow or cause to disperse, spread, or otherwise cause to grow any of the scheduled species. Other non-native species are also considered.

The invasive species listed in Table 9-9 have been recorded within the 10 km grid squares (S20 and S21) overlapping the main wind farm Site. Ten invasive or non-native plant species have been recorded in these 10km grid squares, three of which Indian/Himalayan Balsam, Japanese Knotweed and Rhododendron are listed in Schedule III under Regulations 49 and 50 of the EC (Birds and Natural Habitats) Regulations 2011, which makes it an offence to cause the spread of plant species listed on the Schedule.

Of the non-native species noted, Douglas fir is widely planted as a forestry crop species with a 'Medium Risk'. Sycamore, butterfly-bush, three-cornered garlic, travellers joy and turkey oak are widely spread species of 'Medium Risk'. Cherry laurel is still widely planted and is associated with a 'risk of High Impact' however it is noted this risk refers specifically to semi-natural woodland habitats.

Invasive and non-native species recorded within 1km grid squares which overlap the grid connection route are also detailed within Table 9-9, which also identifies whether these species were observed during field survey.

The locations of the invasive species within or immediately adjacent to the Proposed Development are shown on Figure 9.4, Volume III.

Site

No Schedule III listed invasive species were observed within the Site during walkover surveys.

GCR

Two of Schedule III listed invasive species were recorded along the GCR, Himalayan balsam (one location) and rhododendron (one location). Rhododendron is growing along the R672 roadside. The rhododendron is 2m outside the proposed works area. Multiple stands of Himalayan balsam are growing at the N72 Bridge near Killadangan. These are within close proximity, but outside the proposed works area.

TDR

No Third Schedule listed species were recorded within the TDR PoIs.

Table 9-9: Invasive Species (including non Thid Schedule species) within 10km and 2 km grid squares overlapping Coumnagappul Wind Farm and 1km squares overlapping grid connection route

Species	1km (Grid Cable Route)	2 km	10km	Invasive Impact	Legal Status	Recorded in within the Proposed Development Boundary
Douglas Fir Pseudotsuga menziesii	-	-	S21	Medium	None	Planted in forestry in western section of the proposed windfarm.
Black Currant Ribes nigrum	X2098	-	-	Medium	None	No
Butterfly-bush Buddleja davidii	X2197	-	S20, S21	Medium	None	No
Cherry Laurel Prunus laurocerasus	X2197, 2198, S2209	S20J, S20N	S20, S21	High Risk	None	No
Indian Balsam Impatiens glandulifera	X2295, X2197	-	S20	High Risk	Schedule III	Along GCR and TDR
Japanese Knotweed Fallopia japonica	X2395, X2295, X2196, X2197	-	S20, S21	High Risk	Schedule III	Along TDR
Field Penny-cress Thlaspi arvense	X2395	-	-	Medium	None	No
Rhododendron ponticum	X2197	-	S20, S21	High Risk	Schedule III	Along GCR and TDR
Sycamore Acer pseudoplatanus	X2395, X2098, S2106	S20N	S20, S21	Medium Risk	None	Along GCR and TDR
Three-cornered Garlic Allium triquetrum	S2106	-	S20	Medium Risk	None	No
Traveller's-joy Clematis vitalba	X2395	S21K	S21	Medium Risk	None	No
Turkey Oak Quercus cerris	-	-	S21	Medium Risk	None	No
Wall Cotoneaster Cotoneaster horizontalis	X2196	-	-	Medium	None	No

9.7.4 Description of Existing Habitats

9.7.4.1 Wind farm Site

No flora listed on the FPO or as threatened, vulnerable or endangered on the Irish Red list were recorded during Site walkovers.

The wind farm Site habitat survey encompasses a mixture of habitat types, with Wet heath HH3 habitats, composed of predominantly grasses and sedges, forming a large portion. Dense Bracken HD1 and Dry siliceous heath HH1 are also present on the slopes. Agricultural land, comprising Improved agricultural grassland GA1, Scrub WS1 and Wet grassland GS4, dominates the lowlands. Conifer plantation WD4 dominates the western side of the Site, where the access tracks enter.

An Eroding/ Upland River FW1 flows through the study area. There are few examples of hedgerows WL1, Treelines WL2 and Drainage ditches FW4 onsite, with the slopes being open and field boundaries largely restricted to the lowland fields.

Other habitats present, either in pure form or various mosaic combinations include (Mixed) broadleaved woodland, Conifer plantation WD4, and Buildings and artificial surfaces BL3.

The habitats present within the Site boundary are mapped in Figure 9.5, Volume IV.

Improved Agricultural Grassland GA1

Intensively managed pastureland is present in the centre of the Site. Observations of the Site indicate the Intensively managed grassland onsite is primarily used as grazing.

The uniform sward is dominated by perennial ryegrass *Lolium perenne*, indicating re-seeding has been carried out. Other grasses such as annual meadow grass, Yorkshire fog and cocksfoot *Dactylis glomerata* are present occasionally.

A range of common forbs are present, including creeping buttercup *Ranunculus repens*, common mouse ear *Cerastium fontanum*, chickweed *Stellaria media*, dandelion *Taraxacum officinale* Agg., ribwort plantain *Plantago lanceolata* and white clover *Trifolium repens*. The latter is planted with grasses as a nitrogen-fixer but is also beneficial to bees. A number of ruderal species including fat hen *Chenopodium album* and knotgrass *Polygonum aviculare* were present in more open swards and disturbed ground.

While the self-seeded forbs listed above increase the diversity of this habitat somewhat and the presence of clover is beneficial to pollinators, it is predominantly an intensive monoculture crop managed for silage and grazing and as such is of limited biodiversity value. As such they are ***locally important lower value***.

Image 9-2: Improved Agricultural Grassland GA1

Wet Grassland GS4

There are two distinct wet grassland habitats present within the Site.

The first, is the wetland grassland associated with the forest rides and tracks along the conifer plantation to the west of the Site. This habitat is dominated with by soft rush with a high moss cover of common haircap moss and common Tamarisk-moss *Thuidium tamarscinum*. Jointed rush *Juncus articulatus* is also present, along with false oat grass and Yorkshire fog. There are several forb species such as meadowsweet, devils bit scabious Succisa pratensis, cats-ear *Hypochaeris radicata* and angelica. Bilberry and hard fern *Blechnum spicant* are rare within this habitat.

The wet meadow-type strips associated with the conifer forestry do not correspond with the Annex 1 habitat '*Molinia meadows [6410]*.' However, their semi-natural character, lack of management, low level of disturbance and grazing means they are good-quality semi-natural grasslands. As such they are ***locally important higher value.***

The other wet grassland type is found in the central part of the Site, consisting of grazing fields, which are less heavily managed than the surrounding improved agricultural grassland. This habitat is dominated by soft rush, with a much lower cover of annual meadow grass, Yorkshire fog and red fescue. Heath plait-feather moss is present on the ground layer. Forb species present in include white clover *Trifolium repens* and broad-leaved dock *Rumex obtusifolius*. Bramble and bracken were also recorded in these fields.

The wet grassland fields do not correspond with the Annex 1 habitat '*Molinia meadows [6410]*.' They are species poor but are less intensively managed than the surrounding improved agricultural grassland. As such they are ***locally important lower value***.

Turbine locations T02 and T05 are within this habitat, and the proposed internal access track network traverse this habitat.

Image 9-3: Wet Grassland GS4

Dry siliceous heath HH1

Dry siliceous heath is present in the east of the Site on the well-drained valley slopes. Observations of the Site indicate the majority of this habitat is in poor condition with signs of grazing and regular burning. In some locations the heather is completely burnt with large areas of bare ground. None of the two relevé surveys on dry siliceous heath met the criteria for the linked Annex I Habitat - European dry heaths (4030) due to the high coverage of bracken *Pteridium aquilinum*.

While the species composition within this habitat varies greatly across the Site, it is generally dominated by Ling heather *Calluna vulgaris*. Bracken is often abundant, where it dominates the habitat is considered under Dense bracken HD1. Grasses within this habitat include purple moor grass, common cotton grass, Yorkshire fog, common bent grass and red fescue grass *Festuca rubra*. Carnation sedge *Carex panicea* and toad rush *Juncus bufonius* are also present. Mosses cover the ground in some locations, namely heath plait-feather moss. Other dwarf shrubs, excluding heather species, are sparse like bilberry *Vaccinium myrtillus* and gorse *Ulex europaeus*.

While the ling heather is beneficial to pollinators and ground nesting birds, the majority of the dry siliceous heath on Site is in poor condition due to burning and grazing and as such is of limited biodiversity value. As such they are ***locally important lower value***.

Turbine location T06, T07, T08 and T10 are within this habitat, and the proposed internal access track network traverse this habitat.

Image 9-4: Dry siliceous heath HH1

Wet heath HH3

Wet heath is present in the central and western areas of the Site on the valley slopes and peaks. Observations of the Site indicate the majority of this habitat is in poor condition with signs of grazing and regular burning. The steeper areas and top of the hills are in better condition than the valley slopes. Of the relevé surveys carried out in September 2021 (refer to Appendix 9.4, Volume III), only one of the eight relevé surveys on wet heath met the criteria for the linked Annex I Habitat - North Atlantic wet heaths with *Erica tetralix* (4010) (relevé # 1 – see Appendix 9.4 - Relevé Survey Report, Volume III). This relevé was located on the slope to the west of the Site between conifer forestry and the hilltop near T4. The road alignment for the Proposed Development aims to avoid this habitat type by travelling in a northern direction in to drier habitat as opposed to travelling up-slope directly to T4. Since the relevé surveys, the heath on Site was subject to intense burning (see Image 9-5) and therefore the heath habitats onsite are in poor ecological condition and none of the habitat within the Site is considered to be Annex I Habitats.

The other relevés do not meet the Annex I criteria due to absence of crossed leaved heath *Erica tetralix*, evidence of burning, bare ground accounting for >10% of the relevé, and negative indicator species namely common bent grass (*Agrostis capillaris*) accounting for >10% of the relevé.

While the species composition within this habitat varies greatly across the Site, it is generally dominated by Ling heather *Calluna vulgaris*. Cross leaved heath is far less abundant. Common grasses at some locations include purple moor grass *Molinia caerulea* and cotton grass *Eriophorum angustifolium* at some locations, with less cover of Yorkshire fog *Holcus lanatus* and common bent grass. Carnation sedge *Carex panicea* and toad rush *Juncus bufonius* are also present. Mosses and lichens cover a large portion of the ground in some locations, namely heath plait-feather moss *Hypnum cupressiforme*, with Papillose peatmoss *Sphagnum papillosum* and reindeer lichen *Cladonia portentosa* to a lesser extent. Common tormentil *Potentilla erecta* is a regular forb species. Other dwarf shrubs, excluding heather species, are sparse like bilberry *Vaccinium myrtillus* and gorse *Ulex europaeus*.

While the ling heather is beneficial to pollinators and ground nesting birds, the majority of the wet heath on Site is in poor condition due to burning and grazing. The wet heath is of limited biodiversity value, however, the semi-natural character of this habitat where it is in good condition is ***higher value locally important***. It is noted that the Site experienced intense burning in 2022 and 2023, after habitat surveys were completed. The burnt heath is of negligible biodiversity value, and therefore considered to be ***lower value locally important***. In the absence of continued burning, the heath will rejuvenate to a higher biodiversity value.

Turbine locations T01, T04, and T12 are within wet heath habitat, and the proposed internal access track network traverse this habitat.

Image 9-5: Wet heath HH3

Image 9-6: Heavily burnt Wet heath HH3

Dense bracken HD1

This habitat is dominated by bracken which forms dense stands. Other species are occasional or rare under the or between the stands of bracken. Grasses within this habitat include purple moor grass, Yorkshire fog, red fescue and annual meadow grass Poa annua. Soft rush is also present. Heath plait-feather moss can be found on the ground level. Common tormentil is an occasional forb species. Dwarf shrubs found in amongst the brakcen include ling heather, cross leaved heath and bilberry.

This habitat type is ***locally important, higher value*** due to its provision of cover to ground nesting birds.

Turbine location T11 is within this habitat, and the proposed internal access track network traverse this habitat.

Image 9-7: Dense bracken HD1

Dense bracken/Scrub Mosaic HD1/WS1

Both sides of the Colligan River that runs through the central part of the study area contains a mosaic of these habitat types, with high levels of bracken, gorse and ling heather. Other shrubby species present include goat willow Salix caprea, bramble, hawthorn, holly, rowan and bilberry. Yorkshire fog, spear thistle *Cirsium vulgare*, nettle and cleavers *Galium aparine* are also found in this mosaic of habitats.

The semi-natural character of this habitat makes it ***locally important, higher value***.

Internal access track networks traverse this habitat mosaic.

Image 9-8: Dense bracken/ scrub mosaic HD1/WS1

Hedgerows WL1

There are very little hedgerows within the wind farm study area, with the improved grassland fields delineated by electric fencing and most of the heathland grazed by free roaming sheep. Some hedgerows are present along the existing roads and field margins made of former earth banks that have been succeeded by shrubs.

These hedgerows are dominated by bramble and gorse. Bilberry, willow and male fern are frequent. Also present along the hedgerows are Yorkshire fog, cocksfoot , hard fern, harts tongue, ling, creeping buttercup, foxglove, spear thistle and nettle.

The semi-natural character, structural diversity and usefulness to wildlife of this habitat makes it ***locally important, higher value***.

This habitat is outside the proposed development.

Image 9-9: Hedgerows WL1

Treelines WL2

There is one treeline within the study area, consisting of a row of mature sitka spruce trees near the road in the centre of the Site.

This habitat offers limited commuting opportunity for birds and bats, and therefore is ***locally important, higher value***.

This habitat is outside the Proposed Development footprint.

Mixed Broadleaved Woodland WD1

The broadleaved woodland onsite is predominantly composed of plantation woodlands dominated by alder *Alnus glutinosa* with lower numbers of willow *Salix spp*., silver birch *Betula pendula*, beech *Fagus sylvatica* and rowan *Sorbus aucuparia*.

Ash plantations made up of trees ranging from 8 – 12m in height are present in the western parts of the study area where they form buffers around the conifer plantations. The ground flora in these plantations ranges from a drier assemblage consisting of nettle *Urtica dioica*, bramble *Rubus fruticosus* and false oatgrass *Arrhenatherum elatius* to wet grassland type vegetation found in wetter areas of angelica *Angelica sylvestris* and meadowsweet *Filipendula ulmaria*.

This woodland is outside the proposed development footprint.

The plantations in the western and southern parts of the study area consist of fenced off stands of trees. The ground flora here is less diverse and is dominated by bracken and bramble.

This woodland is outside the proposed development footprint.

This habitat is ***locally important, higher value***.

The woodlands/plantations on Site do not correspond to any Annex 1 habitat types.

Image 9-10: Mixed Broadleaved Woodland WD1

Conifer Plantation WD4

A mature Sitka spruce *Picea sitchensis* plantation is present at the -western side of the study area. There are also smaller stands in the centre of the Site. These mature trees form monocultures and there is little to no understory in the deeply shaded areas beneath these trees. Sections of the conifer plantation to the west of the Site have recently been felled but are included in this category as they have been replanted. Aside from the replanted sitka spruce trees, the area is dominated by grasses such as common bent and Yorkshire fog, with high levels of soft rush. Ling, foxglove, spear thistle, bramble and gorse are also present. As the replanted trees grow, these will likely form mature monoculture stands as seen elsewhere in the study area.

This habitat type is ***locally important, lower value*** due to its artificial and monoculture structure.

The proposed internal access track network traverse this habitat and a small stand is just outside of the bat felling buffer for T11.

Image 9-11: Conifer Plantation WD4

Exposed siliceous rock ER1

Bare rock with areas of dispersed vegetation is located on the peak of the mountain west of the Site at T4. Due to the steepness and instability of the terrain, access was not possible at the time of the survey. This habitat was observed from a distance with visible areas of bracken, link and grasses. T4 is within a small area of this habitat type. This is an Annex 1 habitat – siliceous rocky slopes with chasmophytic vegetation (8220) – which is a qualifying interest of the SAC Comeragh Mountains SAC. However T4 is outside the SAC boundary and is species poor, dominated by burnt heather and therefore is considered to be of ***locally important, lower value***.

Image 9-12: Exposed siliceous rock ER1

Stone walls BL1

These low features help delineate improved grassland fields, but due to their reduced height, electric fencing is often used along the stonewalls.

The stonewalls are low and dominated by grasses of the agricultural fields. The low floristic diversity and limited habitat potential of these walls makes it ***locally important, lower value***.

This habitat is overlapped by hardstanding's and internal access tracks.

Drainage Ditches FW4

Drainage ditches are ubiquitous throughout the study area. They vary in character and scale, ranging from small swales carrying trickles of water through old established channels carrying stream-like flows to large arterial ditches holding high volumes of stagnant water.

The drainage ditches associated with the conifer plantation are largely grassy in nature, with cocks-foot, meadow fescue *Festuca pratensis*, soft rush and jointed rush. Common haircap moss, polypody, remote sedge *Carex remota*, meadowsweet, common tormentil and spear thistle can be found on the banks. Water mint *Mentha aquatica* and water horsetail *Equisetum fluviatile* are associated with the wetter areas.

The drainage ditches through the heath areas are exposed features with little wetland vegetation. These were dry at the time of the walkover and are likely only wet in winter or during times of heavy rain. Plant species are indicative of the surrounding heath habitat with elevated cover of soft rush and common haircap moss.

The larger drainage ditches in the study area habitat are ***locally important, higher value*** due to their potential to host breeding amphibians.

A number of drainage ditches are intersected by the proposed internal access track network.

Image 9-13: Drainage Ditches FW4

Eroding/Upland Rivers FW1

The Colligan River is a large stream with the upper reaches flowing from north-south through the centre of the study area. The bed contains boulder cobble and gravel. It has a wet width of 3-7m. Flows are dominated by riffles, with occasional steps and pools. Bankside vegetation varies from scrub to dense bracken. The stream is relatively open to sunlight. Biological water quality at four sampling Sites on the Colligan River were assigned Q4 (Good status).

The western side of the study area drains to the Skeheens Stream. The bed contains cobble, gravel, silt and boulder. It has a wet width of 2.5m. Flows are characterised by riffles and glides. The habitat of the upper parts of this stony stream is affect by shade and siltation where it passes through or adjacent to commercial forestry plantation. The bed of Skeheens Stream consists mainly of large cobble and boulders, with some gravel, indicating high velocities at times of higher flow. Biological water quality at sampling Sites along the upper stretches of Skeheens River were assigned Q3 (Unsatisfactory moderate status). The river's biological water quality improves as the river flows downstream, to Q4 before it joins the Colligan River.

Two fish species, brown trout were recorded via electro-fishing at the sampling Sites along the upper stretches of Colligan River and Skeheens Stream. European eel, three-spined stickleback, flounder and *Lampetra sp*. (ammocoetes) were recorded in the downstream in the Colligan River. Both rivers have no suitability for freshwater pearl mussel or white-clawed crayfish given the unsuitable substratum/ geology and lack of historical records of their presence.

This habitat type is intersected by the proposed internal access track footprint, however the crossing methodology selected (clear span bridge) selected will avoid habitat loss. The watercourses within the study area could be subject to indirect effects arising from pollution associated with wind farm construction.

The Colligan stream is ***locally important, higher value*** where it flows through the habitat survey study area.

Image 9-14: Eroding/Upland Rivers FW1

Buildings and Artificial Surfaces BL3

This habitat is represented by roads and stone walls. These structures have ***locally important, lower value.***

Turbine location T05 is within this habitat, and the proposed internal access track network traverse this habitat.

9.7.4.2 Grid Connection

The grid connection originates within the proposed wind farm Site and traverses plantation forestry before exiting the Site to join an unnamed local road. A walkover survey of the grid connection which included a habitat survey was carried out on the 28th July 2020, and revisited on 08th September 2021 and 07th June 2022. No flora listed on the FPO or as threatened on the Irish Red list were recorded during this survey.

Upon exiting the main wind farm Site, the grid connection traverses un-named local roads, the R672, the L1041, and the N72 until it reaches Dungarvan 110 kV substation. The dominant habitat along this section is Buildings and artificial surfaces BL3 represented by road surfaces, however the road verges which contain dry meadows and grassy verges GS2 would also be traversed by the grid connection.

The roads are bounded by Hedgerows WL1 and Treelines WL2. Other habitats abutting the grid connection include Improved agricultural grassland GA1, Amenity Grassland GA2, Wet grassland GS4, Conifer plantation WD4, Scrub WS1, Arable lands BC1, Tilled lands BC3, Earth banks BL2 and Buildings and artificial surfaces BL3.

This section of the GCR intersects Upland rivers FW1 at two points (Ballynaguilkee_Lower and an unnamed tributary of Skeheens Stream) and Lowland rivers FW2 at one point (Colligan River). The associated bridges/ culverts are categorised as Buildings and artificial surfaces BL3.

Buildings and artificial surfaces BL3

After leaving the main wind farm Site, the grid connection follows existing local roads. These are paved and have no biodiversity value. Adjacent to the existing roads lie residential properties, agricultural buildings, surrounding grounds, and other structures which also represent this habitat type. Older buildings may present some nesting habitat for birds and roosting habitat for bats. Older residential buildings have the potential to support bat roosts whilst agricultural buildings have the potential to support roosting birds such as Swallow *Hirundo rustica* and may be Locally Important (Higher Value). These are outside the proposed grid connection footprint, however. The existing roads are of value to wildlife.

Dry Meadows & Grassy Verges GS2

This habitat is present along road verges bordering the local roads traversed by the grid connection. Species present include Yorkshire fog *Holcus lanatus*, annual meadow grass *Poa annua*, cocksfoot *Dactylis glomerata*, nettle *Urtica dioica*, dock *Rumex Sp*., bush vetch *Vivia sepium*, cow parsley *Anthriscus sylvestris*, creeping buttercup *Ranunculus repens*, spear thistle *Cirsium vulgare*, hogweed *Heracleum sphondylium* and cleavers *Galium aparine*.

Due to its semi-natural character this habitat is ***higher value locally important***.

This habitat does not have links with the corresponding Annex 1 habitat 'Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis) [6510]*'.

Hedgerows WL1

The hedgerows bordering the section of the grid connection along public roads vary in character and quality, ranging from thick mature hawthorn *Crataegus monogyna* hedges to grassy banks with intermittent shrubs.

In addition to hawthorn, the hedgerows along this section also contained fuchsia *Fuchsia magellanica*, sycamore *Acer pseudoplatanus*, blackthorn *Prunus spinosa*, cherry laurel *Prunus laurocerasus* and ash *Fraxinus excelsior* trees. Hedgerows regularly contain cleavers *Gallium aparine*, scaly male fern *Dryopteris affinis Dryopteris affinnis*, gorse *Ulex europaeus* and bramble *Rubus fruticosus* in the understory, while ivy *Hedera helix* was present in both the understory and in some tree crowns.

This habitat is ***locally important, higher value***.

Treelines WL2

There are few treelines along the grid connection, with most consisting of single rows of Sitka spruce Picea sitchensis. Ash Fraxinus excelsior treelines are present in some areas, with occasional sycamore Acer pseudoplatanus also present.

This habitat is ***locally important, higher value.***

Image 9-15: BL3, GS2, WL1 and WL2 along the proposed Grid Connection

Improved agricultural grassland (GA1)

Improved agricultural grassland GA1 fields adjacent to the grid connection traversing public roads were either grazed by cattle or used for silage. Perennial Rye-grass *Lolium perenne*, Yorkshire Fog Holcus lanatus, and White Clover *Trifolium repens* were the dominant species. This habitat is species poor and common in the area and is assessed as being ***locally important, lower value***.

Amenity grassland (GA2)

Amenity grassland is represented by regularly mowed lawns associated with domestic gardens where the grid connection traverses public roads. This intensively managed artificial habitat is ***locally important, lower value***.

Wet grassland (GS4)

Wet grassland GS4 fields adjacent to the grid connection traversing public roads were either grazed by cattle or sheep. This grassland has similar dominant species to Improved agricultural grassland (GA1) but with a high cover of soft rush *Juncus effusus* and herbs such as spear thistle *Cirsium vulgare* and meadow buttercup *Ranunculus acris*. This habitat is species poor and common in the area and is assessed as being ***locally important, lower value.***

Conifer plantation WD4

Pockets of Sitka spruce Picea sitchensis plantations are adjacent to the grid connection traversing public roads. These stands of mature trees form monocultures and there is little to no understory in the deeply shaded areas beneath these trees.. This habitat is ***locally important, higher value***.

The section within the main wind farm study area originates within and then traverses conifer plantation WD4.

Scrub WS1

Areas of gorse *Ulex europaeus* scrub adjacent to the section of the grid connection traversing public roads is associated with a rivers, drainage ditches and derelict fields. This habitat is ***locally important, higher value***.

Earth banks BL2

This habitat is associated with field margins and domestic gardens abutting the grid connection where it traverses public roads. These banks are dominated by grasses and herb species, where shrubs have succeeded and dominate, these are considered under hedgerows WL1. This habitat is ***locally important, higher value*** due to it's potential to provide food for pollinators.

Watercourse Crossing

Upland rivers FW1

This section of the grid connection intersects Upland rivers FW1 at two points (an unnamed tributary of Skeheens Stream and Ballynaguilkee_Lower). The grid intersects the unnamed tributary of Skeheens Stream at an existing forded river crossing comprising a concrete slab on the river bed.

The grid intersects Ballynaguilkee_Lower via a cast concrete culvert. This is a small watercourse with low-moderate energy, that is 1m wide and 0.05m deep. It is composed of boulder, cobble, fine-course gravels and sand, with moderate to heavy siltation. It is moderately shaded with improved grassland, scrub and grassy verges bordering the stream. Livestock poaching was evident immediately north of the culvert. Upstream afforestation and agriculture are considered existing threats and pressures.

Despite its degraded state of both waterbodies, this habitat is ***locally important, higher value*** due to the connections with larger watercourses downstream, and less degraded stretches up and downstream.

Image 9-16: Existing Forded River Crossing Skeheens Stream

Lowland rivers FW2

The grid route traverses the Colligan River via a cast concrete bridge, Kildangan Bridge. This is a large natural watercourse, 18-20m wide and 0.4-0.8m deep with deeper pools of greater than 2m. It is composed of cobble, boulder, fine-coarse gravel and sand with no siltation and mobile substrata. There is low shading with the surrounding habitats being of improved agricultural grassland and buildings/ artificial surfaces. Agricultural enrichment, upstream afforestation and invasive species are considered existing threats and pressures.

This habitat is ***locally important, higher value***.

Buildings and artificial surfaces BL3

The existing bridge structure carrying the unnamed tributary of Skeheens Stream under the unamned road is a cast concrete structure and is not vegetated. No potential bat roosting features (PRFs) are present. The structure is not of any value to roosting bats or nesting dipper *Cinclus cinclus*.

A small concrete culvert carries the Ballynaguilkee_Lower under the L1401. The structure is not of any value to roosting bats or nesting dipper *Cinclus cinclus*.

The existing bridge structure carrying the Colligan River over the N72 is a cast concrete structure and is not vegetated. No potential bat roosting features (PRFs) are present. The structure is not of any value to roosting bats or nesting dipper *Cinclus cinclus*. The waterbodies provide suitable foraging habitat for Daubenton's bat.

Image 9-17: Ballynaguilkee_Lower Crossing Point

Image 9-18: Colligan River Crossing Point

9.7.4.3 Turbine Delivery Route (TDR)

A walkover of the TDR was undertaken at the TDR PoIs (points of interest along the route where accommodation works and/or special trailer manoeuvres may be required) on 09th September 2021 and revisited 08th June 2022. No flora listed on the FPO or listed as threatened on the Irish Red list were recorded during Site walkovers.

PoI 1 –N29 Bellview Port Exit Waterford

This area includes Buildings and artificial surfaces BL3 (roads, buildings and storage units). Only existing road infrastructure is present within the oversail footprint and therefore there will be no habitat loss to facilitate oversail.

PoI 2 –N29 Slieverue Roundabout

This area includes Buildings and artificial surfaces BL3 (roads), Amenity grassland GA2, Improved agricultural grassland GA1, Ornamental/non-native shrub WS3, Hedgerows WL1 and Scrub WS1. The invasive non-native species Winter heliotrope *PeraSites fragrans* is present along the bank on the southern side of the roundabout, c. 10m outside the load bearing footprint. This species is a low impact invasive species.

The proposed works area overlaps amenity comprised of dominantly annual meadow grass Poa annua with a species poor herb layer of dandelion *Taraxacum offcinale* daisy *Bellis perennis* and ribworth plantain *Plantago lanceolata.* This habitat is present in the regularly mown grass at the centre of the roundabout.

The amenity grassland habitat is ***locally important, lower value***.

PoI 3 – N25 Luffany Roundabout

This PoI comprises Amenity grassland GA2, Improved agricultural grassland GA1, Wet grassland GS4, Hedgerows WL1 and Scrub WS1.

The proposed works area overlaps amenity comprised of dominantly annual meadow grass Poa annua with a species poor herb layer of dandelion, daisy, broad-leaved dock *Rumex obtusifolius* and ribworth plantain. This habitat is present in the regularly mown grass at the centre of the roundabout and along the roadside verges.

The amenity grassland habitat is ***locally important, lower value***.

PoI 4 –N25 Toll Booth

This area includes Buildings and artificial surfaces BL3 (roads, buildings and storage units). Only existing road infrastructure is present within the oversail footprint and therefore there will be no habitat loss to facilitate oversail.

PoI 5 – N25 Carrick Road Roundabout

This PoI comprises similar habitats to that of PoI 3, with Amenity grassland GA2, Improved agricultural grassland GA1, Wet grassland GS4, Hedgerows WL1, Treelines WL2 and Scrub WS1.

The proposed works area overlaps amenity comprised of dominantly annual meadow grass Poa annua with a species poor herb layer of dandelion, daisy, broad-leaved dock *Rumex* obtusifolius and ribworth plantain. This habitat is present in the regularly mown grass at the centre of the roundabout and along the roadside verges.

The amenity grassland habitat is ***locally important, lower value***.

PoI 6 – N26/ N72 Junction

This area includes Buildings and artificial surfaces BL3 (roads), Amenity grassland GA2, Improved agricultural grassland GA1, Grassy verges GS2, Ornamental/non-native shrub WS3, Hedgerows WL1, Treelines WL2, Mixed broadleaved woodland (WD1) and Scrub WS1. The invasive non-native species Japanese knotweed Fallopia japonica is present along the N25 roadside hedgerow, c. 60m east to the PoI. This is a high impact Third Schedule invasive species.

The proposed works area overlaps amenity grassland comprised of dominantly annual meadow grass Poa annua with dandelion and daisy. This habitat is present along the rod verge.

The amenity grassland habitat is ***locally important, lower value***.

PoI 7 – N72/ R672 Junction

This area includes Buildings and artificial surfaces BL3 (roads), Ornamental/non-native shrub WS3, Hedgerows WL1 and Treelines WL2. The invasive non-native species Butterfly bush *Buddleja davidii* is present along the N72 roadside hedgerow, c. 5m north and running adjacent to the PoI and Sycamore *Acer pseudoplatanus* along the N72/R672 roadside treeline, c 10km southeast of the PoI. These are medium impact Schedule invasive species.

Only existing road infrastructure is present within the oversail footprint and therefore there will be no habitat loss to facilitate oversail.

PoI 8 – N72/ R672 Junction Master McGraith Monument

This area includes Buildings and artificial surfaces BL3 (roads), Improved grassland GA1, Grassy verges GS2, Hedgerows WL1 and Treelines WL2. The invasive non-native species Sycamore is present along the R672 roadside treeline, c 80km northwest of the PoI. This is a medium impact Schedule invasive species.

Only existing road infrastructure is present within the oversail footprint and therefore there will be no habitat loss to facilitate oversail.

PoI 9 – R672 East of Ballylemon Lower

This area includes Buildings and artificial surfaces BL3 (roads and buildings), Improved agricultural grassland GA1, Grassy verges GS2, Hedgerows WL1 and Treelines WL2.

The proposed works area overlaps grassy verges comprised of grasses such as annual meadow grass and cocksfoot *Dactylis glomerata* with a diverse herb layer of white clover *Trifolium repens*, vetchling *Lathyrus pratensis*, selfheal *Prunella vulgaris*, birds foot trefoil *Lotus corniculatus*, cut leaved cranes bull *Geranium dissectum,* creeping thistle Cirsium arvense and ribworth plantain. This habitat is present in the grassy roadside verges. A hedgerow of *Fuchsia magellanica* is also present within the overall footprint.

These habitats are ***locally important, higher value***.

PoI 10 – R672 South of Colliganwood

This area includes Buildings and artificial surfaces BL3 (road and dwelling), Improved grassland GA1, Amenity grassland GA2, and Hedgerows WL1.

The proposed works area overlaps the hedgerow which will require trimming. The hedgerow is composed of non-native and Fuchsia *Fuchsia magellanica*.

The hedgerow is ***locally important, higher value***.

PoI 11 – R672 South of Colligan

This area includes Buildings and artificial surfaces BL3 (road), Conifer Plantation WD4 and Grassy verges GS2.

The proposed works area overlaps the Sitka spruce Picea sitchensis forestry where the vegetation will require trimming. Native Oak *Quercus petraea* and Ash *Fraxinus Excelsior* are growing along the edge.

PoI 12 – R672 Colligan

This area includes Buildings and artificial surfaces BL3 (road and dwelling), Improved grassland GA1, Amenity grassland GA2, and Hedgerows WL1.

The proposed works area overlaps the hedgerow which will require trimming. The hedgerow is composed of non-native and Fuchsia *Fuchsia magellanica* as well as sapling ash *Fraxinus excelsior* and non-native invasive Sycamore.

The hedgerow is ***locally important, higher value***.

PoI 13 – R672 West of Colligan

This area includes Buildings and artificial surfaces BL3 (roads), Improved agricultural grassland GA1, Hedgerows WL1, Treelines WL2 and Drainage ditches FW4. The invasive non-native species Cherry laurel *Prunus laurocerasus* is present in the treeline adjacent to the works area. This is a high impact invasive species.

Only existing road infrastructure is present within the proposed works area and therefore there will be no habitat loss to facilitate oversail.

PoI 14 – R672 North of Garrycline

This area includes Buildings and artificial surfaces BL3 (roads), (Mixed) broadleaved woodland WD1, Improved agricultural grassland GA1, Hedgerows WL1, Treelines WL2 and Upland river FW1.

The proposed works area overlaps the treelines which will require trimming. The treeline is composed of Ash *Fraxinus excelsior*.

The treeline are ***locally important, higher value***.

PoI 15 – R672 West of Colligan

This area includes Buildings and artificial surfaces BL3 (road) Hedgerows WL1, and Dry meadows and grassy verges GS2.

The Hedgerow to be cleared consists of bramble *Rubus fructicosus*, cocksfoot *Dactylis glomerata*, nettle *Urtica dioica*, perennial rye grass *Lolium perenne*, ash saplings and spear thistle *Cirsium vulgare*. The hedgerows are ***locally important, higher value***.

PoI 16 – R672 Hickeys Cross Road

This area includes Buildings and artificial surfaces BL3 (road, houses and farm buildings), Improved grassland GA1, Amenity Grassland GA2, Stone walls and other stonework BL1, Hedgerows WL1 and Treeline WL2. The stone wall associated with a dwelling has been pointed and is in good repair with no gaps in the mortar. Dilapidated farm buildings are located across from the works area. The Third Schedule high impact non-native species Rhododendron *Rhododendron ponticum* is present along the unnamed roadside garden, c. adjacent to but outside the works area.

The proposed works area overlaps improved grassland, which is dominated by perennial rye grass *Loillium perenne* and is species poor, as well as a Treeline and Hedgerow. The Treeline is composed of the non-native invasive species Sitka Spruce *Picea sitchensis* and the Hedgerow is composed of the non-native species Fuchsia *Fuchsia magellanica* and invasive species Snowberry *Symphoricarpos albus*.

These habitats are ***locally important, lower value*** with the hedgerow being of ***higher value***.

PoI 17 – Bryan's Cross Roads

This area includes Buildings and artificial surfaces BL3 (road), Improved agricultural grassland GA1, Wet grassland GS4, Dry meadows and grassy verges GS2, Earthbanks BL2 and Upland river FW1.

The proposed works area overlaps all the above habitats. The improved grassland is dominated by perennial rye grass *Loillium perenne* and is species poor. The wet grassland has high soft rush cover *Juncus effusus*, with the grassland turning into Gorse *Ulex europaeus* scrub outside the works area. The grassy verges and earthbanks associated with the road verges are dominated by grass species such as Yorkshire fog Holcus lanatus, cocksfoot *Dactylis glomerata*, sweet vernal grass *Anthoxanthum odoratum* and perennial rye grass *Loillium perenne*. Nettle *Urtica dioica*, Male fern *Dryopteris filix-mas*, Herb Robert *Geranium robertianum*, Foxglove *Digitalis purpurea*, bramble *Rubus fructicosus* are also frequent. The upland river is unnamed tributary of Skeheens Stream, and will be crossed by the cable route by HDD at this location also.

The grassy verges, earthbanks and upland river are ***locally important, higher value***.

PoI 18 – Sweep Crossroads

This area includes Buildings and artificial surfaces BL3 (road and dwelling), Improved grassland GA1, Amenity grassland GA2, Scrub WS1, Hedgerows WL1 and Stone walls and other stonework BL1.

The oversail footprint overlaps improved agricultural grassland, scrub, stonewall, and hedgerow, The improved grassland is dominated by perennial rye grass *Loillium perenne* and is species poor. The scrub is composed of gorse *Ulex europaeus*, soft rush *Juncus effusus*, bramble *Rubus fructicosus* and ling *Calluna vulgaris*. The stonewall is between the road and the garden of the dwelling. The hedgerow is composed of non-natives Grisilinea *Griselinia littoralis* and Fuchsia *Fuchsia magellanica*.

The scrub is ***locally important, higher value***.

PoI 19 – West of Blaentasour

This area includes Buildings and artificial surfaces BL3 (road), Improved grassland GA1, Hedgerows WL1, Drainage ditches FW4 and Stone walls and other stonework BL1.

The proposed works area overlaps hedgerow, stone wall and drainage ditches. The hedgerow is composed of native hawthorn *Crataegus Monogyna* and non-native fuchsia with one Sitka Spruce *Picea sitchensis* tree within the works area. The drainage ditch runs between the road and the stone wall, and is well vegetated with Yorkshire fog *Holcus lanatus*, soft rush *Juncus effusus*, Hard fern *Dryopteris filix-mas* and bramble *Rubus fructicosus.*

The hedgerows and drainage ditches are ***locally important, higher value***.

PoIs 20 – South of Knockeen

This area includes Buildings and artificial surfaces BL3 (road), Improved agricultural grassland GA1, Conifer plantation WD4, Recently-felled woodland WS5, Hedgerows WL1 and Treelines WL2.

The proposed works area overlaps hedgerows. The hedgerows are composed of Bilberry, Yorkshire fog, bramble, gorse, male fern and hawthorn.

The Hedgerows are ***locally important, higher value***.

PoIs 26-28 – South of Bryans' Cross

This area includes Buildings and artificial surfaces BL3 (road), Improved grassland GA1, Hedgerows WL1, Drainage ditches FW4 and Stone walls and other stonework BL1.

The proposed TDR accommodation works require diversion into third party lands (GA1) and some minor temporary hedge removal.

The Hedgerow is ***locally important, higher value***.

9.7.5 Terrestrial Mammals

9.7.5.1 Desktop Study Rare and Protected Mammals

The mammal species listed in Table 9-8, below have been recorded within the 10 km grid squares (S20 and S21) in which the main wind farm Site is located. Both NBDC records (dated 04th April 2023) and NPWS records obtained by request (28th March 2023) were consulted as part of the desktop study.

Eight protected mammal species have been recorded within the 10km grid square for the main wind farm Site, namely Badger *Meles meles*, Pygmy Shrew *Sorex minutus*, Red Squirrel *Sciurus vulgaris*, Otter *Lutra*, Irish Hare *Lepus timidus subsp*. *hibernicus*, Irish Stoat *Mustela erminea subsp. hibernica*, Pine Marten *Martes martes* and Hedgehog *Erinaceus europaeus*. While Fallow Deer *Dama dama* and Sika Deer *Cervus nippon* have been recorded within the 10km grid squares for the main wind farm Site, and are protected under the Wildlife Acts, they are also listed as invasive species and are therefore considered further in this assessment. Red Fox *Vupes vulpes* were also recorded in grid squares R41 and R51.

Within these, Badger and Otter have been recorded within a 1km grid square overlapping the main wind farm Site. The closest Otter record is along the Colligan River c. 185 downstream and south of the main wind farm.

Seven protected mammal species have been within the 1km grid squares overlapping the grid connection, namely Badger (X2295, X2196 S2106 S2107 S2108), Pygmy Shrew (X2197), Red Squirrel (X2196, X2197), Otter (X2395, X2295, X2196, X2197, X2198, S2208), Irish Hare (S2209), Pine Marten (X2196) and Hedgehog (S2000)

9.7.5.2 Desktop Study Invasive Mammal Species

Table 9-11 lists the invasive mammal species recorded within the 10km grid squares (S20 and S21) overlapping the main wind farm Site. Both NBDC records (dated 28th March 2023) and NPWS records obtained by request (04th May 2022) were consulted as part of the desktop study.

There are eleven species of invasive mammal recorded within the 10km grid squares overlapping the main wind farm Site. The eleven invasive mammal species are: American Mink *Mustela vison*, Bank Vole *Myodes glareolus*, Grey Squirrel *Sciurus carolinensis*, European Rabbit *Oryctolagus cuniculus*, Brown Rat *Rattus norvegicus*, Fallow Deer *Dama dama*, Feral Ferret *Mustela furo*, Greater White-toothed Shrew *Crocidura russula*, Sika Deer *Cervus nippon* and Wild Boar *Sus scrofa*.

Seven invasive mammal species have been within the 1km grid squares overlapping the grid connection, namely Bank Vole (X2197, S2000), Grey Squirrel (X2295, X2196) European Rabbit (X2196, S2000 S2001 S2104 S2105) Brown Rat (S2105), Fallow Deer (X2197, S2000), Greater White-toother Shrew (X2197) and Siberian Chipmunk *Tamias sibiricus* (X2197).

Records of these species in the greater area are relatively recent, with many having occurred within the last ten years.

Table 9-10: Historical Mammal Records within 10km of the main wind farm Site

Species	Grid Squares covering Wind Farm Site	Year of Last Record	Survey/Dataset	Protection	NBDC and NPWS records within the study area
Eurasian Badger *Meles meles*	S20, S21	2014	Badger Setts of Ireland Database	Wildlife Acts	Closest record is 1km resolution record from 2005 from grid square S2407 overlapping the main wind farm. Badger were recorded within 1km of the grid connection in grid squares X2295, X2196, S2106, S2107, S2108.
Irish Hare *Lepus timidus subsp. hibernicus*	S20, S21	2013	Atlas of Mammals in Ireland 2010-2015; Mammals of Ireland 2016-2025	Annex V Habitats Directive; Wildlife Acts	Closest record is 1km resolution record from 2008 from grid square S2209 overlapping the main wind farm and grid connection.
Eurasian Pygmy Shrew *Sorex minutus*	S21	2012	Atlas of Mammals in Ireland 2010-2015	Wildlife Acts	There were no records of Pygmy Shrew within 1km of the main wind farm Site. Pygmy Shrew are recorded within 1km of the grid connection in grid squares X2197.
Eurasian Red Squirrel *Sciurus vulgaris*	S20, S21	2018	Mammals of Ireland 2016-2025	Wildlife Acts	There were no records of Red Squirrel within 1km of the main wind farm. Closest record is within the 2km grid squares S20N from 2018 and S21K from 2021 which overlap the Site. Red Squirrel were recorded within 1km of the grid connection in grid squares X2196 and X2197.
European Otter *Lutra lutra*	S20, S21	2016	Otter (*Lutra lutra*) records 2011-2015; Mammals of Ireland 2016-2025	Annex II and IV Habitats Directive, Wildlife Acts	Closest record is 1km resolution record from 2007 from grid square S2409 and 1981 from grid square S2407 overlapping the main wind farm. Closest 100m grid square record from 1981 is along the Colligan River c. 185 downstream and south of the main wind farm within S242072 and overlapping the grid route at S220083.

Species	Grid Squares covering Wind Farm Site	Year of Last Record	Survey/Dataset	Protection	NBDC and NPWS records within the study area
Irish Stoat *Mustela erminea subsp. hibernica*	S20, S21	2018	Atlas of Mammals in Ireland 2010-2015; Mammals of Ireland 2016-2025	Wildlife Acts	There were no records of Irish Stoat within 1km of the main wind farm Site or along the grid connection.
Irish Hare *Lepus timidus subsp. hibernicus*	S20, S21	2013	Atlas of Mammals in Ireland 2010-2015	Wildlife Acts	There is no further information on the location of the overlapping 10km records. There is 10km resolution record within 1km of the GCR.
Pine Marten *Martes martes*	S21	2021	Mammals of Ireland 2016-2025	Annex V Habitats Directive; Wildlife Acts	There were no records of Pine Marten within 1km of the main wind farm Site. Pine Marten were recorded within 1km of the grid connection in grid squares X2196.
Red Fox Vulpes vulpes	S20, S21	2013	Atlas of Mammals in Ireland 2010-2015	None	There is no further information on the location of the overlapping 10km records.
West European Hedgehog *Erinaceus europaeus*	S20, S21	2013	Atlas of Mammals in Ireland 2010-2015	Wildlife Acts	There were no records of Hedgehog within 1km of the main wind farm Site. Hedgehog were recorded within 1km of the grid connection in grid square S2000.

Table 9-11: Historical Records of Invasive Mammal Species within 10km of the Proposed Development

Species	10km Grid Square	Survey	Conservation Status/Impact	Records within the study area
American Mink *Mustela vison*	S21	Badger and Habitats Survey of Ireland	High Impact Schedule III	No records of this species are present within 1km of the main wind farm Site or along the grid connection.
Bank Vole *Myodes glareolus*	S20, S21	Atlas of Mammals in Ireland 2010-2015	Medium Impact	No records of this species are present within 1km of the main wind farm Site. Bank Vole were recorded within 1km of the grid connection in grid squares X2197 and S2000.
Grey Squirrel *Sciurus carolinensis*	S21	Atlas of Mammals in Ireland 2010-2015	High Impact Schedule III	No records of this species are present within 1km the main wind farm Site. Grey Squirrel were recorded within 1km of the grid connection in grid squares X2295 and X2196
Brown Rat *Rattus norvegicus*	S20	Atlas of Mammals in Ireland 2010-2015	High Impact Schedule III	No records of this species are present within 1km of the main wind farm Site. Brown Rat were recorded within 1km of the grid connection in grid square S2105.
European Rabbit *Oryctolagus cuniculus*	S20, S21	Atlas of Mammals in Ireland 2010-2015	Medium Impact	There are no records of the species within the 1km of the main wind farm Site. Closest record is within the 2km grid squares S20P and S21K from 2007 which overlap the Site. Rabbit were recorded within 1km of the grid connection in grid squares X2196, S2000, S2001, S2104 and S2105

Species	10km Grid Square	Survey	Conservation Status/Impact	Records within the study area
Fallow Deer *Dama dama*	S20, S21	Mammals of Ireland 2016-2025	High Impact Schedule III Wildlife Acts	There are no records of the species within 1km of the main wind farm Site. Closest record is within the 2km grid square S20J from 2007 which overlaps the Site. Fallow Deer were recorded within 1km of the grid connection in grid squares X2197 and S2000.
Feral Ferret *Mustela furo*	S21	National Feral Ferret (*Mustela putoris furo*) Database	High Impact	There are no records of the species within 1km of the main wind farm Site or along the grid connection.
Greater White-toothed Shrew *Crocidura russula*	S20, S21	Mammals of Ireland 2016-2025	Medium Impact	There are no records of this species within 1km of the main wind farm Site. Greater White-toothed Shrew were recorded within 1km of the grid connection in grid square X2197.
Siberian Chipmunk *Tamias sibiricus*	S21	National Invasive Species Database	High Impact Schedule III	There are no records of this species within 1km of the main wind farm Site. Siberian Chipmunk were recorded within 1km of the grid connection in grid square X2197.
Sika Deer *Cervus nippon*	S20	Deer of Ireland Database	High Impact Schedule III Wildlife Acts	There are no records of the species within 1km of the main wind farm Site or along the grid connection.
Wild Boar *Sus scrofa*	S20	National Invasive Species Database	High Impact Schedule III Wildlife Acts	There are no records of the species within 1km the main wind farm Site or along the grid connection.

9.7.5.3 Terrestrial Mammals Survey Results

A total of three terrestrial (non-volant) mammals were identified within the study area during surveys. See Table 9-12 for more information.

This data was obtained during the mammal survey walkover and as well as incidental records gathered during other ecological surveys. Two of these species are considered to be of 'Least Concern', namely Red Fox and Wood Mouse. The other species, Fallow Deer, is introduced and not provided a conservation status. Fallow Deer are a high-risk invasive species, and also listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).

Red Fox

A dead Red Fox cub was observed along an unnamed road associated with the GCR.

Wood Mouse

Feeding signs (stripped spruce cones) indicating the presence Wood Mouse were observed within conifer plantation at the western side of the study area on 07th September 2022. This species is likely to inhabit the Site where suitable habitats and conditions exist. In general, good cover and the availability of food is a prerequisite. The scrub, hedgerows, treelines and woodland habitats are suitable for this species.

Otter

An otter spraint was observed in the Finisk River c. 2.3km downstream of the GCR crossing point.

While no evidence of otter was recorded at any of the stretches of watercourse surveyed in the Nier or Colligan catchment, the NBDC website shows records of this species at several locations, including one record from 2007 within the 1km of the Site. Otter likely use the Colligan river that runs through the centre of the Site for foraging and commuting, and have been recorded downstream.

Fallow Deer

Live adult fallow deer were recorded within the main windfarm Site on 27th July 2020 in dry siliceous heath habitat. It is likely the deer use the heathland, agricultural land and woodland onsite.

Table 9-12: Mammal Species recorded in the study area and their conservation status (Marnell et al., 2019)

Name	Conservation Status (As per Red List No.12: Terrestrial Mammals) (Lawton et all 2019)
Red Fox *Vulpes vulpes*	Least Concern
Wood Mouse *Apodemus sylvaticus*	Least Concern
Fallow Deer *Dama dama*	Invasive species

Other mammal species previously recorded in the area of the study area but not observed during surveys may also occur; Badger, Otter, Irish Stoat, Pygmy Shrew, Irish Hare, Hedgehog, Pine Marten and Red Squirrel. While no Badger Setts were recorded within the main windfarm Site, potential foraging habitat is available in the forestry and grasslands for badgers in the surrounding area. The edge of the forestry and scrub habitats, and adjacent field edges are suitable for Irish Stoat; utilising habitat edges to hunt. Hedgehog if present is likely to use the same habitats. Pygmy shrew could occur where sufficient vegetated ground cover is available, and Irish Hare could use the agricultural grasslands and wet heath onsite. The conifer plantation onsite is suitable for Pine Marten and Red Squirrel.

Species are subject to seasonal fluctuations in population as the availability of food changes throughout the year (Couzens et al 2017). Survey findings may therefore vary temporally according to the natural seasonal cycles of ecosystem (food) productivity.

9.7.6 Bats

BCI records indicate three known bat roosts within 10 km of grid reference S245091 (central point within the proposed wind farm Site), namely soprano pipistrelle recorded roosting c.5.4km to the north-west, brown long-eared bat recorded roosting c. 5.7km to the south-east and Daubenton's bat *Myotis daubentonii* recorded roosting c.8.3km to the east of the proposed Site[4]. Six of the ten known Irish species of bat (Bat conservation Ireland) have also been recorded (observed) within 10km. These bats include pipistrelle species *Pipistrellus pipistrellus sensu lato*, soprano pipistrelle *P. pygmaeus*, Leisler's bat *Nyctalus leisleri*, brown long-eared *Plecotus auritus*, Daubenton's bat and Natterer's bat *Myotis nattereri*. These bats were also identified within the existing records form NBDC (10km grid squares S10, S11, S20, S21, S30 and S31). See Table 8-17 for more information:

Table 9-13: Historical Records of Bat Species near the Study Area (NBDC)

Species	Survey	Conservation Status	Closest record to the study area
Soprano pipistrelle *Pipistrellus pygmaeus*	National Bat Database of Ireland	EU Habitats Directive Annex IV Wildlife Acts	No records for this species are located within the main wind farm Site. The closest record is comprised of a single 100m resolution record (2008) (grid square S213135) c. 3.5 km north-west of the main wind farm Site.
Unidentified pipistrelle sp. *Pipistrellus pipistrellus sensu lato*	National Bat Database of Ireland	EU Habitats Directive Annex IV Wildlife Acts	No records for this species are located within the main wind farm Site. The closest record is comprised of a single 100m resolution record (2009) (grid square S230049) c. 2.5 km south of the main wind farm Site.

Review of the NPWS Lesser Horseshoe bat database indicates that there are no records of roosts within a 2.5 km buffer (Core Sustenance Zone (CSZ)) of the proposed wind farm Site boundary (NPWS 2018).

[4] It should be noted that BCI data for roost locations are only given to a four-figure grid refence which is equal to 1 km squared.

The Cave Database for the Republic of Ireland hold record of a cave within a 10km radius of the proposed Site, namely Crotty's Cave, located c.8km to the north-east. Bats are not noted as a feature of this cave.

Ecological surveys undertaken to inform an EIAR for the Carrigroe Pig Farm, located c.5.9km to the west of the proposed development recorded five species of bat, namely Leisler's, Nathusius' pipistrelle, soprano pipistrelle, common pipistrelle and brown long-eared bat[5].

9.7.6.1 Bat Landscapes

The bat landscape association model (Lundy et al, 2011) suggests that the proposed wind farm Site is part of a landscape that is of low to moderate suitability for all bats. The proposed Site and its environs are of moderate suitability for common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle, and Leisler's bat, low to moderate suitability for Daubenton's bat and Natterer's bat., and of low suitability for whiskered bat *Myotis mystacinus*, Nathusius' pipistrelle (P. nathusii) and lesser horseshoe bat *Rhinolophus hipposideros* (being outside of the distribution range for lesser horseshoe bat).

9.7.6.2 Bat Activity/Transect Survey 2020

The results of the three bat activity surveys carried out in 2020 are presented below in Table 9-15 and Image 9-18: Bat Activity Survey Results. Weather conditions for each of the survey dates are presented in Table 9-14.

Overall, at least three bat species were recorded (common pipistrelle, soprano pipistrelle, Leisler's bat). In situations where the call could not be identified to species, the identification was determined to genus level or recorded as NoID.

The most commonly recorded species was common pipistrelle, followed by lower activity levels for Leisler's and soprano pipistrelle.

The highest level of activity recorded for all species was during the transects on 24th May 2020, common pipistrelle were recorded with 12 passes, Leisler's bat was with four passes and soprano pipistrelle with two passes.

Table 9-14: Weather Conditions During Bat Activity Surveys

Date	Sunset	Start	Finish	Temp (°C)	Wind (Beaufort)	Cloud (Oktas)	Precipitation
24/04/2020	20:45	20:45	22:30	12	2	3	None
30/07/2020	21:25	21:20	23:15	15	3	4	None
29/08/2020	20:27	20:10	22:30	11	3	4	None

[5] Curtin Agricultural Consultants Ltd (2020) Environmental Impact Assessment Report for Carrigroe Pig Farm, Carrigroe, Ballynamult, Co. Waterford.

Table 9-15: Bat Activity Survey Results

	24/04/2020	30/07/2020	29/08/2020
Common pipistrelle (CP)	12	0	1
Soprano pipistrelle (SP)	2	0	0
Leisler's (Lei)	4	1	0
NoID	1	0	0
Total	**19**	**1**	**1**

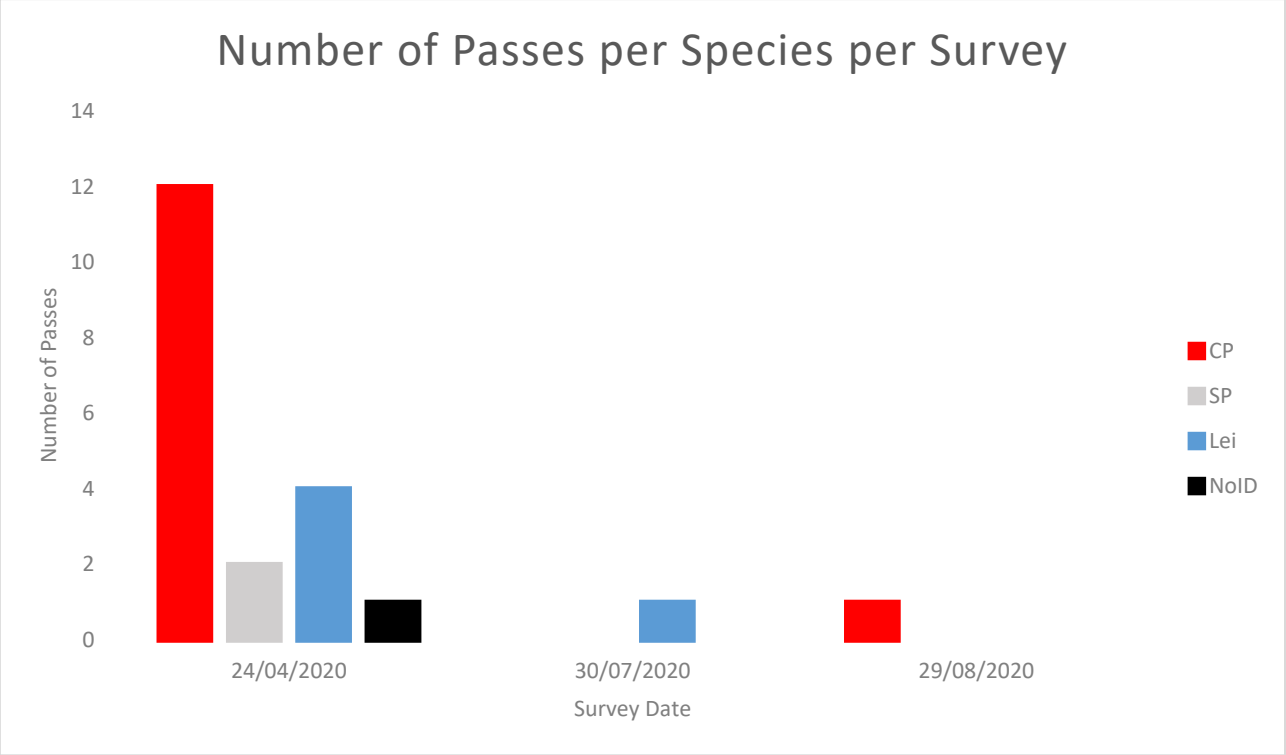


Image 9-19: Bat Activity Survey Results

9.7.6.3 Roost Surveys – Desktop Assessment

The Site predominantly comprises heath habitats in upland areas to the east and west of the Site, with improved grassland in the valley in the centre of the Site. Conifer plantation is also present to the west of the Site and in small parcels in the centre of the Site. A number of small 1st and 2nd order watercourses are present at the Site. The 1st order Coumnagappul and Colligan watercourses flow into the 2nd order Knockavanniamountain watercourse, which flows in a southerly direction through the valley in the centre of the Site. The 1st order Kilkeanymountain watercourse flows though forestry to the west of the Site and a small section of the 1st order Carrigbrack watercourse flows through the south-eastern boundary of the proposed Site.

As noted previously, most of the Site comprises open upland habitat. The valley situated at the centre of the proposed Site is more sheltered and does support small areas of forestry, however, these areas are isolated and poorly connected to the wider landscape. The commuting and foraging habitats over most of the wind farm study area are of low suitability for bats.

The suitability of habitats along the GCR and TDR for commuting and foraging bats varies. In general, better-quality habitat is present along the un-named local roads due to reduced levels of disturbance.

9.7.6.4 Roost Surveys– Inspection of Trees

No trees within the Site or 300m thereof were confirmed as having bat roosts. The cover of broadleaved trees at the Site at Coumnagappul is low; no large mature trees were recorded during the course of the site survey. No trees of moderate or high potential for roosting bats.

A total of 8 trees supporting features such as heavy Ivy growth are within the GCR. These trees may have potential for individual/ small numbers of bats to roost opportunistically. These trees are therefore classified as being of low suitability to support roosting bats. None of these trees will require trimming or removal as part of the grid works.

No trees within the TDR PoIs were identified as having potential roosing features.

9.7.6.5 Roost Surveys - Structures

Bridges

No bridges or culverts were recorded within the proposed Site. One agricultural clear span bridge crosses the Colligan just south of the wind farm Site. This is composed of steel and concrete and no potential roosting features were identified. Two culverts over small watercourses draining the Site are located along the access track to the Site, outside of the Site boundary. These culverts did not support any features of potential use by roosting bats and both culverts are classified as negligible roosting potential.

Three water crossings are present along the GCR, two are existing watercourse crossings. The water crossing over the Colligan River is a clear span bridge. The water crossing over the Blackwater River consists of a concrete culvert that runs under the road. No features of suitability for roosting bats were recorded within any the water crossings and they are classified as of negligible roosting potential.

Buildings

No dwellings or other buildings are present within the proposed Site at Coumnagappul and its environs. The closest structure is c.653m from the closest proposed infrastructure (hardstanding for T10).

No relevant underground features (natural or man-made) were identified during the desk study, and no other underground sites were recorded on-site during walkover surveys.

9.7.6.6 Static Detector Surveys (2020)

The results of the static detector surveys deployed over three rounds are shown below.

Eight species of bats were recorded during the three survey periods with a total of 9,901 recordings over the three survey periods. The most commonly recorded species was common pipistrelle, followed by Leisler's bat. Much lower levels of activity of soprano pipistrelle, brown long-eared bat, Daubenton's bat, Nathusius' pipistrelle, Natterer's bat, and whiskered bat were detected.

Brown long-eared bat is present on-Site, but this species is very quiet and sometimes hunts without echolocating, therefore this species may be under-recorded by the static detectors.

Table 9-16 below summarises the results of static detector surveys completed in 2020. Ten static units were deployed during each survey period. Overall, eight bat species were recorded (common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Leisler's bat, brown long-eared bat, Natterer's bat, Daubenton's bat and Whiskered bat). Where the call could not be identified to species, the identification was determined to genus level. The graphs within Image 9-20 to Image 9-32 below shows the number of bat passes (per species) recorded at each static detector site over the three surveillance periods.

Table 9-16: Summary results of Static Bat Detectors Deployed during Survey Periods 1 to 3 (2020)

Static Detector No. and location habitats	Species detected during Period 1 23rd April to 4th May 2020 (Night 1 – 12)	Species detected during Period 2 24th June to 4th July 2020 (Night 13 – 23)	Species detected during Period 3 15th to 27th August 2020 (Night 24 – 36)
CG1 Wet heath	Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Leisler's bat Nathusius' pipistrelle Common pipistrelle	Daubenton's bat Whiskered bat Leisler's bat Common pipistrelle Soprano pipistrelle Brown long-eared bat
CG2 Wet heath	Whiskered bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Daubenton's bat Whiskered bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Daubenton's bat Whiskered bat Natterer's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat
CG3 Wet heath	Daubenton's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Daubenton's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Brown long-eared bat	Daubenton's bat Whiskered bat Natterer's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat
CG4 Wet heath	Daubenton's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle	Daubenton's bat Whiskered bat Natterer's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat

Static Detector No. and location habitats	Species detected during Period 1 23rd April to 4th May 2020 (Night 1 – 12)	Species detected during Period 2 24th June to 4th July 2020 (Night 13 – 23)	Species detected during Period 3 15th to 27th August 2020 (Night 24 – 36)
CG5 Wet heath adjacent to conifer plantation and stream	Daubenton's bat Whiskered bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Daubenton's bat Whiskered bat Natterer's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Daubenton's bat Whiskered bat Natterer's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat
CG6 Wet heath	Daubenton's bat Whiskered bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle	Daubenton's bat Whiskered bat Natterer's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat
CG7 Dry heath / bracken	Daubenton's bat Whiskered bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Daubenton's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Daubenton's bat Whiskered bat Natterer's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat
CG8 Dry heath / siliceous rock	Daubenton's bat Whiskered bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	N/A	Daubenton's bat Whiskered bat Natterer's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat
CG9 Dense bracken	Daubenton's bat Whiskered bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Whiskered bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Daubenton's bat Whiskered bat Natterer's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle

Static Detector No. and location habitats	Species detected during Period 1 23rd April to 4th May 2020 (Night 1 – 12)	Species detected during Period 2 24th June to 4th July 2020 (Night 13 – 23)	Species detected during Period 3 15th to 27th August 2020 (Night 24 – 36)
			Brown long-eared bat
CG10 Dense Bracken	Whiskered bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Whiskered bat Natterer's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	Daubenton's bat Whiskered bat Natterer's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat

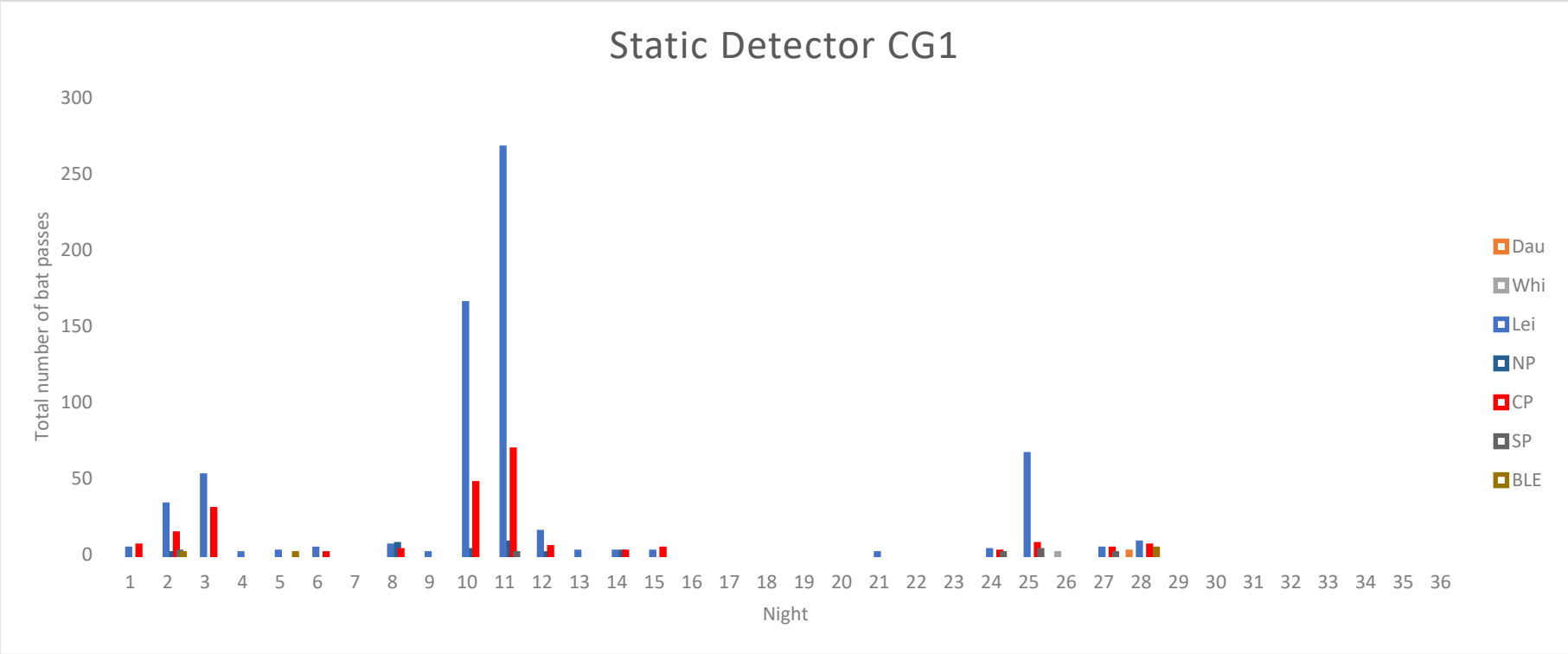


Image 9-20: Total number of nightly bat passes recorded at Static location CG1

The static unit CG1 recorded seven species of bat. A higher level of activity was recorded in period 1 (23rd April to 4th May 2020) and period 3 (15th to 27th August 2020) compared to period 2 (24th June to 4th July). During period 1 and period 3 a higher level of Leisler's bat was recorded in comparison to the remaining species. Peak activity was recorded on nights 10 (2nd July), 11 (3rd July) and 25 (16th August) with 165 passes, 267 passes and 66 passes respectively. A much lower level of bat activity for all bat species recorded was noted during Period 2. There was no activity recorded on nights 7 (29th April), 16 (27th June) to 20 (1st July), 22 (3rd July) to 23 (4th July) and 29 (20th August) to 36 (27th August).

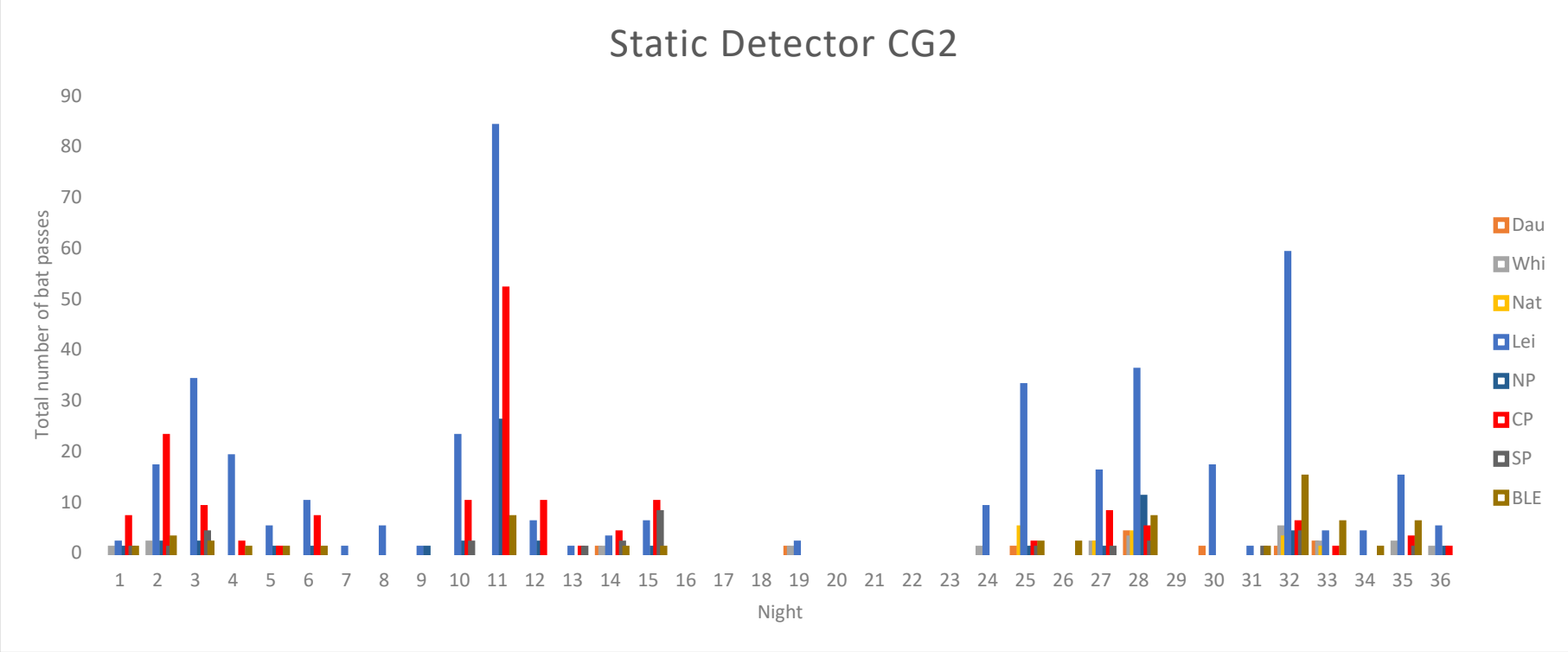


Image 9-21: Total number of nightly bat passes recorded at Static location CG2

The static unit CG2 recorded eight species of bat. A higher level of activity was recorded in period 1 (23rd April to 4th May 2020) and period 3 (15th to 27th August 2020) compared to period 2 (24th June to 4th July). During period 1 and period 3 a higher level of Leisler's bat was recorded in comparison to the remaining species. Peak activity was recorded on nights 11 (3rd July) with 84 passes and 32 (23rd August) with 59 passes. Common pipistrelle also had a peak activity level on night 11 (3rd July) with 52 passes. A much lower level of bat activity for all bat species recorded was noted during Period 2 with no activity recorded on nights 16 (27th June) to 18 (29th June) and nights 20 (1st July) to 23 (4th July).

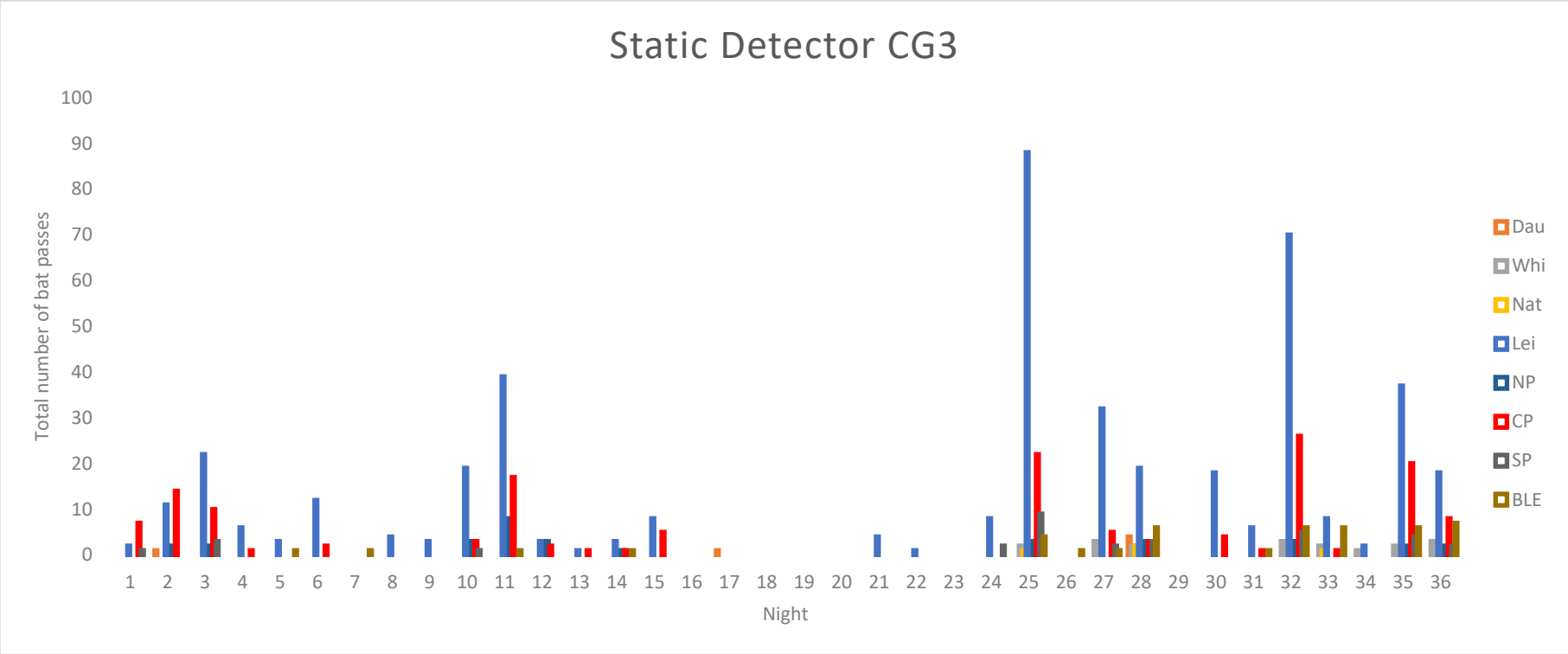


Image 9-22: Total number of nightly bat passes recorded at Static location CG3

The static unit CG3 recorded eight species of bat. A higher level of activity was recorded in period 1 (23rd April to 4th May 2020) and period 3 (15th to 27th August 2020) compared to period 2 (24th June to 4th July). The highest level of activity for Leisler's bat was recorded in period 3 with a peak of activity on nights 25 (16th August) and 32 (23rd August) with 88 passes and 70 passes respectively. Lower levels for activity were recorded for the remaining bat species during these periods, while a much lower level of bat activity for all bat species recorded was noted during Period 2. There was no activity recorded on nights 16 (27th June), and nights 18 (29th June) to 20 (1st July).

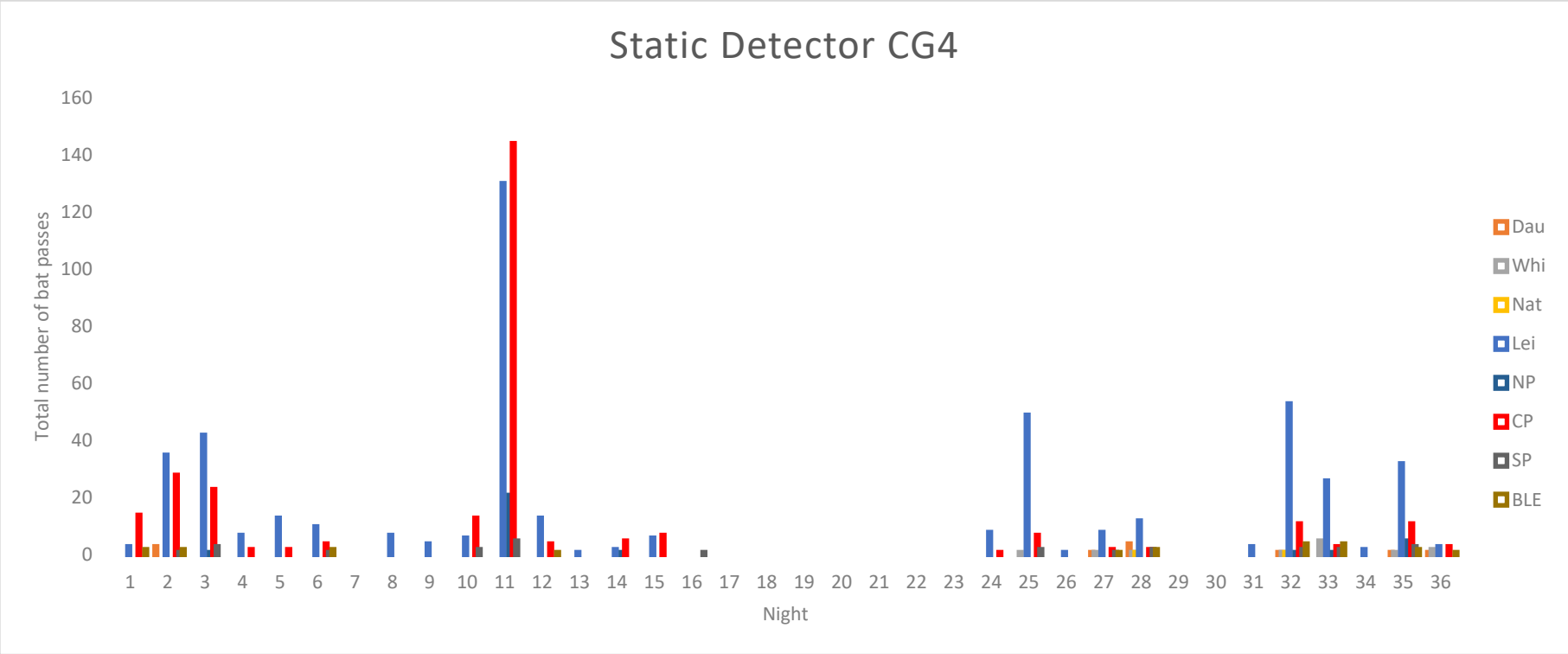


Image 9-23: Total number of nightly bat passes recorded at Static location CG4

The static unit CG4 recorded eight species of bat. A higher level of activity was recorded in period 1 (23rd April to 4th May 2020) for Leisler's bat. A particularly high level of activity was recorded on night 11 (3rd May) for both common pipistrelle and Leisler's bat with 144 passes and 130 passes respectively. No activity was recorded between nights 17 (28th June) and 23 (4th July). A much lower level of bat activity for all bat species recorded was noted during Period 2 with no activity recorded on nights 17 (28th June) to 23 (4th July).

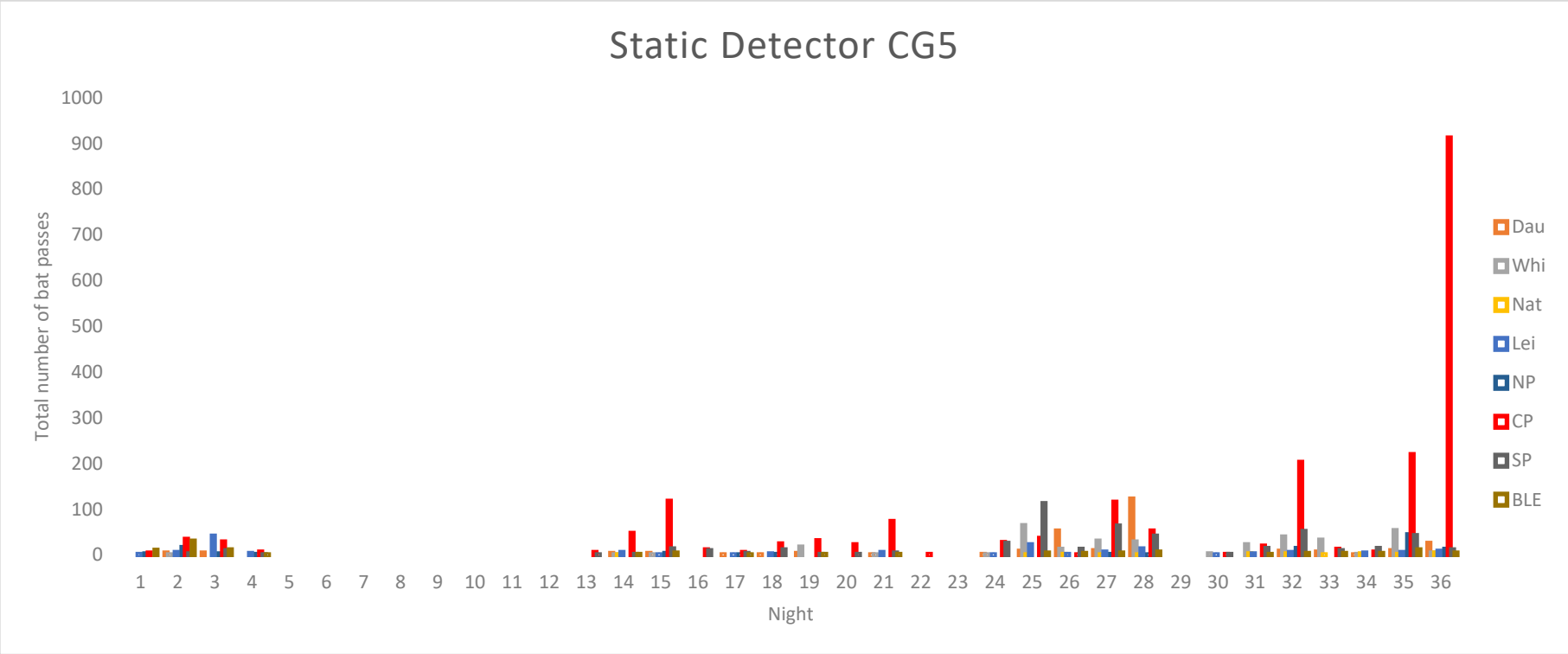


Image 9-24: Total number of nightly bat passes recorded at Static location CG5

The static unit CG5 recorded eight species of bat. A higher level of activity was recorded in period 3 (15th to 27th August 2020) compared to period 1 (23rd April to 4th May 2020) and period 2 (24th June to 4th July). During period 3 common pipistrelle had a particularly high activity level in comparison to the remaining species with 912 passes on nights 36 (27th August). A much lower level of bat activity for all bat species recorded was noted during Period 1 with no activity recorded on nights 5 (27th April) to 12 (4th May).

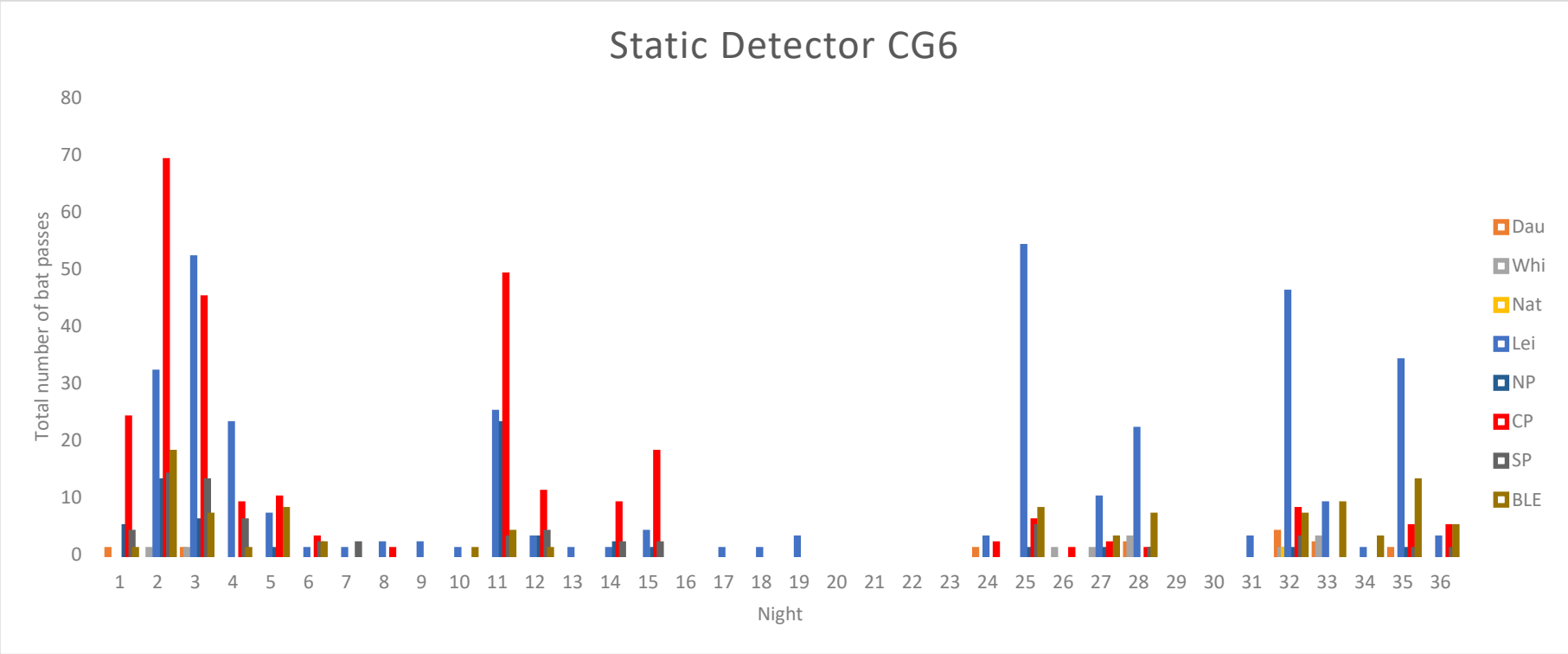


Image 9-25: Total number of nightly bat passes recorded at Static location CG6

The static unit CG6 recorded eight species of bat. A higher level of activity was recorded in period 1 (23rd April to 4th May 2020) and period 3 (15th to 27th August 2020) compared to period 2 (24th June to 4th July). During period 1 and period 3 a higher level of Leisler's bat was recorded, while a higher level of activity for common pipistrelle was recorded in period 1, in comparison to the remaining species. Peak activity for Leisler's bat was recorded on nights 3 (25th April) with 52 passes and 25 (16th August) with 54 passes, whilst peak activity for common pipistrelle was recorded on night 2 (24th April) with 69 passes. A much lower level of bat activity for all bat species recorded was noted during Period 2 with no activity recorded on night 16 (27th June) and nights 20 (1st July) to 23 (4th July). Only 1 record on a Natterer's bat was made on night 32 (23rd August).

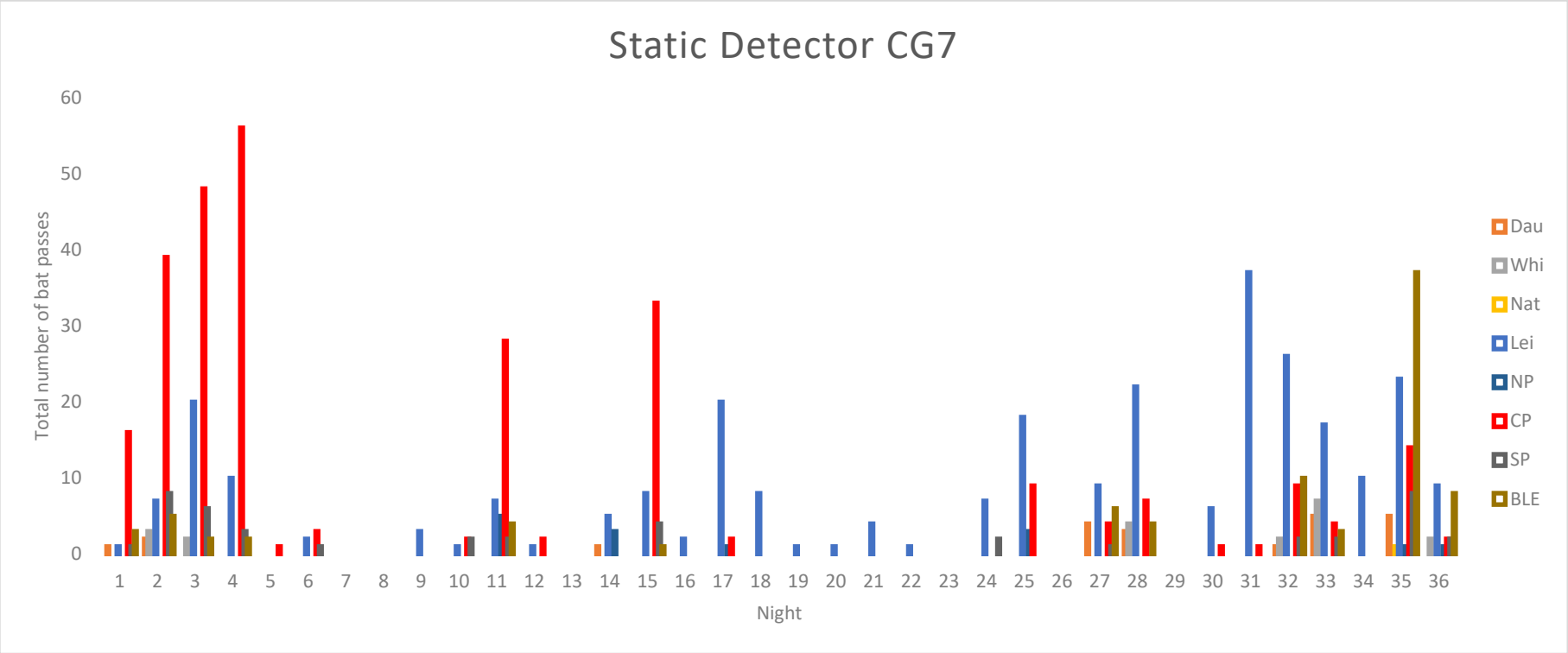


Image 9-26: Total number of nightly bat passes recorded at Static location CG7

The static unit CG7 recorded eight species of bat. A higher level of activity was recorded in period 1 (23rd April to 4th May 2020) for common pipistrelle and period 3 (15th to 27th August 2020) for Leisler's bat. Peak activity for common pipistrelle was recoded on night 4 (26th April) with 56 passes, while peak activity for Leisler's bat was recorded on night 31 (22nd August) with 37 passes. Brown long-eared bat also had a particularly high activity level on night 35 (26th August) with 37 passes, in comparison to the level of activity for the remaining nights at this location. Only 1 record on a Natterer's bat was made on night 35 (26th August).

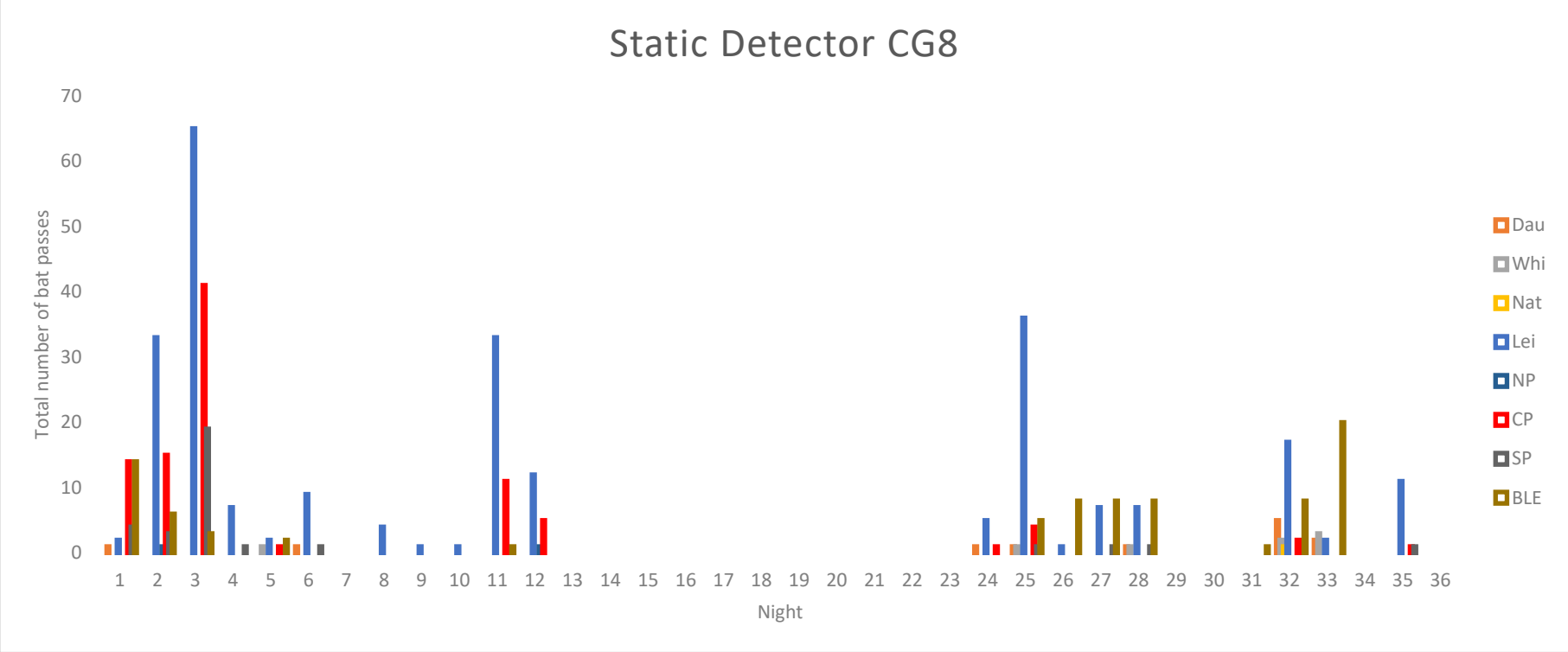


Image 9-27: Total number of nightly bat passes recorded at Static location CG8

The static unit CG8 recorded eight species of bat. No data is available for period 2 (24th June to 4th July) at this location. A higher level of activity was recorded in period 1 (23rd April to 4th May 2020) for Leisler's bat with peak activity recorded on night 3 (25th April) with 65 passes. Common pipistrelle activity also peaked on this night with 41 passes. Only 1 record on a Natterer's bat was made on night 32 (23rd August) and 1 Nathusius pass was recorded on nights 2 (24th April) and 12 (4th May).

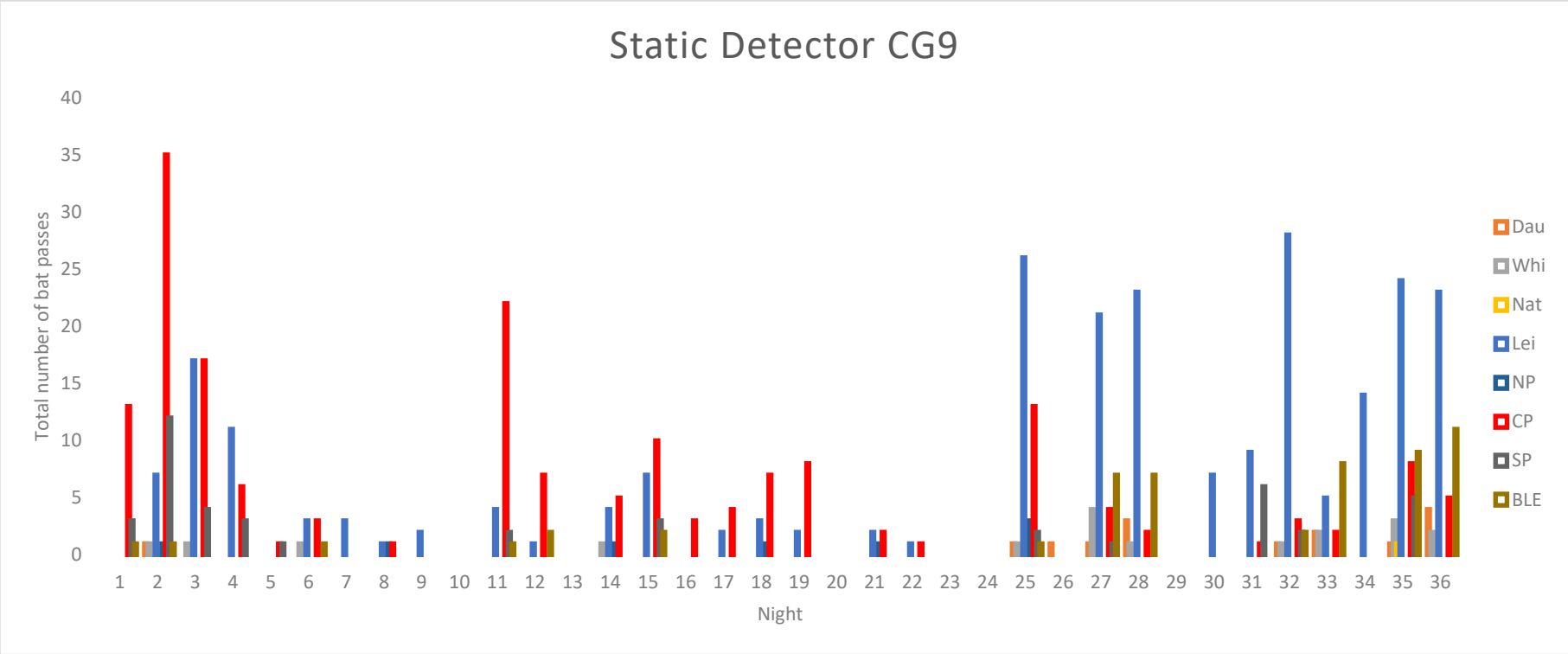


Image 9-28: Total number of nightly bat passes recorded at Static location CG9

The static unit CG9 recorded eight species of bat. A higher level of activity was recorded in period 1 (23rd April to 4th May 2020) for common pipistrelle and period 3 (15th to 27th August 2020) for Leisler's bat. Peak activity for common pipistrelle was recoded on night 2(24th April) with 35 passes, while peak activity for Leisler's bat was recorded on night 32 (23rd August) with 28 passes. A lower level of bat activity for all bat species recorded was noted during Period 2 with no activity recorded for Myotis sp. On nights 15 (26th June) to 23 (4th July). Only 1 record on a Natterer's bat was made on night 35 (27th August).

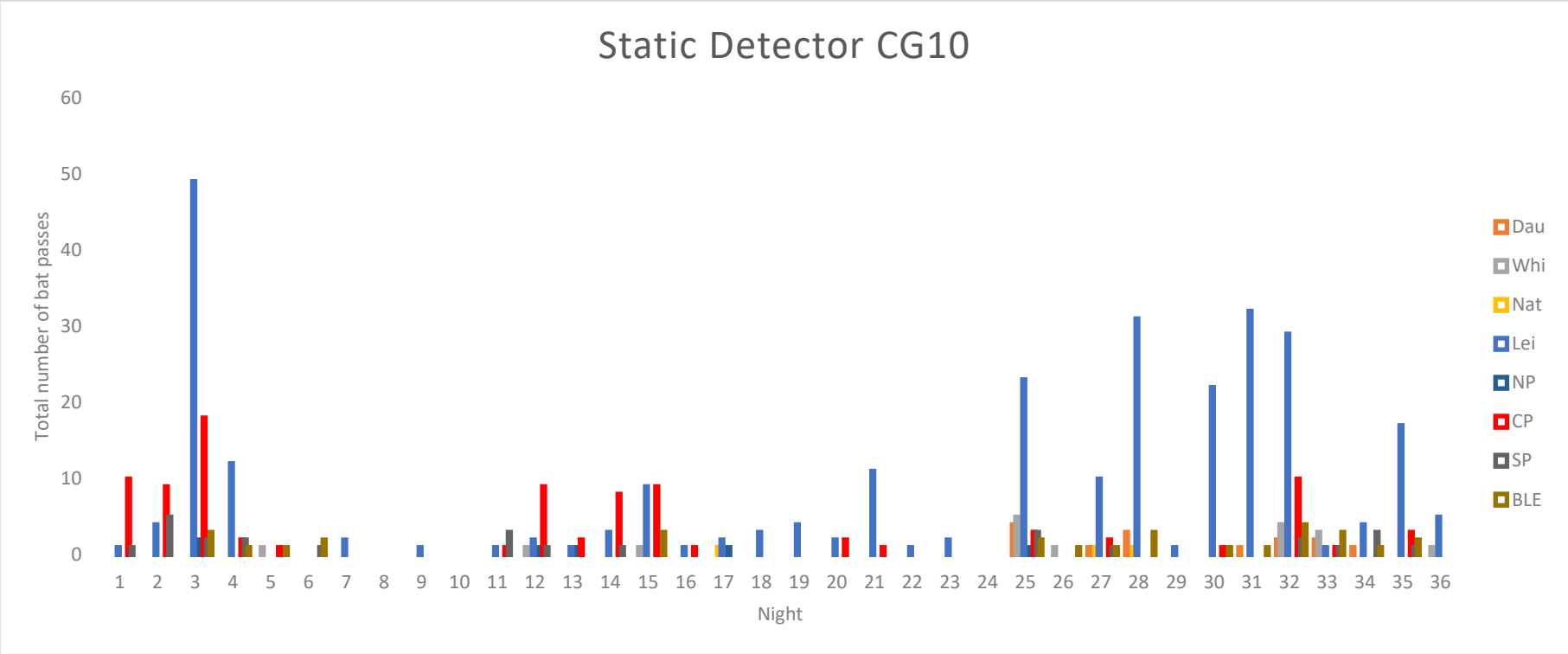


Image 9-29: Total number of nightly bat passes recorded at Static location CG10

The static unit CG10 recorded eight species of bat. A higher level of activity was recorded in period 1 (23rd April to 4th May 2020) and period 3 (15th to 27th August 2020) compared to period 2 (24th June to 4th July). During period 1 and period 3 a higher level of Leisler's bat was recorded in comparison to the remaining species. Highest peak activity for Leisler's bat was recorded on night 3 (25th April) with 49 passes.

The graphs within Plate 8-40 and Plate 8-41 show the comparison of activity levels for individual species (common pipistrelle and Leisler's bat) at each static detector location. Location CG5 has the highest number of passes of Common pipistrelle, while also having the lowest number of passes for Leisler's bat. The remaining activity levels for both species are similar at all static locations.

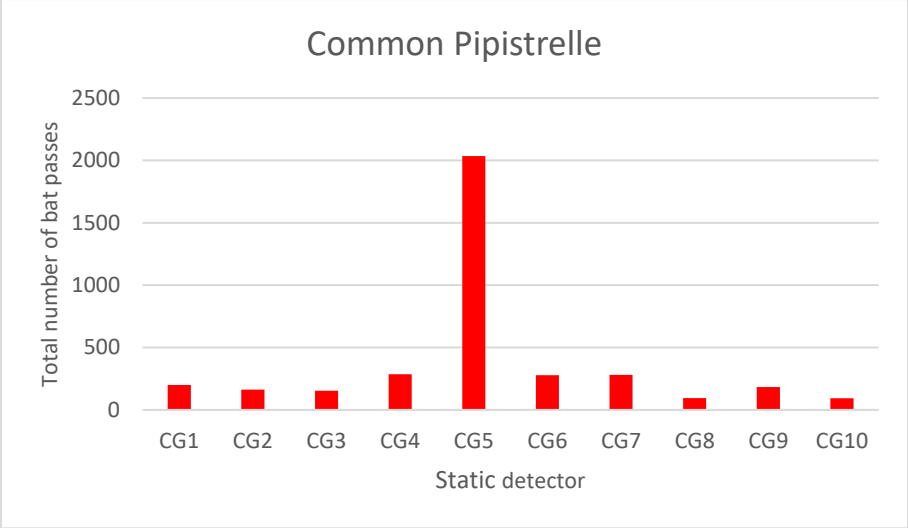


Image 9-30: Total number of bat passes recorded for Common pipistrelles at each of the static detector locations in 2020.

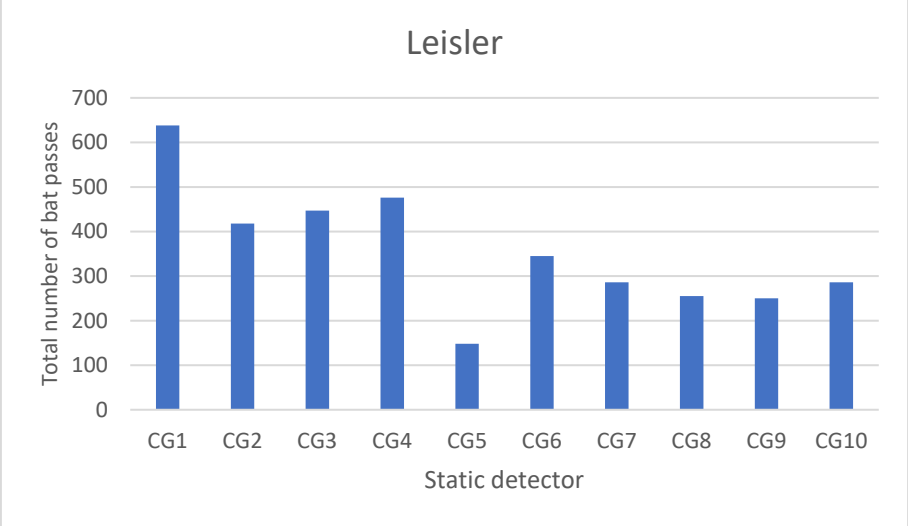


Image 9-31: Total number of bat passes recorded for Leisler's bat at each of the static detector locations in 2020.

Static location CG5 had the highest number of passes for Daubenton's bat (n=275 passes), Whiskered bat (n=321 passes), soprano pipistrelle (n=473 passes), Nathusius pipistrelle (n=108) and brown long-eared bat (n=119 passes) recorded during the surveillance surveys. Refer to Plate 8-42 for all remaining bat species results.

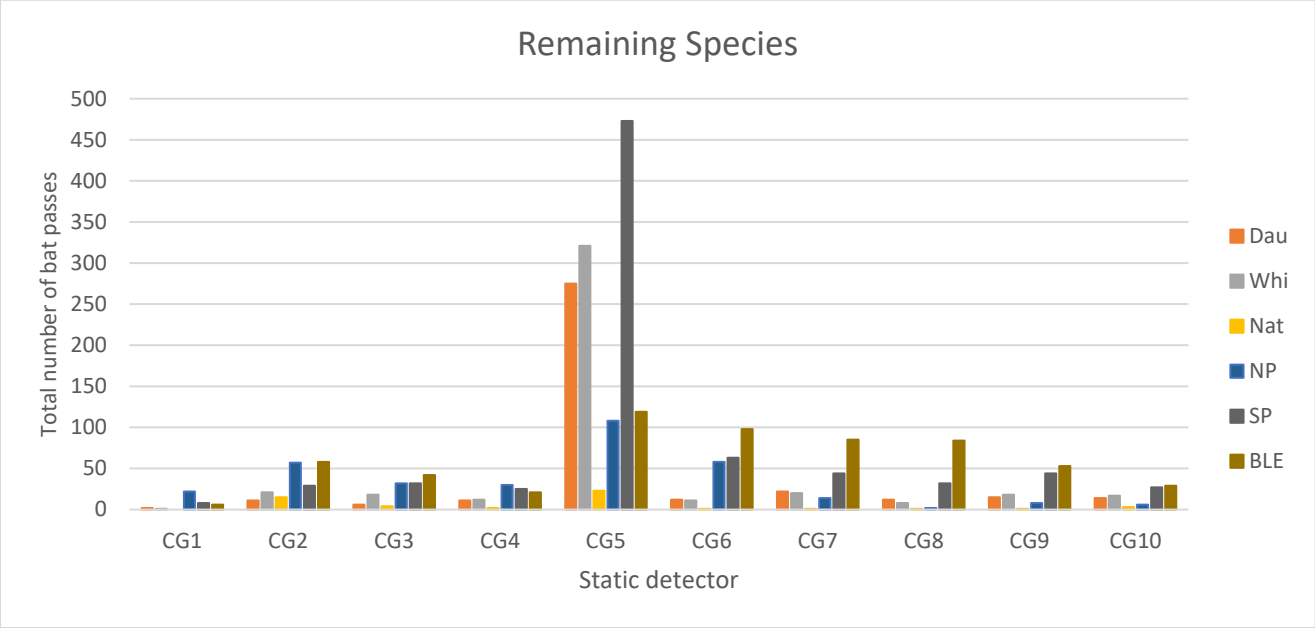


Image 9-32: Total number of bat passes recorded for remaining bat species at each of the static detector locations in 2020.

9.7.6.7 Static Detector Surveys (2021)

Eight species of bats were recorded during the two survey periods with a total of 890 recordings. The most commonly recorded species was common pipistrelle, followed by soprano pipistrelle and Leisler's bat. Much lower levels of activity of brown long-eared bat, Daubenton's bat, Nathusius' pipistrelle, Natterer's bat, and Whiskered bat were detected. Brown long-eared bat is present on-Site, but this species is very quiet and sometimes hunts without echolocating, therefore this species may be under-recorded by the static detectors.

Table 9-17 below summarises the results, in relation to bat species, recorded on the static detectors deployed in 2021. CG3 was deployed for one period (period 3) and CG5 was also deployed for one period (period 2). Overall eight bat species were recorded (common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Leisler's bat, brown long-eared bat, Natterer's bat, Daubenton's bat and whiskered bat). The graphs within Plate 8-43 to Plate 8-44 below show the number of bat passes (per species) recorded at each static detector location for the surveillance periods.

Table 9-17: Summary results of Static Bat Detectors deployed during survey periods 2 to 3 (2021)

Static Detector No. and location habitats	Species detected during Period 2 26th July to 06th August 2021 (Night 1 – 10)	Species detected during Period 3 07th to 24th September 2021 16 (Night 11 – 26)
CG3 Conifer plantation	N/A	Daubenton's bat Whiskered bat Natterer's bat Leisler's bat Common pipistrelle Soprano pipistrelle Brown long-eared bat
CG5 Improved grassland/ adjacent to drainage ditch & wet heath	Daubenton's bat Whiskered bat Natterer's bat Leisler's bat Nathusius' pipistrelle Common pipistrelle Soprano pipistrelle Brown long-eared bat	N/A

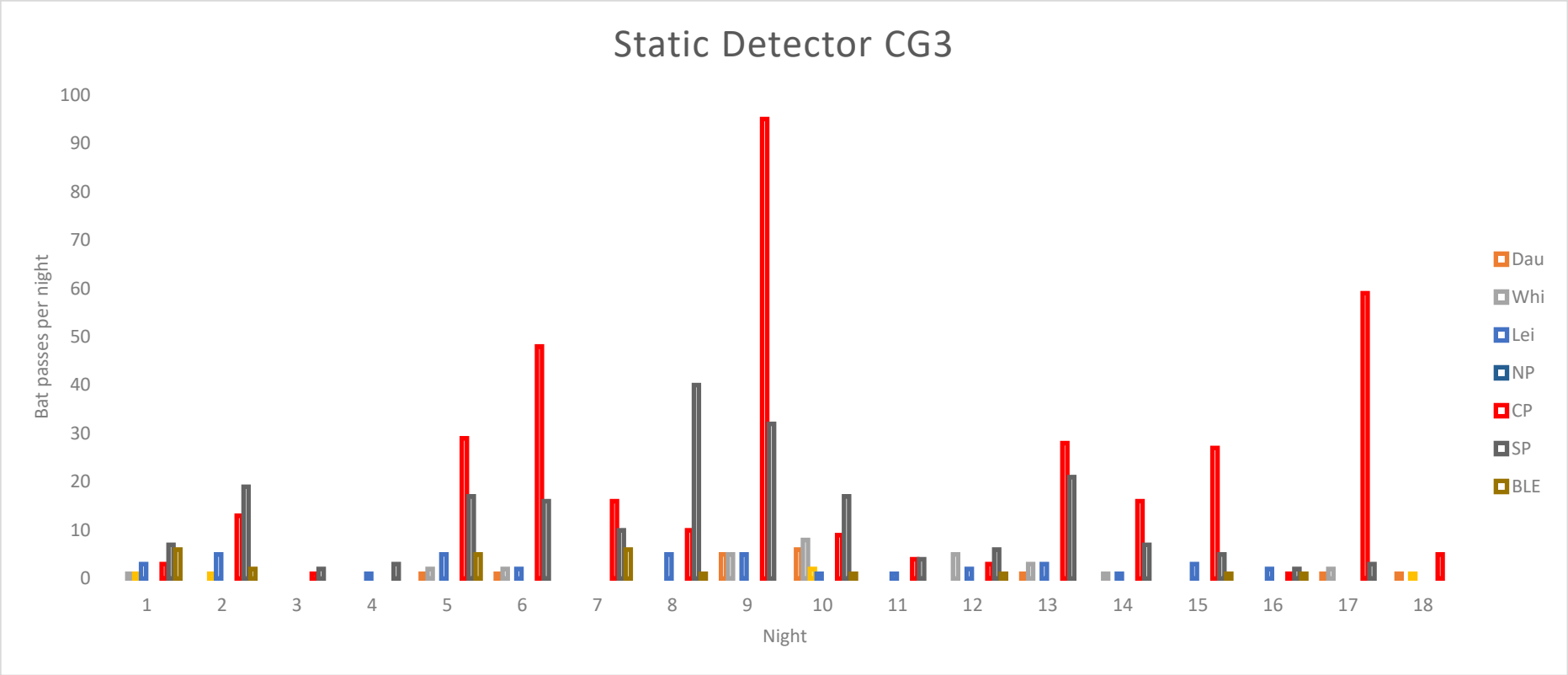


Image 9-33: Total number of nightly bat passes recorded at static location G3

The static unit CG3 recorded seven species of bat. Common pipistrelle shows the highest activity level for the period which spiked in activity on night 9 (15th September) with 95 passes. Soprano pipistrelle have the next highest activity levels for the period showing consistent activity throughout, peaking on night 8 (14th September) with 40 passes. A much lower level of bat activity can be seen for the remaining bat species.

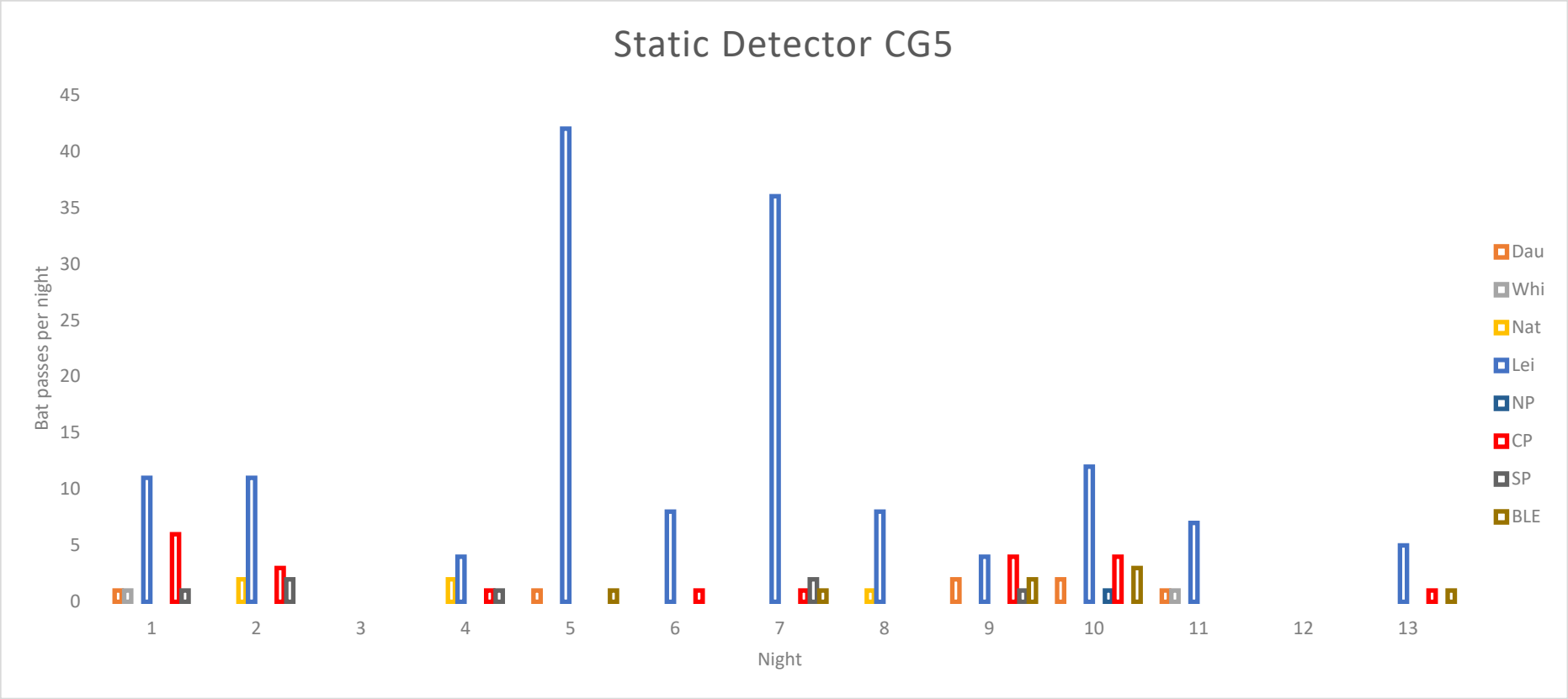


Image 9-34: Total number of nightly bat passes recorded at static location CG5

The static unit CG5 recorded eight species of bat. Leisler's bat shows the highest activity level for, which shows spikes in activity on days 5 (29th July), and 7 (31st July) with 42 and 36 passes respectively. A much lower level of activity of the remaining bat species was recorded at this location.

9.7.6.8 Survey from Height

During the survey period, four species were recorded. These were Leisler's bat, common pipistrelle, soprano pipistrelle and Natterer's bat, as well as unidentified Myotis bats. Leisler's was the most active species, with 2136 calls, accounting for 97.5% of all calls during the survey period. Common pipistrelle, soprano pipistrelle, unidentified Myotis spp., and Natterer's bat were present in lower numbers, accounting for 1.3%, 0.7%, 0.3% and 0.1% of calls respectively. Leisler's bat passes peaked on 12th August 2022, with 249 passes, followed by 175 passes on 15th July 2022. Leisler's social calls were frequently recorded suggesting regular use of the area by pairs or groups of Leisler's bat.

9.7.6.9 Ecobat analysis

The static detector data was uploaded and analysed using the Ecobat tool. This analysis was undertaken for each survey period separately. Where groups of detectors were deployed for different dates within a survey period, those that were deployed for the same dates were analysed together (details are provided for each survey period below).

The reference range datasets were stratified to include:

- Only records from within 30 days of the survey date.
- Only records from within 100 km2 of the survey location.
- Records using any make of bat detector.

The Ecobat tool provides are series of summary tables to enable analysis of the bat activity level at each static location.

These are presented below, and categorisation of activity level is based on the following table:

Table 9-18: Percentile Score and Categorised Level of Bat Activity (SNH, 2019; NatureScot 2021)

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

Survey Period 1 (2020)

A summary showing the number of nights recorded bat activity within each activity band for each species is presented below in Table 9-19.

Bat surveys were conducted for 11 nights between 23/04/2020 and 04/05/2020, using Wildlife Acoustics static bat detectors.

Seven of the 10 static locations had at least one night of High Activity during the survey period. However, none of the static locations are deemed to have a High Bat Activity (for specific bat species) level based on the Percentile Median value.

Table 9-19 shows the number of nights recorded bat activity fell into each activity band for each species across all of the detectors. While they identify no species as having high activity levels, common pipistrelle had Moderate to High for all detectors locations, except CG3 and CG10. Leisler's bat had Moderate to High for CG5 and brown-long eared bat for CG5. All other bat species at the detector locations had Moderate activity levels or less for Period 1.

The Ecobat analysis has identified no potential roosts within the vicinity of the proposed development due to the lack of number of the recorded passes occurring within the species-specific emergence time ranges based on Russ 2012.

Table 9-19: Summary showing the number of nights recorded bat activity fell into each activity band for each species across all of the detectors – Survey period 1 (2020)

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG1	*Nyctalus leisleri*	3	1	2	1	4	48	Moderate
CG1	*Pipistrellus nathusii*	0	0	2	1	1	43	Moderate
CG1	*Pipistrellus pipistrellus*	1	3	0	1	1	63	Moderate to High
CG1	*Pipistrellus pygmaeus*	0	0	0	0	3	18	Low
CG1	*Plecotus auritus*	0	0	0	0	2	18	Low
CG2	*Myotis mystacinus*	0	0	0	1	1	25	Low to Moderate
CG2	*Nyctalus leisleri*	2	2	4	1	0	56	Moderate
CG2	*Pipistrellus nathusii*	0	1	2	1	3	32	Low to Moderate
CG2	*Pipistrellus pipistrellus*	1	3	1	1	1	62	Moderate to High
CG2	*Pipistrellus pygmaeus*	0	0	0	3	1	32	Low to Moderate
CG2	*Plecotus auritus*	0	0	1	2	3	29	Low to Moderate
CG3	*Myotis daubentonii*	0	0	0	0	1	18	Low
CG3	*Nyctalus leisleri*	1	1	4	2	2	52	Moderate
CG3	*Pipistrellus nathusii*	0	0	3	0	1	46	Moderate

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG3	*Pipistrellus pipistrellus*	0	1	3	0	4	37	Low to Moderate
CG3	*Pipistrellus pygmaeus*	0	0	0	1	2	18	Low
CG3	*Plecotus auritus*	0	0	0	0	3	18	Low
CG4	*Myotis daubentonii*	0	0	0	1	0	40	Low to Moderate
CG4	*Nyctalus leisleri*	2	1	6	0	1	57	Moderate
CG4	*Pipistrellus nathusii*	0	1	0	1	1	32	Low to Moderate
CG4	*Pipistrellus pipistrellus*	1	3	1	2	0	65	Moderate to High
CG4	*Pipistrellus pygmaeus*	0	0	2	0	1	44	Moderate
CG4	*Plecotus auritus*	0	0	0	2	2	25	Low to Moderate
CG5	*Myotis daubentonii*	0	0	2	0	1	44	Moderate
CG5	*Myotis mystacinus*	0	0	0	0	1	18	Low
CG5	*Nyctalus leisleri*	0	2	0	1	0	70	Moderate to High
CG5	*Pipistrellus nathusii*	0	1	1	1	0	56	Moderate
CG5	*Pipistrellus pipistrellus*	0	2	1	0	0	70	Moderate to High
CG5	*Pipistrellus pygmaeus*	0	0	2	0	1	44	Moderate
CG5	*Plecotus auritus*	0	2	1	0	0	64	Moderate to High
CG6	*Myotis daubentonii*	0	0	0	0	2	18	Low
CG6	*Myotis mystacinus*	0	0	0	0	2	18	Low
CG6	*Nyctalus leisleri*	1	2	3	3	1	49	Moderate
CG6	*Pipistrellus nathusii*	0	2	2	0	1	58	Moderate

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG6	*Pipistrellus pipistrellus*	1	4	1	1	2	65	Moderate to High
CG6	*Pipistrellus pygmaeus*	0	1	4	0	1	53	Moderate
CG6	*Plecotus auritus*	0	1	3	2	1	48	Moderate
CG7	*Myotis daubentonii*	0	0	0	1	1	25	Low to Moderate
CG7	*Myotis mystacinus*	0	0	0	2	0	36	Low to Moderate
CG7	*Nyctalus leisleri*	0	2	1	4	0	40	Low to Moderate
CG7	*Pipistrellus nathusii*	0	0	1	0	0	48	Moderate
CG7	*Pipistrellus pipistrellus*	1	3	1	1	1	71	Moderate to High
CG7	*Pipistrellus pygmaeus*	0	0	2	2	2	36	Low to Moderate
CG7	*Plecotus auritus*	0	0	3	1	0	44	Moderate
CG8	*Myotis daubentonii*	0	0	0	0	2	18	Low
CG8	*Myotis mystacinus*	0	0	0	0	1	18	Low
CG8	*Nyctalus leisleri*	1	2	4	1	0	57	Moderate
CG8	*Pipistrellus nathusii*	0	0	0	0	2	18	Low
CG8	*Pipistrellus pipistrellus*	1	2	0	0	1	68	Moderate to High
CG8	*Pipistrellus pygmaeus*	0	1	1	0	2	35	Low to Moderate
CG8	*Plecotus auritus*	0	1	1	1	1	40	Low to Moderate
CG9	*Myotis daubentonii*	0	0	0	0	1	18	Low
CG9	*Myotis mystacinus*	0	0	0	0	3	18	Low
CG9	*Nyctalus leisleri*	0	2	2	2	1	44	Moderate
CG9	*Pipistrellus nathusii*	0	0	0	0	2	18	Low

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG9	*Pipistrellus pipistrellus*	0	5	0	2	1	62	Moderate to High
CG9	*Pipistrellus pygmaeus*	0	1	2	0	3	33	Low to Moderate
CG9	*Plecotus auritus*	0	0	0	2	2	25	Low to Moderate
CG10	*Myotis mystacinus*	0	0	0	0	2	18	Low
CG10	*Nyctalus leisleri*	0	2	0	2	3	32	Low to Moderate
CG10	*Pipistrellus nathusii*	0	0	0	1	1	25	Low to Moderate
CG10	*Pipistrellus pipistrellus*	0	1	3	0	2	57	Moderate
CG10	*Pipistrellus pygmaeus*	0	0	2	2	2	32	Low to Moderate
CG10	*Plecotus auritus*	0	0	0	3	1	32	Low to Moderate

Survey Period 2 (2020)

A summary showing the number of nights recorded bat activity within each activity band for each species is presented below in Table 9-20.

Bat surveys were conducted for 10 nights between 23/06/2020 and 04/07/2020 using Wildlife Acoustics static bat detectors. Static location CG8 failed to record during the survey period.

Static locations CG5 had at least one night of high activity during the survey period for common pipistrelle, the remaining locations had no nights of high activity.

Table 9-20 below the number of nights recorded bat activity fell into each activity band for each species across all of the detectors. Common pipistrelle is identified as having the highest activity level as High, Moderate or Moderate-High (per median percentile) across all detectors for period 2. Leisler's bat has been identified as having a Moderate (per median percentile) activity level across all detectors, except CG6 which had Low-Moderate, for period 2.

The Ecobat analysis has identified no potential roosts within the vicinity of the proposed development due to the lack of number of the recorded passes occurring within the species-specific emergence time ranges based on Russ 2012.

Table 9-20: Bat activity within each activity band for each species – Survey period 2 (2020)

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG1	*Nyctalus leisleri*	0	0	1	2	0	35	Low to Moderate
CG1	*Pipistrellus nathusii*	0	0	0	1	0	35	Low to Moderate
CG1	*Pipistrellus pipistrellus*	0	0	1	0	0	54	Moderate
CG2	*Myotis daubentonii*	0	0	0	2	0	23	Low to Moderate
CG2	*Myotis mystacinus*	0	0	0	2	0	23	Low to Moderate
CG2	*Nyctalus leisleri*	0	0	2	1	0	42	Moderate
CG2	*Pipistrellus nathusii*	0	0	0	1	0	23	Low to Moderate
CG2	*Pipistrellus pipistrellus*	0	1	0	1	0	51	Moderate
CG2	*Pipistrellus pygmaeus*	0	1	0	1	0	42	Moderate
CG2	*Plecotus auritus*	0	0	0	1	0	35	Low to Moderate
CG3	*Myotis daubentonii*	0	0	0	1	0	23	Low to Moderate
CG3	*Nyctalus leisleri*	0	1	1	1	0	51	Moderate
CG3	*Pipistrellus nathusii*	0	0	0	1	0	23	Low to Moderate
CG3	*Pipistrellus pipistrellus*	0	0	1	1	0	43	Moderate
CG3	*Plecotus auritus*	0	0	0	1	0	23	Low to Moderate
CG4	*Nyctalus leisleri*	0	0	1	1	0	46	Moderate
CG4	*Pipistrellus nathusii*	0	0	0	1	0	23	Low to Moderate
CG4	*Pipistrellus pipistrellus*	0	1	0	0	0	64	Moderate to High
CG4	*Pipistrellus pygmaeus*	0	0	0	1	0	23	Low to Moderate
CG5	*Myotis daubentonii*	0	0	2	3	0	35	Low to Moderate
CG5	*Myotis mystacinus*	0	1	0	2	0	35	Low to Moderate
CG5	*Myotis nattereri*	0	0	0	1	0	23	Low to Moderate
CG5	*Nyctalus leisleri*	0	0	3	1	0	48	Moderate
CG5	*Pipistrellus nathusii*	0	0	1	2	0	35	Low to Moderate
CG5	*Pipistrellus pipistrellus*	4	3	0	0	0	81	High

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG5	*Pipistrellus pygmaeus*	0	3	1	2	0	59	Moderate
CG5	*Plecotus auritus*	0	0	1	4	0	35	Low to Moderate
CG6	*Nyctalus leisleri*	0	0	2	2	0	35	Low to Moderate
CG6	*Pipistrellus nathusii*	0	0	1	0	0	42	Moderate
CG6	*Pipistrellus pipistrellus*	0	1	0	0	0	77	Moderate to High
CG6	*Pipistrellus pygmaeus*	0	0	1	0	0	47	Moderate
CG7	*Myotis daubentonii*	0	0	0	1	0	23	Low to Moderate
CG7	*Nyctalus leisleri*	0	2	2	2	0	47	Moderate
CG7	*Pipistrellus nathusii*	0	0	1	1	0	33	Low to Moderate
CG7	*Pipistrellus pipistrellus*	0	1	0	2	0	23	Low to Moderate
CG7	*Pipistrellus pygmaeus*	0	0	1	0	0	47	Moderate
CG7	*Plecotus auritus*	0	0	0	1	0	23	Low to Moderate
CG9	*Myotis mystacinus*	0	0	0	1	0	23	Low to Moderate
CG9	*Nyctalus leisleri*	0	1	2	2	0	42	Moderate
CG9	*Pipistrellus nathusii*	0	0	0	3	0	23	Low to Moderate
CG9	*Pipistrellus pipistrellus*	0	2	3	0	0	58	Moderate
CG9	*Pipistrellus pygmaeus*	0	0	1	0	0	42	Moderate
CG9	*Plecotus auritus*	0	0	0	1	0	35	Low to Moderate
CG2	*Myotis daubentonii*	0	0	0	2	0	23	Low to Moderate
CG2	*Myotis mystacinus*	0	0	0	2	0	23	Low to Moderate
CG2	*Nyctalus leisleri*	0	0	2	1	0	42	Moderate
CG2	*Pipistrellus nathusii*	0	0	0	1	0	23	Low to Moderate
CG2	*Pipistrellus pipistrellus*	0	1	0	1	0	51	Moderate
CG2	*Pipistrellus pygmaeus*	0	1	0	1	0	42	Moderate
CG2	*Plecotus auritus*	0	0	0	1	0	35	Low to Moderate

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG3	*Myotis daubentonii*	0	0	0	1	0	23	Low to Moderate

Survey Period 3 (2020)

A summary showing the number of nights recorded bat activity within each activity band for each species is presented below in Table 9-21.

Bat surveys were conducted for 11 nights between 15/08/2020 and 26/08/2020 using Wildlife Acoustics static bat detectors.

Eight of the 10 static locations had at least one night of High Activity during the survey period.

Table 9-21 below shows the number of nights recorded bat activity fell into each activity band for each species across all of the detectors. While they identify no species as having high activity levels, Leisler bat is identified as having the highest activity level as Moderate to High (per median percentile) across all detectors for period 3. Common pipistrelle and brown long-eared bat have been identified as having a Moderate (per median percentile) activity level across all detectors for period 3.

Due to the number of the recorded passes occurring within the species-specific emergence time ranges based on Russ 2012, the Ecobat analysis has identified a potential roost may be present near static locations CG1 and CG3 for Leisler bats.

Table 9-21: Summary showing the number of nights recorded bat activity fell into each activity band for each species at each static location and bat activity category based on median percentile – Survey period 3 (2020)

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG1	*Myotis daubentonii*	0	0	0	1	0	29	Low to Moderate
CG1	*Myotis mystacinus*	0	0	0	0	1	17	Low
CG1	*Nyctalus leisleri*	1	0	2	1	0	50	Moderate
CG1	*Pipistrellus pipistrellus*	0	0	3	1	0	47	Moderate
CG1	*Pipistrellus pygmaeus*	0	0	0	1	2	17	Low
CG1	*Plecotus auritus*	0	0	1	0	0	43	Moderate
CG10	*Myotis daubentonii*	0	0	3	0	2	43	Moderate
CG10	*Myotis mystacinus*	0	0	2	0	1	50	Moderate
CG10	*Myotis nattereri*	0	0	0	1	0	29	Low to Moderate
CG10	*Nyctalus leisleri*	1	4	2	1	3	59	Moderate

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG10	*Pipistrellus nathusii*	0	0	0	0	1	17	Low
CG10	*Pipistrellus pipistrellus*	0	0	1	4	2	29	Low to Moderate
CG10	*Pipistrellus pygmaeus*	0	0	1	2	1	37	Low to Moderate
CG10	*Plecotus auritus*	0	0	2	3	2	29	Low to Moderate
CG2	*Myotis daubentonii*	0	0	1	1	2	27	Low to Moderate
CG2	*Myotis mystacinus*	0	0	2	1	2	29	Low to Moderate
CG2	*Myotis nattereri*	0	0	3	0	1	45	Moderate
CG2	*Nyctalus leisleri*	1	5	2	1	0	68	Moderate to High
CG2	*Pipistrellus nathusii*	0	1	1	0	2	30	Low to Moderate
CG2	*Pipistrellus pipistrellus*	0	1	2	1	1	43	Moderate
CG2	*Pipistrellus pygmaeus*	0	0	0	3	2	29	Low to Moderate
CG2	*Plecotus auritus*	0	1	3	2	0	48	Moderate
CG3	*Myotis daubentonii*	0	0	1	0	0	43	Moderate
CG3	*Myotis mystacinus*	0	0	3	1	1	47	Moderate
CG3	*Myotis nattereri*	0	0	0	1	2	17	Low
CG3	*Nyctalus leisleri*	3	4	1	0	0	75	Moderate to High
CG3	*Pipistrellus nathusii*	0	0	1	3	0	37	Low to Moderate
CG3	*Pipistrellus pipistrellus*	0	3	2	1	1	55	Moderate
CG3	*Pipistrellus pygmaeus*	0	0	4	1	0	47	Moderate
CG3	*Plecotus auritus*	0	2	2	0	3	47	Moderate
CG4	*Myotis daubentonii*	0	0	1	1	1	29	Low to Moderate
CG4	*Myotis mystacinus*	0	0	1	2	1	33	Low to Moderate
CG4	*Myotis nattereri*	0	0	0	0	2	17	Low
CG4	*Nyctalus leisleri*	2	3	2	1	0	72	Moderate to High
CG4	*Pipistrellus nathusii*	0	0	1	1	0	38	Low to Moderate
CG4	*Pipistrellus pipistrellus*	0	2	2	0	1	53	Moderate
CG4	*Pipistrellus pygmaeus*	0	0	1	3	0	37	Low to Moderate

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG4	*Plecotus auritus*	0	0	1	2	1	33	Low to Moderate
CG5	*Myotis daubentonii*	2	2	0	2	0	73	Moderate to High
CG5	*Myotis mystacinus*	2	5	0	1	0	80	Moderate to High
CG5	*Myotis nattereri*	0	0	3	3	1	37	Low to Moderate
CG5	*Nyctalus leisleri*	0	3	3	2	1	43	Moderate
CG5	*Pipistrellus nathusii*	1	1	0	1	0	66	Moderate to High
CG5	*Pipistrellus pipistrellus*	4	3	0	2	0	74	Moderate to High
CG5	*Pipistrellus pygmaeus*	5	3	1	0	0	81	High
CG5	*Plecotus auritus*	0	2	3	1	1	57	Moderate
CG6	*Myotis daubentonii*	0	0	1	1	2	23	Low to Moderate
CG6	*Myotis mystacinus*	0	0	2	0	1	43	Moderate
CG6	*Myotis nattereri*	0	0	0	0	1	17	Low
CG6	*Nyctalus leisleri*	2	3	2	1	1	67	Moderate to High
CG6	*Pipistrellus nathusii*	0	0	0	0	4	17	Low
CG6	*Pipistrellus pipistrellus*	0	0	3	2	2	29	Low to Moderate
CG6	*Pipistrellus pygmaeus*	0	0	1	2	1	33	Low to Moderate
CG6	*Plecotus auritus*	0	2	3	0	1	56	Moderate
CG7	*Myotis daubentonii*	0	0	3	0	0	50	Moderate
CG7	*Myotis mystacinus*	0	0	2	1	0	43	Moderate
CG7	*Myotis nattereri*	0	0	0	0	1	17	Low
CG7	*Nyctalus leisleri*	0	8	0	0	0	71	Moderate to High
CG7	*Pipistrellus nathusii*	0	0	0	2	0	33	Low to Moderate
CG7	*Pipistrellus pipistrellus*	0	2	2	1	3	43	Moderate
CG7	*Pipistrellus pygmaeus*	0	0	2	1	1	36	Low to Moderate
CG7	*Plecotus auritus*	1	1	1	0	3	37	Low to Moderate
CG8	*Myotis daubentonii*	0	0	1	0	3	17	Low
CG8	*Myotis mystacinus*	0	0	1	0	2	17	Low
CG8	*Myotis nattereri*	0	0	0	0	1	17	Low

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG8	*Nyctalus leisleri*	0	3	3	1	0	59	Moderate
CG8	*Pipistrellus pipistrellus*	0	0	1	1	2	23	Low to Moderate
CG8	*Pipistrellus pygmaeus*	0	0	0	1	2	17	Low
CG8	*Plecotus auritus*	0	3	0	0	2	62	Moderate to High
CG9	*Myotis daubentonii*	0	0	2	2	0	40	Low to Moderate
CG9	*Myotis mystacinus*	0	0	2	1	1	42	Moderate
CG9	*Myotis nattereri*	0	0	0	0	1	17	Low
CG9	*Nyctalus leisleri*	0	7	2	0	1	66	Moderate to High
CG9	*Pipistrellus nathusii*	0	0	0	1	0	37	Low to Moderate
CG9	*Pipistrellus pipistrellus*	0	2	2	1	3	38	Low to Moderate
CG9	*Pipistrellus pygmaeus*	0	0	2	2	1	29	Low to Moderate
CG9	*Plecotus auritus*	0	2	1	0	1	62	Moderate to High

CG3 (2021)

A summary showing the number of nights recorded bat activity within each activity band for each species is presented below in Table 9-22.

Bat surveys were conducted for 17 nights between 07/09/2021 and 23/09/2021 for static locations CG3 using a Wildlife Acoustics SM4BAT-FS static bat detectors. Analysis is based on the number of nights the bats were detected, therefore the nights no bats were detected have not been provided within the analysis.

Static locations CG3 had at least one night of high activity during the survey period for common pipistrelle and soprano pipistrelle, the remaining species had no nights of high activity.

Table 9-22 below the number of nights recorded bat activity fell into each activity band for each species across CG3. While they identify no species as having high activity levels, common pipistrelle and soprano pipistrelle are identified as having the highest activity level as Moderate-High. All other species had Low to Moderate levels of activity, except Natterer's bat, which had Low levels of activity.

The Ecobat analysis has identified no potential roosts within the vicinity of the proposed development due to the lack of number of the recorded passes occurring within the species-specific emergence time ranges based on Russ 2012.

Table 9-22: Bat activity within each activity band for each species – GC3 (2021)

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG3	*Myotis daubentonii*	0	0	2	1	3	22	Low to Moderate
CG3	*Myotis mystacinus*	0	1	4	1	3	40	Low to Moderate
CG3	*Myotis nattereri*	0	0	0	1	3	13	Low
CG3	*Nyctalus leisleri*	0	0	8	2	1	40	Low to Moderate
CG3	*Pipistrellus pipistrellus*	3	6	2	0	2	74	Moderate to High
CG3	*Pipistrellus pygmaeus*	1	7	2	3	2	62	Moderate to High
CG3	*Plecotus auritus*	0	0	3	2	3	30	Low to Moderate

CG5 (2021)

A summary showing the number of nights recorded bat activity within each activity band for each species is presented below in Table 9-23

Bat surveys were conducted for 9 nights between 26/07/2021 and 05/08/2021 using a Wildlife Acoustics static bat detector.

Static locations CG5 had at least one night of high activity during the survey period for Leisler's bat, the remaining species had no nights of high activity.

Table 9-23 below the number of nights recorded bat activity fell into each activity band for each species across CG5. While they identify no species as having high activity levels, Leisler's bat are identified as having the highest activity level as Moderate. All other species had Low to Moderate levels, Natterer's bat and common pipistrelle, or Low levels of activity, the remaining species.

The Ecobat analysis has identified no potential roosts within the vicinity of the proposed development due to the lack of number of the recorded passes occurring within the species-specific emergence time ranges based on Russ 2012.

Table 9-23: Bat activity within each activity band for each species – CG5 (2021)

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG5	*Myotis daubentonii*	0	0	0	1	4	16	Low

Location	Species/ Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity	Median Percentile	Bat Activity Category
CG5	*Myotis mystacinus*	0	0	0	0	2	16	Low
CG5	*Myotis nattereri*	0	0	0	2	1	28	Low to Moderate
CG5	*Nyctalus leisleri*	1	5	2	1	0	60	Moderate
CG5	*Pipistrellus nathusii*	0	0	0	0	1	16	Low
CG5	*Pipistrellus pipistrellus*	0	0	2	3	2	36	Low to Moderate
CG5	*Pipistrellus pygmaeus*	0	0	0	2	3	16	Low
CG5	*Plecotus auritus*	0	0	1	0	4	16	Low

9.7.6.10 Indication of Bat Roosts Present by Ecobat Analysis

The results of the static detector Ecobat analysis of the 2020 and 2021 results identified the potential presence of Pipistrelle and Leisler's bat roosts in the vicinity of the wind farm. No potential roost were identified during roost surveys. There are a domestic and agricultural buildings to the southwest of the Site, within the roost survey study area, where access was not possible during the roost surveys. These buildings could not be ruled out as potential roosts.

Table 9-24 provides a summary of the bat assessment. It outlines whether a bat species identified for the desktop study was subsequently recorded within the main wind farm Site during the bat surveys that took place in 2020 and 2021.

Table 9-24: Bat Survey Summary Results

Bat Species	Desktop Study (NBDC and NPWS)	2020 Activity Surveys	2020 Static Detector Surveys	2021 Static Detector Surveys
Brown long-eared bat	✓*	X	✓	✓
Common pipistrelle	✓	✓	**Potential Roost**	✓
Daubenton's bat	✓	X	✓	✓
Leisler's bat	✓	✓	**Potential Roost**	✓
Nathusius' pipistrelle	X**	X	✓	✓
Natterer's bat	✓	X	✓	✓
Soprano pipistrelle	✓	✓	✓	✓
Whiskered bat	X	X	✓	✓

*Recorded during surveys
**Not recorded during surveys

9.7.7 Aquatic Ecology

9.7.7.1 Description of the Watercourses

The proposed Coumnagappul windfarm is in the Colligan-Mahon (all turbines) and Suir catchment (section of access track). The portion of the wind farm within the Colligan-Mahon catchment is drained by the River Colligan and its tributaries which enter Dungarvan Harbour. The portion within the Suir catchment is drained by the Nier River, which joins the Suir which enters Waterford harbour.

The GCR is located within the Colligan-Mahon catchment. The GCR also traverses the Blackwater (Munster) catchment.

The TDR is located within the Colligan-Mahon and Suir catchments. The TDR PoIs located within the vicinity of watercourses are PoI 1 (Bellview Port Exit, Waterford), PoI 2 (N29 Slieverue Roundabout), PoI 6 (N26 / N72 Junction), PoI 14 (R672 North of Garrycline), PoI 17 (Bryan's Cross Roads), PoI 18 (Sweep Crossroads),

Colligan River

The Knockavanniamountain Stream flows through the centre of the proposed wind farm Site. At 300m OD, it is very small, but, nearer the Colligan confluence, additional runoff increases the stream volume. Similar to the northern parts of the Colligan main channel, this is a high energy watercourse.

The western side of the proposed wind farm Site drains towards the Skeheens Stream. The habitat of the upper parts of this stony stream is affected by shade and siltation where it passes through or adjacent to commercial conifer forestry plantations. A small tributary of the Skeheens Stream is crossed by the proposed cable routes at Bryan's Cross Roads. Near the confluence with the Colligan, the bed of Skeheens Stream consists mainly of large cobble and boulders, with some gravel, indicating high velocities at times of higher flow.

The following outlines the available water quality data for the watercourses in context of the proposed wind farm development. Only recent water quality (i.e. since 2018) is summarised below. Downstream of the proposed windfarm Site, there is a total of four EPA biological monitoring stations along the Colligan. The uppermost three of these, station code: RS17C010090 located at Scart Bridge, station code: RS17C010150 located at Bridge ESE of Lackandarra, as well as station code: RS17C010180 located at Colligan Bridge all achieved Q4-5 (high status) water quality in 2022 and thus meets target good status (≥Q4) as set out under Water Framework Directive (2000/60/EC). Station RS17C010250 (Bridge near Killadangan), achieved Q4 (good status) water quality in 2019.

The WFD River Waterbodies Risk upstream of Scart Bridge (Colligan_010), the Colligan (including tributaries) are 'Not at risk' according to the EPA. The River Waterbodies Risk for the Colligan_010 sub-catchment, is 'At risk' immediately downstream of Scart Bridge, with the remaining sections as under 'Review' from the Bridge ESE of Lackandarra until Colligan Bridge, where the Colligan_010 reverts back to 'Not at risk'.

The Colligan River flows into the Dungarvan Harbour SPA.

Nier River

The Shanballyanne Stream, which flows to the north of the proposed wind farm Site, is within the Nier catchment. This is a high energy watercourse.

The following outlines the available water quality data for the watercourses in context of the proposed wind farm development. Only recent water quality (i.e. since 2018) is summarised below. Downstream of the proposed windfarm Site, there is a total of two EPA biological monitoring stations along the Nier. Station code: RS16N010100 located at Bridge ENE of Ballymacarby and station code: RS16N010400 located at Ballymakee Bridge both achieved Q4 (good status) water quality in 2020.

The WFD River Waterbodies Risk of the Nier and its tributaries downstream of the proposed wind farm are 'Not at risk', with the section of the Suir where the Nier enters, Suir_170, also 'Not at risk'.

The Nier River flows into the Lower River Suir SAC.

Finisk River

The grid connection crosses Ballynaguilkee_lower which flows into the Finnisk River. Downstream of the proposed grid connection route, there is two of the EPA biological monitoring stations along the Finisk. The uppermost these, station code: RS18F060300 located at downstream of Derry Bridge Millstreet, achieved Q4-5 (high status) water quality, and station code: RS18F020300 located at Modelligo Bridge, achieved Q4 (good status) water quality both in 2021 and thus meet target good status (≥Q4) as set out under Water Framework Directive (2000/60/EC). The further downstream station, station code: RS18F020500 located at Kilmolash Bridge, achieved Q4-5 (high status) water quality in 2021.

The Finisk River forms part of the Lower River Suir SAC.

9.7.7.2 Desktop Study

Inland Fisheries Ireland surveyed seven Sites on the Colligan River in 2017 located directly downstream of the Site. There were four fish species recorded in the Colligan during the 2017 survey which were brown trout; European eel, salmon and three-spined stickleback (Kelly *et al*. 2014).

In 2017 Inland Fisheries Ireland carried out surveys on the River Finisk at four Sites. There was a total of three fish species recorded which were brown trout, European eel, salmon.

In 2013 Inland Fisheries Ireland carried out surveys on the River Nier at one Site. There was a total of three fish species recorded which were brown trout, European eel, salmon.

A review of the National Biodiversity Data Centre maps was undertaken to evaluate the aquatic ecology of the area. NPWS data for the hectads overlapping the proposed development has been assessed. Records include European otter. There are no known records of freshwater pearl mussel and white-clawed crayfish in the Colligan, Nier or Finisk rivers.

A low number of otter (lutra lutra) records were spread throughout the relevant grid squares, with records available for the Colligan Catchment at multiple locations. This included a record c.05km south of the wind farm Site.

9.7.7.3 Overall Aquatic Ecology Value

Please see Image 9-1 for locations of aquatic ecology survey Sites.

The aquatic ecology of Sites A1, A2, A3, B1, B2, B7, B8, C1, C2, C3, C4, C5 and C6 were evaluated as being of **Site Importance** due to moderate status water quality (Q3-4) and limited fisheries value.

Sites A4, B4, B5, B6, B9, B10 and C7 were evaluated as being of **Local Importance** in terms of their aquatic ecology. Achieving good status water quality (Q4), the presence of fish species including Atlantic salmon, European Eel, Brown Trout and Sea Trout across these Sites, in addition to poor to good salmonid and lamprey habitat indicated higher value aquatic habitat.

Sites A5, B5 and B11 on the on the unnamed tributary of Skeheens, Skeheens stream and Colligan river watercourses were evaluated as being of **County Importance** in terms of their aquatic ecology. Achieving good status water quality (Q4), the presence of fish species including Brown trout, Atlantic salmon, European eel, lamprey sp., flounder across these Sites, in addition to excellent salmonid and good lamprey habitat indicated the highest value aquatic habitat surveyed.

9.7.7.4 Fish surveys in the Study Area

Seven species of fish were observed in total, namely: Lamprey sp., European Eel, Brown Trout, Sea Trout, Atlantic Salmon, Three-spined Stickleback and Flounder. For more information see the results of fisheries surveys is contained in the Fisheries Report (Appendix 9.3, Volume III).

Sites B8, C1, C2 and C6 had poor or non-existent fisheries value.

All other Sites surveyed for by electrofishing were considered of higher value due to the presence of fish including Brown Trout, European Eel, Three-spined Stickleback and *Lampetra sp*.

9.7.7.5 Freshwater Pearl Mussel

The unstable nature of the substratum in the high energy upper stretches of the Colligan and its tributaries is unsuitable for freshwater pearl mussels. The physical habitat of some main channel stretches farther downstream appears to be very suitable for this species, although the water quality is not high enough for regeneration of a population, if once present. Two sections of the Colligan where the most suitable habitat was found, were surveyed for mussels. The upper section is both upstream and downstream of Lackandarra Bridge) from ITM 62304 60243 to 62304 60189. The lower section is downstream of Colligan Bridge from ITM 6219759802 to 62180 59762. No mussels were found in either stretch. As no freshwater pearl mussels were found in sections of the Colligan where the habitat is most suitable for this species, combined with no shell fragments found in the gravel bank at Kildangan Bridge and the lack of any historical records of its presence in the Colligan, it can be concluded that freshwater pearl mussels are absent from the Colligan catchment.

The small size of the tributaries and the high energy and unstable nature of the Nier main channel makes this catchment unsuitable for freshwater pearl mussels. There has never been any evidence of this species in the Nier catchment.

The small size of the tributaries in this section of the Finisk makes them unsuitable for freshwater pearl mussels. The physical habitat of the main channel of the Finisk downstream of the tributaries appears to be quite suitable for this species, although the water quality recorded here is not suitable. One section of the Finisk, from ITM 61857 60389 to 61808 60344, was surveyed for mussels. No mussels were found. As no freshwater pearl mussels were found in a section of the Finisk where the habitat is most suitable for this species, combined with unsuitable water quality and the lack of any historical records of its presence in the Finisk, it can be concluded that freshwater pearl mussels are absent from the Finisk catchment.

9.7.7.6 White-clawed Crayfish

No crayfish were found at any of the invertebrate sampling sites. From this, combined with unsuitable geology and the lack of any historical records of its presence in the Colligan, it can be concluded that white-clawed crayfish are absent from the Colligan catchment.

No crayfish were found at either of the invertebrate sampling Sites within the Nier catchment. From this, combined with unsuitable geology and the lack of any historical records of its presence in the Nier, it can be concluded that white-clawed crayfish are absent from the upper parts of the Nier catchment. In 2014, crayfish remains were observed in an otter spraint at the lowermost Nier Site, near the Suir confluence (pers. obs.). While crayfish were plentiful in the Suir downstream of the Nier confluence until 2017, crayfish plague has since advanced up the Suir and no live crayfish were been recorded downstream of Thurles in the 2020 round of the EPA River Monitoring Programme (pers. obs.).

No crayfish were found at the invertebrate sampling sites. From this, combined with unsuitable geology and the lack of any historical records of its presence in the Finisk, it can be concluded that white-clawed crayfish are absent this river.

9.7.7.7 Biological water quality

Good water quality, with Q4 assigned, was found at all four Sites assessed on the main channel of the Colligan. The Coumduane Stream, to which some of the southern part of the wind farm Site drains, is also at Q4. The upper stretch of the Lalisheen Stream to which some of the western part of the wind farm Site drains, was assessed as being in unsatisfactory moderate ecological condition (Q3-4), as was a small tributary of this stream that could be impacted by the cable route at Bryan's Cross Roads. A short distance upstream of its confluence with the Colligan, the ecological condition of the Lalisheen Stream was found to have improved and just qualified for assigning Q4 (Good condition). The Knockanpower Stream, which is the only other tributary of the Colligan that could potentially be impacted by the proposed development that has sufficient flow for assessment by the Q-scheme methodology, was found to be in unsatisfactory moderate ecological condition (Q3-4).

Impacts by livestock access to the Glounmor Stream have resulted in moderate water quality (Q3-4) and siltation. The water quality of the Nier main channel is good (Q4 upper).

The tributaries of this section of the Finisk have too little flow to apply the Q-scheme methodology. Biological water quality was assessed at one Site on the main channel of the Finisk. Q3-4 was assigned here, indicating moderate ecological condition. This unsatisfactory condition appears to be influenced by agricultural practices, including access to watercourses by livestock. At the most southerly of the small tributaries visited, not only were banks badly poached, but a sheep carcass was decaying in the water.

9.7.7.8 Annex I Habitat

No aquatic flora communities with the Annex I habitat '*Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation*' (3260) (i.e. 'floating river vegetation') were present at any of the survey sites.

9.7.7.9 Non-native invasive species

During aquatic surveys, no invasive species that is included in Part 1 of the Third Schedule of S.I. No. 477 of 2011, the European Communities (Birds and Natural Habitats) Regulations 2011 was found within the proposed wind farm Site. Two such invasive plant species, Himalayan balsam *Impatiens glandulifera* and Japanese knotweed *Fallopia japonica* occur beside the lower reaches of the Colligan and both are abundant in proximity to Kildangan Bridge (N72), where a cable route crossing is proposed.

9.7.8 Other species

A desk study covering other fauna (amphibians, reptiles and terrestrial invertebrates) was carried out using NPWS and NBDC data for the 10 km grid squares (S20 and R21) overlapping the study area.

9.7.9 Amphibians and reptiles

Common Frog *Rana temporaria* and Common Lizard *Zootoca vivipara* were recorded within the 10 km grid squares overlapping the Site. There are no high-resolution records (up to 2 km^2) of either species overlapping the proposed wind farm Site or the GCR.

9.7.10 Invertebrates

The endangered Wall Butterfly *Lasiommata megera* has been recorded within 10 km grid square S21, while the vulnerable Marsh Fritillary *Euphydryas aurinia* (Annex II species), and vulnerable Dark Green Fritillary *Argynnis aglaja* have been recorded within 10 km grid square S20 and S21. The near threatened Small Heath *Coenonympha pamphilus* was also recorded within 10 km grid square S20 and S21.

No other threatened or protected terrestrial invertebrates were present in records covering 10 km grid squares S20 and S21.

9.7.11 Habitat Evaluation

9.7.11.1 Habitat Evaluation Summary

Table 9-25 below outlines the ecological resources in the form of habitat types found within the study area. Key receptors as per NRA guidance (NRA, 2009a), for which impact assessment is to be carried out, are also indicated.

The habitats within the proposed wind farm Site are dominated by Wet heath HH3, Dry siliceous heath HH1 Conifer plantation WD4, Dense Bracken HD1, Improved agricultural grassland GA1, and Wet grassland GS4.

The dominant habitat along the GCR outside the wind farm Site is buildings and artificial surfaces BL3 represented by road surfaces, bounded by dry meadows and grassy verges GS2. The roads are also bounded by hedgerows WL1, treelines WL2 and a mosaic of these habitats. Other habitats abutting the grid connection include Improved agricultural grassland GA1, Amenity Grassland GA2, Wet grassland GS4, Conifer plantation WD4, Scrub WS1, Arable lands BC1, Tilled lands BC3, Earth banks BL2 and Buildings and artificial surfaces BL3. The proposed GCR does not overlap the woodland habitats listed above.

This section of the GCR intersects Upland rivers FW1 at two points (Ballynaguilkee_Lower and an unnamed tributary of Skeheens Stream) and Lowland rivers FW2 at one point (Colligan River). The associated bridges/ culverts are categorised as Buildings and artificial surfaces BL3. The grid cable installation methodology (HDD) (horizontal directional drilling) at the Skeheens stream crossing point means no significant effects on the aquatic environment will occur. Existing crossing structures are in place at the other crossing points. The habitats along the GCR are subject to disturbance due to their close proximity to roads and dwellings.

The habitats at TDR PoIs include buildings and artificial surfaces BL3, Amenity grassland (GA2), Dry meadows and grassy verges (GS2), Wet grassland (GS4), Scrub (WS1), Conifer woodland (WD4), Drainage Channels (FW4)

Eroding/upland river (FW1), Lowland/depositing rivers (FW2), Hedgerows (WL1), Treelines (WL2) and Earth banks (BL2).

Similarly to the GCR, the habitats at TDR PoIs are subject to disturbance due to their proximity to roads and dwellings.

Habitats evaluated as Local Importance (Higher Value) and above which are within the development footprint or zone of influence of proposed infrastructure are classified as key receptors, while habitats outside the development footprint or zone of influence or those within the development footprint evaluated as Local Importance (Lower Value) are not classified as key receptors.

Table 9-25: Summary of Habitat Evaluations and Identification of Key Receptors

Fossitt Habitat Classification (Code)	Evaluation	Rationale	Key Receptor	Relevant Area		
				WF	GCR	TDR
Improved Agricultural Grassland (GA1)	Local Importance – Lower Value	Intensively managed and artificial habitat of limited biodiversity value.	No	✓	✓	✓
Amenity grassland (GA2)	Local Importance – Lower Value	Intensively managed and artificial habitat of limited biodiversity value.	No	x	✓	✓
Dry meadows and grassy verges (GS2)	Local Importance – Higher Value	Semi-natural habitat present along GCR and TDR.	Yes	x	✓	✓
Wet grassland (GS4)	Local Importance – Higher Value/ Lower Value	This habitat can provide some viable foraging habitat and localised refuge. Wet grassland within the study area is species poor, heavily grazed and typically surrounded by improved grassland habitats. This habitat is overlapped by proposed access tracks and hard standings. The higher value species rich conifer plantation rides are outside the proposed footprint.	No	✓	✓	✓
Dense bracken (HD1)	Local Importance – Lower Value	Dense bracken can provide suitable cover and refuge for faunal species in the locality in terms of cover, refuge and connectivity. However, monoculture stands of poor floristic value.	No	✓	x	x
Dense bracken/ scrub mosaic (HD1/WS1)	Local Importance – Higher Value	A habitat of moderate floristic value. However, scrub habitats provide valuable ecosystem services for other semi-natural habitats and faunal species in the locality in terms of cover, refuge and connectivity. Overlapped by proposed access tracks.	Yes	✓	x	x
Dry siliceous heath (HH1)	Local Importance – Higher Value	This habitat is in poor condition due to overgrazing and burning. However, this habitat provides greater plant species diversity and ecosystem services than areas of intensively managed pastoral lands.	Yes	✓	x	x
Wet heath (HH3)	Local Importance – Higher Value	This habitat is in poor condition due to overgrazing and burning. However, this habitat provides greater plant species diversity and ecosystem services than areas of intensively managed pastoral lands.	Yes	✓	x	x

Fossitt Habitat Classification (Code)	Evaluation	Rationale	Key Receptor	Relevant Area		
				WF	GCR	TDR
Scrub (WS1)	Local Importance – Higher Value	A habitat of moderate floristic value. However, scrub habitats provide valuable ecosystem services for other semi-natural habitats and faunal species in the locality in terms of cover, refuge and connectivity. Overlapped by GCR.	Yes	x	✓	✓
Mixed Broadleaved Woodland (WD1) (Plantation)	Local Importance – Higher Value	Young ash and alder plantations are considered to be of Local Importance, Higher value due to their ecological corridor functionality and ecosystem services for local ecological receptors. These areas are outside the proposed footprint.	No	✓	x	x
Conifer woodland (WD4)	Local Importance – Lower Value	A habitat of poor floristic value. However, conifer woodland can provide suitable habitat for faunal species in the locality in terms of cover, refuge and connectivity. Proposed access tracks and turbine hard standings overlap conifer plantation.	No	✓	✓	✓
Exposed siliceous rocks (ER1)	Local Importance – Higher Value/ Lower Value	This is a habitat has links to the Annex I habitat Siliceous rocky slopes with chasmophytic vegetation [8220] where it occurs to the east of the Site where it a QI habitat of the Comeragh Mountains SAC. A small isolated area of ER1 is within the proposed footprint, hardstanding for T04, but this habitat is of poor floristic value, dominated by burnt ling, and does not have links to any Annex I habitats.	No	✓	x	x
Drainage Channels (FW4)	Local Importance – Higher Value	Direct effects where culverts are installed at crossing points. Indirect effects including siltation and pollution could occur.	Yes	✓	✓	✓
Eroding/upland river (FW1)	Local Importance – Higher Value	Direct effects where crossing structures are installed at internal access crossing points. Indirect effects including siltation and pollution could occur.	Yes	✓	✓	✓
Lowland/depositing rivers (FW2)	Local Importance – Higher Value	Indirect effects including siltation and pollution could occur.	Yes	x	✓	✓

Fossitt Habitat Classification (Code)	Evaluation	Rationale	Key Receptor	Relevant Area		
				WF	GCR	TDR
Hedgerows (WL1)	Local Importance – Higher Value	Hedgerows are a valuable semi-natural habitat and provide ecosystem services to a range of ecological receptors. Hedgerows may be affected by limited branch trimming along the GCR. Will be affected by trimming and felling at TDR PoIs.	Yes	x	✓	✓
Treelines (WL2)	Local Importance – Higher Value	Treelines are a valuable semi-natural habitat and provide ecosystem services to a range of ecological receptors. Treelines may be affected by limited branch trimming along the GCR. Will be affected by trimming and felling at TDR PoIs.	Yes	x	✓	✓
Stone walls (BL1)	Local Importance – Lower Value	Low exposed walls, dominated by agricultural grasses.	No	✓	x	x
Earth banks (BL2)	Local Importance – Higher Value	A semi-natural species rich habitat along the roadside of the GCR.	No	x	✓	✓
Buildings and Artificial Surfaces (BL3) (Buildings)	Local Importance – Lower Value	Consists of existing roads and exposed stone walls, as well as buildings within the vicinity, but outside footprint, of the GCR and TDR.	No	✓	✓	✓

9.7.12 Fauna (Excluding Avifauna) Evaluation

The basis of impact assessment should be a determination of which ecological resources within the zone of influence of the proposed development and are of sufficient value to be material in decision making and therefore, included in the assessment (NRA, 2009a and CIEEM, 2019). Table 9-26, below, outlines the key receptors selected for assessment and the rationale for same; taken from NRA guidance (NRA, 2009a).

Table 9-26: Evaluation of Fauna

Common name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
Badger	Wildlife Act	County Importance	Closest record is 1km resolution record overlapping the main wind farm and within 1km of the GCR.	Yes
Pygmy Shrew	Wildlife Act	National Importance	Record within 1km of GCR.	Yes
Red Squirrel	Wildlife Act	National Importance	Closest record is 2km resolution record overlapping the main wind farm and within 1km of the GCR.	Yes
Otter	EU Habitats Directive Annex II and Annex IV; Wildlife Act	National Importance	Closest record is 1km resolution record overlapping the main wind farm and within 100m of the GCR.	Yes
Irish Stoat	Wildlife Act	National Importance	There were no records of Irish Stoat within 1km of the main wind farm Site or along the GCR but may still use the main wind farm Site and GCR.	Yes
Irish Hare	Wildlife Act	National Importance	10km record overlapping Site and within 1km of the GCR.	Yes
Hedgehog	Wildlife Act	National Importance	No records within 1km of the Site, records within 1km of the GCR.	Yes

Common name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
American Mink	Invasive non-native species	Not of conservation importance	Records in local area. Not of conservation concern.	No
Brown Rat	Invasive non-native species	Not of conservation importance	Records in local area. Not of conservation concern.	No
Bank Vole	Invasive non-native species	Not of conservation importance	Records in local area. Not of conservation concern.	No
Grey Squirrel	Invasive non-native species	Not of conservation importance	Records in local area. Not of conservation concern.	No
Rabbit	Invasive non-native species	Not of conservation importance	Records in local area. Not of conservation concern.	No
Sika Deer	Invasive non-native species	Not of conservation importance	Records in local area. Not of conservation concern.	No
Fallow Deer	Invasive non-native species	Not of conservation importance	Observed in the Site. Not of conservation concern.	No
Greater White-toothed Shrew	Invasive non-native species	Not of conservation importance	Records in local area. Not of conservation concern.	No
Feral Ferret Mustela furo	Invasive non-native species	Not of conservation importance	Records in local area. Not of conservation concern.	No
Wild Boar Sus scrofa	Invasive non-native species	Not of conservation importance	Records in local area. Not of conservation concern.	No
Fox	None	Local Importance (lower Value)	Records in local area. Not of conservation concern.	No
Bats	EU Habitats Directive Annex IV; Wildlife Act	National Importance	10km record overlapping Site and GCR.	Yes
Common Frog	EU Habitats Directive Annex V, Wildlife Act	National Importance	10km record overlapping Site and GCR.	Yes

Common name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
Common Lizard	Wildlife Act	Local Importance (higher Value)	10km record overlapping Site and GCR.	Yes
Invertebrates	Near Threatened - Endangered	Local Importance (higher Value)	Various invertebrates recorded in wind farm study area. Marsh Fritillary, Annex II, have been recorded in the 10km overlapping the Site. However, no suitable larvae habitat observed.	Yes

9.7.13 Aquatic Ecology Evaluation

The basis of impact assessment should be a determination of which ecological resources within the zone of influence of the proposed development and are of sufficient value to be material in decision making and therefore, included in the assessment (NRA, 2009a and CIEEM, 2018). Table 9-27, below, outlines the key receptors selected for assessment and the rationale for same; taken from NRA guidance (NRA, 2009a).

All watercourses are considered key receptors. This includes minor streams with no fisheries value due to downstream connectivity to high value watercourses.

Table 9-27: Aquatic Key Receptor Evaluations

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary	Key Receptor
A1	Shanballyane River	16S13	Site	Good salmonoid habitat; Brown trout via electrofishing; Q3-4 (moderate status); no other aquatic species or habitats of high conservation value	Yes
A2	Kilkeany River	16K22	Site	Good salmonoid habitat; brown trout via electrofishing; no other aquatic species or habitats of high conservation value	Yes
A3	Reanadampaun Commons Stream	16R10	Site	Good salmonoid habitat; brown trout via electrofishing; no other aquatic species or habitats of high conservation value	Yes

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary	Key Receptor
A4	Shanballyanne River	16S13	**Local**	Good salmonoid habitat; Brown trout & Atlantic salmon recorded via electrofishing; Q4 (good status); no other aquatic species or habitats of high conservation value	Yes
A5	Unnamed stream	n/a	**County**	Excellent salmonoid habitat; Brown trout & Atlantic salmon via electrofishing; no other aquatic species or habitats of high conservation value. No infrastructure belonging to the Proposed Development within the NIER_010 sub-basin.	No
B1	Skeheens Stream	17S01	Site	Moderate salmonoid habitat; brown trout via electrofishing; Q3-4 (moderate status); no other aquatic species or habitats of high conservation value	Yes
B2	Unnamed stream	n/a	Site	Moderate salmonoid habitat; brown trout via electrofishing; Q3-4 (moderate status); no other aquatic species or habitats of high conservation value	Yes
B3	Skeheens Stream	17S01	**County**	Excellent salmonid habitat; brown trout & Atlantic salmon recorded via electro-fishing; no other aquatic species or habitats of high conservation value	Yes
B4	Colligan River	17C01	**Local**	Not accessible during fisheries survey, Q4 (good status) during aquatic survey); no other aquatic species or habitats of high conservation value.	Yes
B5	Glennaneanemountain River	17G23	**Local**	Not accessible during fisheries survey, Q4 (good status) during aquatic survey); no other aquatic species or habitats of high conservation value.	Yes
B6	Colligan River	17C01	**Local**	Good salmonoid habitat; brown trout & Atlantic salmon via electrofishing; 4 (good status); no other aquatic species or habitats of high conservation value.	Yes
B7	Knockacaharna Stream	17K54	Site	Poor salmonoid habitat; Stickleback via electrofishing; no other aquatic species or habitats of high conservation value.	Yes
B8	Greenane Stream	17G05	Site	Poor salmonoid habitat; no fisheries value (no fish recorded); no other aquatic species or habitats of high conservation value.	Yes

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary	Key Receptor
B9	Colligan More Stream	17C11	**Local**	Poor salmonoid habitat, good lamprey habitat; European eel via electrofishing; no other aquatic species or habitats of high conservation value.	Yes
B10	Colligan River	17C01	**Local**	Moderate salmonoid habitat; Brown trout, Atlantic salmon, Sea trout & European eel recorded via electrofishing; Q4 (good status); no other aquatic species or habitats of high conservation value.	Yes
B11	Colligan River	17C01	**County**	Excellent salmonoid habitat, good lamprey habitat; Brown trout, Atlantic salmon, European eel, lamprey sp., flounder via electrofishing; Q4 (good status); no other aquatic species or habitats of high conservation value.	Yes
C1	Unnamed stream	n/a	Site	Poor salmonoid habitat; no fisheries value (no fish recorded); no other aquatic species or habitats of high conservation value.	Yes
C2	Ballynaguilkee Upper Stream	18B20	Site	Poor salmonoid habitat; no fisheries value (no fish recorded); no other aquatic species or habitats of high conservation value.	Yes
C3	Tooraneena Stream	18T04	Site	Good salmonoid habitat; brown trout via electrofishing; no other aquatic species or habitats of high conservation value.	Yes
C4	Clooncogaile Stream	18C13	Site	Moderate salmonoid habitat, moderate lamprey habitat; brown trout via electrofishing; no other aquatic species or habitats of high conservation value.	Yes
C5	Clooncogaile Stream	18C13	Site	Good salmonoid habitat; Brown trout, European eel, lamprey species via electrofishing; Q3-4 (moderate status); no other aquatic species or habitats of high conservation value.	Yes
C6	Tinalira Stream	18T05	Site	Dry at time of survey	Yes

9.8 Do Nothing Scenario

If the proposed development does not proceed, the 'do nothing' scenario is that the existing environment and key receptors identified are likely to remain as described previously. This assumes the continuation of existing agricultural activities at the main wind farm Site but excludes forestry operations (thinning, harvesting and replanting). Agricultural practices such as intensive farming, overgrazing and burning would continue.

If forestry management activities proceed, the plantation woodlands onsite will undergo changes as they are harvested and subsequently replanted. Although key ecological receptors can fluctuate in abundance and may be found in different locations during different stages of said forestry operations (e.g. post-felling, plantation habitats can be replaced by scrub habitats, which may cause animals that use wooded habitats to move to different locations in the forestry), overall, the habitats and species found at the project will likely remain as they are currently.

9.9 Potential Impacts on Biodiversity

9.9.1 Potential effects during the construction phase of the Project

9.9.1.1 European Sites

There are no designated European Sites within the proposed main wind farm Site, GCR or TDR, therefore no direct impacts are predicted during construction for these elements of the project.

An Appropriate Assessment Screening Report and Natura Impact Statement (NIS) have been prepared to provide the competent authority with the information necessary to complete an Appropriate Assessment for the Proposed Development in compliance with Article 6(3) of the Habitats Directive.

As per the EPA Guidance (2022), "a biodiversity section of an EIAR, should not repeat the detailed assessment of potential effects on European Sites contained in a Natura Impact Statement" but should "incorporate their key findings as available and appropriate".

The Stage One Appropriate Assessment Screening report concluded that:

- the Proposed Development, alone and in combination with other plans and projects, including the GCR and TDR is likely to have significant effect(s) on the Lower River Suir SAC, Blackwater River (Cork/Waterford) SAC, the Dungarvan Harbour SPA and Mid-Waterford Coast SPA when considered in light of the conservation objectives of the European Sites, given that the Proposed development is to be located within waterbody sub-catchments which drain to these European Sites.

A Natura Impact Statement was therefore prepared. The Natura Impact Statement identified potential for drainage from the Proposed Development to enter the Lower River Suir SAC, Blackwater River (Cork/Waterford) SAC, and the Dungarvan Harbour SPA. Mitigation is proposed within the NIS to ensure no potential for adverse effects on the integrity of these European Sites.

9.9.1.2 Natural Heritage Areas or Proposed Natural Heritage Areas

Please note, details on the findings of the AA Screening/NIS report are included here to provide a summary of findings for European Sites which overlap with some National Sites. This is not intended to replace assessment of National Sites in their own right, which is also provided in this section.

A downstream pNHA within the ZoI of the wind farm and/or GCR/TDR overlaps a European Site which was considered as part of the NIS.

- Dungarvan Harbour SPA/ pNHA (000663)

The GCR does not traverse any designated nature conservation Site. The SACs and SPAs/pNHAs described above are outside the footprint of the grid connection and therefore, no direct impacts are predicted.

The TDR traverse Grennyferry pNHA, however no works are proposed within or near this conservation Site.

Within 15 km of the wind farm Site there are a further seven pNHAs which are not within the ZoI of the development:

- Comeragh Mountains pNHA
- Nier Valley Woodlands pNHA
- Toor Wood pNHA
- Glenboy Wood pNHA
- Kilsheelin Lake pNHA
- Stradbally Woods pNHA
- Marlfield Lake pNHA

None of these Sites are overlapped by any European Site.

The potential for likely significant effects to aquatic conservation interests for the Dungarvan Harbour SPA from emissions to water (sediment/hydrocarbons) at construction stage could not be ruled out.

The aforementioned effects could not be ruled out on the basis of available scientific information, the proposed construction, operation and decommissioning of the Project, and best scientific knowledge, and as such it is submitted that an appropriate assessment is required with regard to the Sites identified above.

The NIS has assessed the potential effects on the integrity of the Dungarvan Harbour SPA in light of these Sites' conservation objectives and mitigation measures will be implemented to prevent such potential effects occurring.

In the light of the conclusions of the assessment which it shall conduct on the implications for Dungarvan Harbour SPA the competent authority is enabled to ascertain that the Proposed Development, in combination with any other plan or project, will not adversely affect the integrity of any of these European Sites.

There are no additional national Sites other than those detailed above within the potential ZoI of the GCR and TDR.

Potential Direct Impacts

The proposed footprint of the main wind farm Site is not within the boundaries of any designated nature conservation Site. All pNHAs/NHAs previously described are outside the footprint of the main wind farm Site and therefore, no direct impacts are predicted.

The GCR does not traverse any designated nature conservation Site. All pNHAs/NHAs previously described are outside the footprint of the grid connection, and therefore no direct impacts are predicted.

The TDR traverse Grennyferry pNHA, however no works (TDR PoIs) are proposed within or near this conservation Site.

A number of other pNHAs are in close proximity to the TDR, however none are overlapped by PoIs where additional works are required. These are discussed in Potential Indirect Impacts below.

Potential Indirect Impacts

Site

In considering the potential for indirect effects via the hydrological network, the following key information on water regions is of relevance; the main wind farm Site is situated within the Colligan_SC_010 (17_6) and Suir_SC_130 (16_3).

The Dungarvan pNHA (000663) is located c. 12.79 km south of the closest turbine, within the Colligan_SC_010 subcatchment. This pNHA is connected with the EPA-mapped hydrological network. The features of interest for this Site include the wetland and waterbirds. As hydrological effects are predicted, effects in this regard are predicted (alteration of plant habitat and food availability for waterbirds via hydrological changes).

Waterbirds are a feature of interest for Dungarvan Harbour pNHA. Due to distance from the proposed development, being outside the maximum foraging range for the species listed (see Table 9-7), no other indirect effects on wetlands or waterbirds arising from the proposed wind farm are predicted.

Grid Connection

The GCR originates within the main wind farm Site and intersects an unnamed tributary of the Skeheen stream outside the main wind farm Site (proposed crossing method is by horizontal directional drilling under the stream bed). The route crosses the Colligan River over and existing road bridge before entering the Dungarvan 110 kV substation where it terminates. Both these crossings are hydrologically connected to the Dungarvan Harbour pNHA. Himalayan Balsam are also present at the Colligan River crossing, and works could lead to the spread of this invasive species downstream into the pNHA.

As hydrological effects are predicted, effects in this regard are predicted (alteration of plant habitat and food availability for waterbirds via hydrological changes and spread of invasive species). Due to the works being small scale and predominantly within the road; any habitat damage/dust deposition will be localised and temporary, and lands will be reinstated, no other indirect effects on wetlands or waterbirds are predicted.

Turbine Delivery Route (TDR)

Additional works at 'PoIs' along the TDR will be comprised of the removal of vegetation, placement of load bearing surfaces (aggregate). Lowering of walls/fences and removal of street furniture (and associated reinstatement).

As the PoIs are not within or adjacent to any designated Site, no effects are predicted for pNHAs or NHAs to arise from works at PoIs, due to lack of hydrological and ecological connectivity with these Sites.

9.9.1.3 Habitats and Flora

Potential Direct Impacts

Wind Farm Site

Table 8-32 details the areas covered by all habitats within the habitat survey study area. Habitats which are not subject to loss are not discussed further in terms of habitat loss.

Table 9-28 below summarises the habitat loss which will result from the Proposed Development (within the Wind Farm Site). Areas of habitat loss are depicted in Figure 8-9.

Table 9-28: Habitat loss (habitat areas) within the main wind farm Site

Habitat	Selected as key ecological receptor	Area within the Proposed Development Boundary (ha)	Area of habitat to be lost (ha)
Improved Agricultural Grassland (GA1)	No	10.09	0.11
Wet grassland (GS4)	No	20.57	4.49
Dense bracken (HD1)	No	14.17	1.73
Dense bracken/ scrub mosaic (HD1/WS1)	Yes	0.93	0.10
Dry siliceous heath (HH1)	Yes	51.83	7.25
Wet heath (HH3)	Yes	57.99	5.94
Mixed Broadleaved Woodland (WD1) (Plantation)	No	0	0
Conifer woodland (WD4)	No	5.89	5.4
Exposed siliceous rocks (ER1)	No	2.83	0.56
Total		**190.30**	**25.57**

The construction of access roads, temporary compound, on-site substation, foundations and hard standings as well as the excavation of cable trenches will result in a degree of habitat damage and loss. The habitat loss will be the total area covered by the access tracks (new sections and upgrading of existing tracks), plus the footprint associated with each of the 10 proposed turbines (foundations, hard standings, note the turbines have been positioned such that associated bat felling buffers do not require any tree removal) and all other wind farm infrastructure.

The most abundant habitat type within the Proposed Development Boundary is wet heath (57.99 ha). This is followed by dry siliceous heath (51.83 ha) and wet grassland (20.57 ha).

Approximately 0.11 ha of Improved agricultural grassland (GA1) will be lost within the proposed development footprint. Due to its artificial character and intensive management, GA1 has low intrinsic value in ecological terms and as such is not considered a key ecological receptor. Wet grassland (GS4) is also species poor and heavily grazed onsite and is not a key ecological receptor. Approximately 4.49 Ha of GS4 will be lost within the proposed development footprint.

A range of semi-natural grassland habitats and mosaics are present in Proposed Development Boundary. In terms of collective loss of all heathland habitats, c. 13.19 ha of this grouping will be lost. The most abundant type, wet heath, will be subject to loss of c. 5.94 ha. It is noted that there will be no loss of Annex I- linked wet heath, with the heath onsite heavily burned and grazed. A Long-term Slight Reversible effect at the Local scale is predicted for this habitat. Dry siliceous heath will be subject to loss of c. 7.25 ha. A Long-term Slight Reversible effect at Local scale is predicted.

The only woodland habitat loss will apply to conifer plantation, with 5.4 ha of this habitat lost. Commercial conifer plantation, a monoculture commercial crop, is not a key receptor however, due to its artificial nature and low floristic diversity. It has low intrinsic value in ecological terms and as such is not a key ecological receptor.

Dense bracken, with 1.73 ha of this habitat lost, is not a key receptor, due to its low floristic diversity. The only exposed siliceous rocks habitat loss will apply to the hardstand area of T04, with 0.56 ha of this habitat type lost. This habitat is of low floristic diversity due to burning and grazing and is not considered a key ecological receptor.

Dense bracken/ Scrub mosiac is also present within the proposed footprint, with 0.1 ha of this habitat type to be lost. This will be due to clearance of the bank vegetation for the clear span bridge crossing. This habitat mosaic will be subject to Permanent Imperceptible Irreversible effects at the Local scale.

Approximately 150 m of stone wall/hedgerows will be lost within the development footprint at the Site with an additional 100m to be removed at TDR PoI 26. This is considered to translate into a Long-term Moderate Reversible effect at the Local scale.

The upper reaches of the Skeheens are intersected by an access track at the entrance to the Site. The river at this point flows over a concrete ford. It is proposed to remove the concrete on the river bed here, replace it with gravels / boulders, and install an open-bottomed box culvert. Considering the small localised nature of enhancement of fisheries value, a Long-term Imperceptible Reversible effect at the Local scale is predicted.

Upland eroding river represented by the River Colligan is intersected by a section of proposed access track; however, in-stream habitat loss will not occur at this location as the bridge will not directly affect the stream bed. The crossing at this location will be a clear-span bridge, the footings of which will be set back from the river bank. As such riparian habitat can be retained. As such no impact in terms of aquatic / riparian habitat loss will occur at this location. Potential effects on water quality are discussed in Chapter 12 – Hydrology and Water Quality.

Potential Indirect Impacts

Deposition of dust could affect adjacent terrestrial habitats by inhibiting plant growth and contributing to the sediment load in watercourses. The Air Quality and Climate Chapter (Chapter 7) identified the wind farm Site as a major construction Site, which could result in the sedimentation of watercourses occurring up to 100m from the source, with PM10 deposition and effects on vegetation occurring up to 25m (potential for reduction in photosynthesis through shading or chemical interference; potential for adverse reactions if alkaline dust enters water; potential for alterations to soil chemistry). A *Short-term Moderate Reversible* effect at the *Local scale* in terms of vegetation effects is predicted.

The deposition of dust in watercourses contributing to siltation of the hydrological network is identified as a *Short-term Not Significant Reversible* effect at the Local scale. Potential effects on the aquatic receiving environment are considered in detail in Section 9.9.1.6.

The dewatering of excavations for turbine base construction could result in the drying out of surrounding habitats, including wet heath and wet grassland. As dewatering is a temporary measure, *Temporary Slight-Moderate Reversible* effects are predicted at the *Local scale*.

Grid Connection

Indirect impacts on habitats and flora include the spread of invasive species which could be distributed during construction works. One Third Schedule listed invasive species, Himalayan Balsam, was recorded along the grid connection route. Construction works along GCR could affect the existing environment by facilitating the spread of Himalayan balsam. It is considered that prior to mitigation a *Long-term Moderate Reversible* effect at the *County scale* could arise.

The habitat loss within the wind farm Site associated with the GCR is encompassed within the footprint of proposed access tracks. The section along public roads may result in the temporary loss of limited sections of dry meadows and grassy verges along road edges. Any potential effects on hedgerows and/or treelines will be limited to branch trimming and will not decrease the overall value of these habitats.

Two Upland/eroding Rivers and a Lowland/depositing River are within the proposed GCR footprint; however, habitat loss will not occur as these habitats will be traversed via existing crossing structures (minor watercourses) or HDD (EPA mapped rivers). The proposed entry and exit points and associated work areas are within the public road corridor.

The proposed crossing methodology for the crossing of the unnamed tributary of the Skeheens Stream is horizontal directional drilling (HDD) which will avoid instream works and thereby avoid direct impacts on upland/ eroding Rivers. The predicted impact to habitats due to construction of the grid connection is predicted to be a *Short-term Imperceptible Reversible* effect at the Local scale.

Turbine Delivery Route

Habitat loss associated with the TDR is limited to laying of temporary hardcore along road verges and grassed areas, trimming of vegetation, hedgerow cutting and tree trimming. The habitats at TDR PoIs are largely made up of buildings and artificial surfaces, with adjacent vegetated habitats including hedgerows, treelines, ornamental non-native shrub, amenity grassland, dry meadows and grassy verges, stone walls and other stonework and drainage ditches.

Where minimal hedgerow/vegetation trimming, trimming or cutting of ornamental/non-native shrub, and temporary placement of hardcore is required, a *Short-term Imperceptible Reversible* Local effect will occur.

Potential Indirect Impacts

Deposition of dust could affect adjacent terrestrial habitats by inhibiting plant growth and contributing to the sediment load in watercourses. The Air Quality and Climate Chapter (Chapter 7) identified the wind farm Site as a major construction Site, which will result in the sedimentation of watercourses occurring up to 100m from the source, with PM10 deposition and effects on vegetation occurring up to 25m (potential for reduction in photosynthesis through shading or chemical interference; potential for adverse reactions if alkaline dust enters water; potential for alterations to soil chemistry). A *Short-term Moderate Reversible* effect at the *Local scale* in terms of vegetation effects is predicted.

The deposition of dust in watercourses contributing to siltation of the hydrological network is identified as a *Short-term Not Significant Reversible* effect at the Local scale.

9.9.1.4 Mammals (excluding Bats)

Potential Direct Impacts

The construction of new tracks, turbine hardstanding areas and substation will lead to a permanent loss of approximately 42.5 Ha of varied habitats. No mammal resting or breeding places were recorded within the Proposed Development boundary or adjacent lands. An otter spraint was observed in the Finisk River c. 2.3km dowsntream of the GCR crossing point during fisheries surveys.

The relatively small-scale loss of habitat at the wind farm Site will not result in a significant negative impact on the distribution of local protected mammal fauna including Pygmy Shrew, Irish Hare, Irish Stoat, and Hedgehog.

Any unmitigated impacts to these species will be a *Short-term Imperceptible Reversible* Impact at the *Local Scale*.

No effects on mammals (excluding bats) are envisaged as a result of habitat loss along the TDR or grid connection route as the habitats are highly modified/disturbed and due to the limited footprint of works.

Potential Indirect Impacts

The construction phase of the development may result in temporary disturbance to fauna, however as this will be temporary in duration, and given the habitats present in the wider environment, affected mammals will be able to move to other locations in the wider area until the disturbance has ceased. As such, the potential exists for a *Short-term Significant Reversible* effect on badger at the *Local scale*, prior to mitigation.

Prior to mitigation, there is potential for indirect effects to otter through the transport of pollutants and/or contaminants to downstream watercourses which could negatively affect the aquatic animals such as salmonids on which otter depend. These effects could occur as the result of felling and/or construction activities. As such, any effects on otter prior to mitigation are predicted to be *Short-term Significant* at the *Local scale*. and Reversible.

Considering the non-invasive nature of works proposed at TDR PoIs intersecting rivers, there will be no indirect effects on otter during TDR accommodation works.

9.9.1.5 Bats

Wind energy developments and associated infrastructure present a number of potential construction-phase impacts to bats, namely:

1. Damage of or disturbance to roost Sites during construction
2. Loss or fragmentation of habitat
3. Disturbance to foraging bats
4. Lighting

The impacts listed above are most relevant to the construction phase of the project. The following provides an assessment of the potential impacts on bats during the construction phase.

Potential Direct Impacts

Wind Farm Site

Direct effects on bats during construction include vegetation removal, resulting in a loss of potential roost Sites in mature trees.

There are no existing buildings in or within the vicinity of the Site, with the proposed construction corridor being largely through open heathland and conifer plantation. Throughout the proposed construction corridor vegetation clearance will be required to facilitate access and construction activities, including creating gaps through the conifer plantation and the removal of scrub along the Colligan River for the watercourse crossing. No potential roosting features were identified in any of these locations.

Felling is proposed for the following areas:

- The removal of conifer plantation for the access tracks at the entrance.
- Scrub removal to facilitate the watercourse crossing between T09 and T12.

The assessment of negligible potential for roost Sites within conifer plantation likely to be affected by vegetation clearance means that direct effects on roosting bats is highly unlikely within this habitat type where it occurs along wind farm access tracks. The scrub within the likely clearance areas around proposed watercourse crossing locations was classed as supporting negligible PRFs and therefore direct effects on roosting bats is considered unlikely across the proposed construction area.

Therefore, no impacts on roosts due to the removal of these trees in the absence of mitigation are envisaged.

Grid Connection

No direct effects to trees with low bat roosting potential along the GCR are predicted, as these trees will be retained.

Due to the proposed crossing methodology (HDD) of new watercourse crossings, and the negligible potential for roosting bats of the existing watercourse crossings, no direct effects to roosting bats are anticipated.

Turbine Delivery Route

All trees within the proposed felling footprint at TDR PoIs are of negligible bat roosting potential. Therefore, no direct effects to roosting bats are anticipated.

Potential Indirect Impacts

Wind Farm Site

Potential secondary effects on bats resulting from construction works are limited to the loss of foraging and commuting habitats/features utilised by bats, and disturbance. While no bat roosts were identified within the study area during roost surveys, the static detector surveys identified potential roosting bats nearby. While these roosts are likely outside the Site, the bats from these roosts may use the Site for foraging and commuting.

Disturbance of roosting and foraging bats through lighting impacts was considered; however, there will be no regular night-time working at the Site and as such no additional lighting will be required for sustained periods during the construction phase of the works. Construction operations will generally be restricted to between 08:00 hours and 19:00 hours Monday to Saturday. Any potential night-time activities will be limited to occasional delivery of turbine components and pre-dawn starts for turbine foundation pours.

In addition, the species utilising this Site most – Leisler's bat, soprano pipistrelle and common pipistrelle – are less sensitive to light pollution than the less commonly recorded species –brown long-eared bats and Myotis species.

The Site holds a number of hedgerows, treelines, and streams that are known to be used by foraging and commuting bats. The baseline study shows that linear features, the conifer plantation and streams are active foraging grounds for bats. These features are of particular importance to bats which are heavily reliant on features for commuting and foraging. Vegetation removal as a result of the proposed felling detailed in the previous section will also affect bat foraging patterns within the Site, particularly given the greater levels of activity seen in conifer plantations (including edges and firebreaks) which will require felling for proposed access tracks. However, the access tracks traverses through dense areas of conifer plantation, and these access tracks would lead to an increase in linear features, forestry edge, after felling.

The removal of the scrub along the Colligan stream for the proposed watercourse crossing will lead to a reduction in the quality of the foraging habitat, however, the prominent linear feature, the stream itself, will not be removed. Also the footings for the bridge crossing will be set back from the river bank allowing the retention of some riparian vegetation. The removal of vegetation capable of disrupting connectivity within the Site is not likely to occur at turbine locations, as they are all located in open habitats.

In the absence of mitigation, vegetation removal has the potential for indirect effects on bats to be *Long-term Slight* and *Reversible* at the *Local scale*.

Grid Connection

Mature ash trees with dense ivy cladding are present along the GCR at eight locations. These trees have low bat roosting potential (potential to host individuals or low numbers of bats) but if bats were present they could potentially be subject to disturbance from works.

Considering the low roosting potential of the trees align the GCR and limited duration and magnitude of noise/vibration, in the absence of mitigation the potential for disturbance is considered Temporary Slight Reversible at the Local level.

Turbine Delivery Route

Low potential PRF were noted in two semi-mature Ash trees at TDR PoI 12, however the surrounding habitats, traffic disturbance and poor connectivity reduce the likelihood of bats (individuals or low numbers) roosting here. Considering the low roosting potential of this tree, in the absence of mitigation the potential for disturbance is considered *Temporary Imperceptible Reversible* at the at the *Local level*.

9.9.1.6 Aquatic Ecology

Wind farm developments, as with all major construction projects, have the potential to have significant negative effects on aquatic habitats and the key ecological receptors in the aquatic environment. Wind farm projects are often located near the sources of streams or rivers. These reaches are generally minor watercourses and are therefore potentially vulnerable to even relatively small pollution events. Such areas can also be important salmonid spawning and nursery areas; or can act as vectors of pollution to downstream areas. Minor headwaters and upper reaches can be of importance to protected or ecologically important features downstream.

The impacts of wind farm developments on aquatic areas are generally focused on the construction phase.

The proposed development will require clearance of trees/vegetation, to build Site access roads, cable trenches and provide Site drainage. These operations can affect the quality of habitats present for aquatic organisms. Wind farm construction can increase suspended solids loading of watercourses, alter recharge or drainage/runoff patterns and change surface water quantity thereby increasing flood risk for downstream watercourses, eroding watercourse banks and edges, widening channels and altering stream beds.

The potential impacts of the proposed wind farm development are outlined below for the construction phase of the project. These are the potential effects that could potentially occur in the absence of mitigation measures.

Wind Farm Site

The watercourses on the proposed Wind Farm Site itself are all small 2nd and 1st order streams. The survey Sites on the watercourses draining the proposed wind farm Site are in the upper reaches of the Colligan River, and Nier River. Of the total of 16 survey Sites on these two watercourses, one Site on the Colligan River was unsuitable for a fishery survey as it was semi-dry and heavily tunnelled and therefore of very little fisheries value. However, all other survey Sites on these two watercourses had greater fisheries value.

Direct Impacts

The proposed wind farm Site is drained by the Colligan River, and Nier River. These are located in the Colligan-Mahon (17) and the Suir (16) catchment.

There is potential for releases of suspended solids and other substances associated with upgrading, realigning and construction of access roads within the Site and also during the excavation work associated with these types of works. Installation, upgrading and/or extension of an internal road network on a wind farm Site and excavations can result in increased silt runoff. Vegetation clearance will be required along with tree felling, potentially resulting in the release of suspended solids. Suspended solids in even quite small quantities may have a serious effect on the spawning Sites of salmonids. Good spawning habitat occurs on the upper reaches of the Colligan River and the Nier River.

The proposal also includes three stream crossing at the wind farm Site. A culvert is proposed located upstream of Site B4, which was inaccessible at the time of the fisheries surveys, on the first order Colligan River north of T09. A clear span bridge is proposed located immediately downstream of Site B4, on second order Colligan River between T09 and T12. B6, located downstream from the stream crossing had salmon and brown trout during fisheries surveys. There may be some fisheries habitat between Sites B4 and B6. The third crossing point (east of the wind farm Site) which will be a box culvert, is located on the second order Skeheens Stream, located downstream of Site B1. This stream only had brown trout during fisheries surveys, moderate salmonid habitat and poor eel habitat while being unsuitable for lamprey.

Engineering works in the vicinity of streams and at stream crossings can also impact directly on physical habitat, for example nursery areas for fish. Permanent loss of aquatic habitats can also occur where access roads are constructed over or in close proximity to streams/rivers. Obstruction to upstream movement of fish, particularly salmon and trout, due to construction of culverts can also potentially occur.

'Improved' drainage of the Site can potentially result in increased erosion of nearby streams and may result in lower water levels in dry weather, which will reduce the habitat available to fish. Any operations which result in loss of sediment will also result in increased nutrients being released from the soil. This has the potential to cause eutrophication of streams thereby lowering the capacity of the streams to support fish and invertebrate fauna. The construction of the wind farm is not expected to significantly affect the drainage regime on the Site, with direct impacts affecting watercourses and aquatic ecology minimised via the protection of water quality within the Site. The Site surveys also revealed that the watercourses draining this area are being affected by background water quality issues, such as agricultural practises and channel maintenance. Potential direct construction phase effects on aquatic ecology, in the absence of mitigation, are assessed as being Significant Negative, Short-term, Reversible and in the local context. Mitigation is required to avoid potential effects.

Indirect Impacts

The most likely potential indirect effects during the construction phase of the wind energy development on receiving watercourses and aquatic habitats arises indirectly via impacts affecting water quality, such as accidental releases of silt laden runoff. Other potential impacts affecting aquatic ecology during the construction phase could also occur as a result of accidental spillage of cement or hydrocarbons stored on Site impacting upon water quality. Waste from on-Site toilets and wash facilities could also potentially have an effect on aquatic ecology.

Indirect water quality impacts can potentially occur during the construction of access roads, the laying of cable route as well as any works required to facilitate the indicative turbine delivery route. These works could result in silt run-off, pollution events originating from the Site works and machinery used, which could indirectly affect areas elsewhere in the catchments. These indirect impacts could give rise to the potential for impacts affecting fish and fisheries, as well as aquatic invertebrate communities within the study area.

Any engineering works which cause runoff of sediments can also increase the levels of nutrients in receiving streams. This can result in the enrichment or eutrophication of the affected streams and catchment areas further downstream, and a possible change in overall water quality status. Suspended solids or sediment in a river can have significant negative effects on aquatic invertebrate and instream flora. Atlantic salmon, listed on Annex II of the EU Habitats Directive (92/43/EEC) found occurring downstream of the proposed wind farm Site in the Colligan River and Nier River.

There is also a risk that machinery or materials imported onto the Site could act as a vector for introducing or dispersing non-native invasive species. Potential indirect construction phase effects on aquatic ecology, in the absence of mitigation, are assessed as being Significant Negative, Short-term and in the local context. Mitigation is required to avoid potential effects.

Grid Connection Route

The GCR crosses the Colligan-Mahon and the Blackwater (Munster) catchment. The survey Sites are located on the Colligan River and Finisk River. The survey Sites, B3 and B11, in the Colligan-Mahon catchment, are located within the vicinity of the GCR watercourse crossings. Annex II species recorded at B3, salmon, and B11, salmon, Lampetra sp. and eel.

The survey Site C7, in the Blackwater (Munster) catchment, is located within the vicinity of the GCR watercourse crossings. Annex II species were recorded at C7, salmon and eel. This river flows into the Blackwater [Munster] downstream.

Direct Impacts

The grid connection route crosses an unnamed stream (a tributary of Skeheens Stream) and the lower reaches of the Colligan River. These Sites are all in the Colligan-Mahon Catchment. The route also crosses the up Ballynaguilkee_lower, which is within the Blackwater (Munster) catchment.

There is potential for releases of suspended solids and other substances associated with these types or works. Vegetation clearance will be required as well as some excavations works. These activities could result in increased silt runoff. Suspended solids in even quite small quantities may have a serious effect on the spawning Sites of salmonids.

Engineering works in the vicinity of streams and at stream crossings can also impact directly on physical habitat, for example nursery areas for fish. There is salmonid and eel nursery and spawning habitats at some of these Sites. Salmon, lamprey and eels are present along the proposed grid connection route. Potential direct construction phase effects on aquatic ecology, in the absence of mitigation, are assessed as being Significant Negative, Short-term, Reversible and in the local context. Mitigation is required to avoid these potential effects. As discussed, there are sensitive ecological receptors at these locations. There will be no instream works as part of the AGCR.

Indirect Impacts

The most likely potential effects during the construction phase of the grid connection route on receiving watercourses and aquatic habitats arises indirectly via impacts affecting water quality, such as accidental releases of silt laden runoff and vegetation removal resulting in erosion. There are sensitive ecological receptors downstream, with salmon, lamprey and eels are present along the proposed GCR.

Three EPA-mapped watercourses will be crossed. Horizontal drilling will be employed to install grid connection cables under the Skeheens tributary riverbed. Where existing culverts are in place ducts will be installed over or under the existing culvert.

The grid connection will be underground for its entire length. Impacts could occur from the associated excavation works. These works could result in silt run-off, pollution events originating from the Site works and machinery used, which could indirectly affect areas elsewhere in the catchment. These indirect impacts could give rise to the potential for impacts affecting fish and fisheries, as well as aquatic invertebrate communities within the study area.

Any engineering works which cause runoff of sediments can also increase the levels of nutrients in receiving streams. This can result in the enrichment or eutrophication of the affected streams and catchment areas further downstream, and a possible change in overall water quality status. Suspended solids or sediment in a river can have significant effects on aquatic invertebrate and instream flora. Aquatic species listed on Annex II of the EU Habitats Directive (1992) occurring within the study area include salmon, eel and lamprey. Potential impacts affecting these species could occur as a result of water quality impacts arising through accidental pollution events including the increased erosion which may give rise to elevated suspended solids and siltation effects. There is also floating river vegetation at the lower reaches of this river. This is potentially Annex I habitat *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260), noted at three of the Sites along the Colligan River. This habitat can be effected by water quality deterioration, increased siltation and invasive non-native species.

There is also a risk that machinery or materials imported onto the Site could act as a vector for introducing or dispersing non-native invasive species. Potential indirect construction phase effects on aquatic ecology, in the absence of mitigation, are assessed as being *Significant Negative, Short-term Reversible* and in the *local context*. Mitigation is required to avoid potential effects.

Turbine Delivery Route

Direct Impacts

The TDR crosses several watercourses. It crosses through the Suir catchment, over the SMARTSCASTLE_WEST, Smartscastle (Stream), Blackwater [Kilmacow], Suir, GLENGRANT, MOUNT_CONGREVE, Ballymoat (Stream), Whelanbridge (River), Dawn(River), BALLYSHONOCK and BALLYHUSSA waterbodies. It crosses Colligan-Mahon catchment, over the Mahon, LEMYBRIEN, Tay, ADRAMONE_MORE, PAULSACRES, GORTAVICARY, Dalligan, KNOCKAHAVAUN, SKEHANARD, CLONANAGH, BALLYCONNERY_UPPER, Colligan, GREENANE 17, KNOCKACAHARNA, and an unnamed tributary of Skeheens Stream waterbodies. It crosses Blackwater (Munster) catchment, over the CLOONCOGAILE, TOORANEENA, and BALLYNAGUILKEE_UPPER (including an unnamed tributary) waterbodies.

Works proposed at TDR PoIs near watercourses are limited to laying of load bearing surface and road sign removal at PoI 1 (Bellview Port Exit, Waterford), PoI 2 (N29 Slieverue Roundabout), and PoI 6 (N26 / N72 Junction), removal of utility pole and vegetation at PoI 15 (R672 West of Colligan) PoI 17 (Bryan's Cross Roads) and PoI 18 (Sweep Crossroads), and reprofiling of the verge and the removal of trees /hedgerows at PoI 12 (R672 Colligan), PoI 14 (R672 North of Garrycline), PoI 16 (R672 Hickeys Cross Roads), PoI 23 (West of Knockeen) and PoI 25 (Approach to Proposed Site Entrance). Potential direct construction phase effects on aquatic ecology, in the absence of mitigation, are assessed as being Significant Negative, Short-term, Reversible and in the local context.

Indirect Impacts

The most likely potential effects during the construction phase of the proposed TDR on receiving watercourses and aquatic habitats arises indirectly via impacts affecting water quality, such as accidental releases of silt laden runoff and vegetation removal resulting in erosion. These indirect effects would occur downstream from the source of the impact. There are sensitive ecological receptors downstream of TDR PoIs 1, 2 and 25 including the River Suir. Other potential impacts affecting aquatic ecology during the construction phase could also occur as a result of accidental spillage of hydrocarbons used by machines to fell trees and clear vegetation as well as for excavation works.

To facilitate the TDR, vegetation clearance and tree felling will occur. These works could result in silt run-off, pollution events originating from the Site works and machinery used, which could indirectly affect areas elsewhere in the catchment. These indirect impacts could give rise to the potential for effects on fish and fisheries, as well as aquatic invertebrate communities and habitats within the study area.

Any engineering works which cause runoff of sediments can also increase the levels of nutrients in receiving streams. This can result in the enrichment or eutrophication of the affected streams and catchment areas further downstream, and a possible change in overall water quality status. Suspended solids or sediment in a river can have significant negative effects on aquatic invertebrate and instream flora. Aquatic species listed on Annex II of the EU Habitats Directive (92/43/EEC) occurring within the study area include salmon, eel. Potential impacts affecting these species could occur as a result of water quality impacts arising through accidental pollution events including increased erosion which may give rise to elevated suspended solids and siltation effects. These species are located in the River Colligan, River Finisk and the River Suir.

There is also a risk that machinery or materials imported onto the Site could act as a vector for introducing or dispersing non-native invasive species. Potential indirect construction phase effects on aquatic ecology, in the absence of mitigation, are assessed as being *Slight Negative, Short-term* and in the *local context*. Mitigation is required to avoid potential effects.

9.9.1.7 Other Species

Common Frog and lizard may be directly affected through habitat loss during construction, though this is considered unlikely to be significant due to the presence of similar habitats not impacted by the proposed development.

Common Frog may also be indirectly affected through sediment or pollution run off into waterbodies. It is considered possible that any unmitigated impacts on water quality could be ***Significant***. Interference with actively used amphibian breeding habitat during breeding periods could result in a ***Short-term Significant Reversible Impact***.

Some invertebrate habitat will be directly lost through land take across various habitats. Due to the limited amount of habitat loss (23.6 Ha or 3.4 % of the combined total for all types), a ***Short-term Not Significant Impact*** is predicted for invertebrates as a general group.

9.9.2 Potential effects during the operational phase of the Project

The operational phase will have lower potential for impacts on the local ecology than the construction phase. The main potential operational impacts of the project will arise from the rotation of the blades of the wind turbines and, to a lesser extent, from vehicular movement in relation to wind turbine maintenance along access roads. The rotation of the blades may result in displacement of local wildlife due to the avoidance by birds of the area around the turbines. In addition, the rotating blades present a potential collision hazard to local bird and bat species. The rotation of the blades of the turbines may also result in increased noise levels which may also cause disturbance to local wildlife. There is also potential for landscaping maintenance to cause disturbance to wildlife.

9.9.2.1 European Sites

A Natura Impact Statement (NIS) has been prepared for the proposed development. The NIS addresses potential impacts on European Sites. The Stage One Appropriate Assessment Screening report concluded that view of best scientific knowledge and on the basis of objective information and in light of the conservation objectives of the relevant European Sites, that the proposed project at operational stage, individually or in combination with other plans and projects, would not be likely to have a significant effect on any European Sites.

9.9.2.2 Natural Heritage Areas or Proposed Natural Heritage Areas

One pNHA within 15 km of the wind farm are overlapped by European Sites, namely Dungarvan Bog SPA (004032)/pNHA (000663).

Waterbirds are the key consideration in terms of potential effects on Dungarvan Harbour pNHA during the operation phase. Due to the low levels of records for these species within the flight activity study area over 2 years of surveys, and the proposed Site being outside the core range of the SCI species, any barrier effect to migrating birds will be Imperceptible and Not Significant. As such no likely significant operational effects were identified for Dungarvan Bog SPA (004032)/pNHA (000663).

No operational phase impacts are predicted for the remaining pNHAs within 15 km of the wind farm, namely Comeragh Mountains pNHA, Nier Valley Woodlands pNHA, Toor Wood pNHA, Glenboy Wood pNHA, Kilsheelin Lake pNHA, Stradbally Woods pNHA and Marlfield Lake pNHA.

It is not anticipated that operation of the TDR route will be required during the operational phase of the project, unless in the unlikely event a turbine component is required to be transported to the Site for replacement or repair. In this case, there is potential for similar impacts to the construction phase but at a reduced scale.

Therefore, no impacts to any national Sites (pNHAs or NHAs) Sites are envisaged during the operational phase.

9.9.2.3 Habitats and Flora

The habitats within turbine bat buffers will be maintained as treeless during the lifespan of the wind farm. This will have the effect of halting succession to scrub and woodland, instead maintaining the existing short-sward grassland and heath habitats that currently exist. This is in keeping with the current landuse whereby these areas are subject to sheep grazing and as such are prevented from succession due to grazing. As such this will have a Long-term Imperceptible Reversible Impact.

9.9.2.4 Mammals (excluding bats)

The level of human activity associated with the maintenance of the operational windfarm will be infrequent and minimal given that it will be monitored remotely. The proposed wind farm is also located within an agricultural and forestry area, so there is already disturbance caused by human and machinery activity associated with management. As a result, any negative impact to terrestrial fauna as a general group during the operational phase of the windfarm is deemed to be a Long-term Imperceptible Reversible Impact.

9.9.2.5 Bats

In order to undertake an assessment of the potential impact of the proposal on bats, it is important to take into account not only what bat species and numbers are present on the Site, but also how susceptible those species are to impacts from wind turbines and how susceptible populations of the species occurring are to the resultant effects in an Irish context.

SNH (2021) provides guidelines for conducting risk assessment for bat species occurring on wind farms. The assessment of the Coumnagappul Wind Farm Site draws on several sources to apply the SNH guidance in the Irish context, including Marnell et al. (2019) and Wray et al. (2010) for the bat population assessments (Table 9-29). For collision risk of bat species to wind turbines (see Table 9-30) SNH et al. (2021) is used.

As shown in Table 9-30, Leisler's bats and Nathusius' pipistrelles are considered as high risk of direct effects from with wind turbines, as they regularly fly in the open and at heights, which may put them at risk of collision or barotrauma from turbines. The SNH et al. (2021) guidelines consider both common and soprano pipistrelles to be at high risk of direct impacts from wind turbines; based on a study investigating bat collisions at wind farm Sites across the UK (Mathews et al, 2016), which found both these species to be amongst the most commonly recorded casualties during searches of turbines. Myotis species, brown long-eared bats and lesser horseshoe bats are considered as low risk based on behaviour and foraging techniques of these species.

Four species of bat, Leisler's bat, common pipistrelle, soprano pipistrelle and Natterer's bat, as well as unidentified Myotis bats, were recorded at height. Leisler's was the most frequent species on Site accounting for 97.5% of recordings. According to Natural England (2014) common pipistrelle (1.3%) and soprano pipistrelle (0.7%) are a medium turbine collision risks whilst Leisler's bat is a high collision risk. Leisler's were the most common species recorded (97.5% of all recordings). However due to a 81 m diameter buffer zone around turbines (tree-free areas) and the limited availability of roosting habitat, the impact to bats is ***near certain*** to be a ***long term slight impact***.

Based on population status in Ireland and risk level in relation to adverse interactions with turbines, particular attention should be paid to Leisler's bats and Nathusius' pipistrelles, which are believed to be susceptible to impacts from wind turbines and have populations of high population vulnerability, in the context of wind turbine developments in Ireland. Leisler's bats are generally considered to forage habitually at height in more open landscapes and are less associated with habitat features than other bat species. Nathusius' pipistrelles are known to be migratory and may fly at height during migration.

For this assessment we adhere to SNH et al. (2021) guidance, under which common and soprano pipistrelles are considered to have medium population vulnerability to wind farm developments in Ireland due to behaviour in relation to turbines. Whiskered bats are also classed as moderately vulnerable, due to the scarcity range in Ireland. Lesser horseshoe bats, 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, being rarer species (populations of 10,000 to 100,000) exhibiting low collision risk with turbines.

Table 9-29: Ecological evaluation of the bat species recorded during the bat survey (CIEEM Guidelines, 2021) and "Bat Risk" in relation to Wind Turbines (SNH 2021 and EC 2020).

Species	Rarity in Ireland Wray *et al.* (2010)	Irish status (Marnell *et al.*, 2019)
Daubenton's bat *Myotis daubentonii*	Rarer (Frequent/widespread)	Least concern
Whiskered bat *Myotis mystacinus*	Rarest (Scarce/widespread)	Least concern
Natterer's bat *Myotis nattereri*	Rarer (Scarce/widespread)	Least concern
Leisler's bat *Nyctalus leisleri*	Rarer (Frequent/widespread)	Least concern
Common pipistrelle *Pipistrellus pipistrellus*	Common (Widespread)	Least concern
Soprano pipistrelle *Pipistrellus pygmaeus*	Common (Widespread)	Least concern
Nathusius'pipistrelle *Pipistrellus nathusii*	Rarer (Rare/restricted)	Least concern
Brown long-eared bat *Plecotus auritus*	Rarer (Frequent/widespread)	Least concern
Lesser horseshoe bat *Rhinolophus hipposideros*	Rarer (Rare/restricted)	Least concern

Table 9-30: Level of collision risk to individual bats from wind turbines

Collision Risk		
Low risk	**Medium risk**	**High risk**
Myotis species Brown long-eared bat Lesser horseshoe bat		Leisler's bat Nathusius' pipistrelle Common pipistrelle (SNH, 2021) Soprano pipistrelle (SNH, 2021)

Site Risk Assessment & Impact Assessment:

According to SNH (2019; 2021) wind farms can affect bats in the following ways:

1. Collision mortality, barotrauma and other injuries (although it is important to consider these in the context of other forms of anthropogenic mortality)
2. Loss or damage to commuting and foraging habitat, (wind farms may form barriers to commuting or seasonal movements, and can result in severance of foraging habitat);
3. Loss of, or damage to, roosts;
4. Displacement of individuals or populations (due to wind farm construction or because bats avoid the wind farm area).

According to SNH (2019; 2021) to ensure that bats are protected by minimising the risk of collision, an assessment of impact at a Site requires an appraisal of:

- The level of activity of all bat species recorded at the Site assessed both spatially and temporally.
- The risk of turbine-related mortality for all bat species recorded at the Site during bat activity surveys.
- The effect on the species' population status if predicted impacts are not mitigated.

In addition, it is recommended to consider the relevant factors in the assessment process:

- Is the bat species at the edge of its range
- Cumulative effects
- Presence of protected Sites
- Proximity of maternity and winter roosts
- Key foraging areas
- Key flight lines
- Possible migration routes.

Using the SNH guidelines outlined in Table 9-31, the following risk assessment for the individual turbines in relation to each bat species recorded was completed using the following values:

- Project Size = Large (turbines >100m in height)
- Habitat Risk = Moderate

Table 9-31: Stage 1 - Initial Site risk assessment extracted from SNH (2019/2021) guidance documents

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

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

* Some sites could conceivably be assessed as being of no (0) risk to bats. This assessment is only likely to be valid in more extreme environments, such as above the known altitudinal range of bats, or outside the known geographical distribution of any resident British species.

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

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

The Impact assessment is determined by multiplying the Site Risk Assessment value (as outlined above) by the Ecobat median (most frequent activity category) and maximum (highest activity category recorded) activity values converted to the percentile score.

The median activity levels for each of the High Risk (Leisler's bat, common pipistrelle, soprano pipistrelle and Nathusius' pipistrelle) species were converted to the percentile score and an average taken over the three survey periods for 2020 and for GC5 in 2021. CG3 in 2021 was not included as this was placed in conifer plantation, where turbines are no longer proposed.

The Impact Assessment is then carried out for the individual turbines using the overall Site assessment value (4) and compared to the Risk Assessment Matrix (Table 9-32) in order to determine the level of overall risk to the population.

It should be noted that the Impact Assessment is based on the median values to determine overall risk to population.

Table 9-32: Risk Assessment Matrix

	Ecobat activity percentile					
Site Risk	**Nil (0)**	**Low (1)**	**Low – Moderate (2)**	**Moderate (3)**	**Moderate – High (4)**	**High (5)**
Lowest (1)	0	1	2	3	4	5
Low (2)	0	2	4	6	8	10
Medium (3)	0	3	6	9	12	15
High (4)	0	4	8	12	15	18
Highest (5)	0	5	10	15	20	25

Overall assessment value (i.e. Turbine Risk value) is then compared to the ranges below:

Low Overall Risk (0-4)	Medium Overall Risk (5-12)	High Overall Risk (13-25)

Evaluation of 2020 survey results

With regards to the 2020 surveys, the Ecobat Median Percentile for Leisler's bat, all locations had a Medium Risk Factor. All locations have a High Risk Factor with regards to the Ecobat maximum percentile. This is presented in Table 9-33:

Table 9-33: Risk assessment for each proposed turbine location - Leisler's bat

Turbine No.	Bat detector ID No.	Site risk value	Ecobat Maximum Percentile	Turbine risk (Site risk x Ecobat maximum percentile)	Ecobat median percentile	Turbine risk (Site risk x Ecobat median percentile)
T01	CG1	4	4	16	3	12
T02	CG2	4	4	16	3	12
T04	CG3	4	5	20	3	12
T05	CG3	4	5	20	3	12
T06	CG4	4	4	16	3	12
T07	CG6	4	4	16	3	12
T08	CG7	4	4	16	3	12
T10	CG9	4	4	16	3	12
T11	CG10	4	4	16	2	8
T12	CG7	4	4	16	3	12

With regards to the 2020 surveys, the Ecobat Median for common pipistrelle, all locations had a Medium Risk Factor, except T06 which had a High Risk Factor. All locations have a High Risk Factor with regards to the Ecobat maximum percentile. This is presented in Table 9-34.

Table 9-34: Risk assessment for each proposed turbine location – Common pipistrelle

Turbine No.	Bat detector ID No.	Site risk value	Ecobat Maximum Percentile	Turbine risk (Site risk x Ecobat maximum percentile)	Ecobat median percentile	Turbine risk (Site risk x Ecobat median percentile)
T01	CG1	4	4	16	3	12
T02	CG2	4	4	16	3	12
T04	CG3	4	4	16	3	12
T05	CG3	4	4	16	3	12
T06	CG4	4	4	16	4	16
T07	CG6	4	4	16	3	12
T08	CG7	4	4	16	3	12

Turbine No.	Bat detector ID No.	Site risk value	Ecobat Maximum Percentile	Turbine risk (Site risk x Ecobat maximum percentile)	Ecobat median percentile	Turbine risk (Site risk x Ecobat median percentile)
T10	CG9	4	4	16	3	12
T11	CG10	4	4	16	2	8
T12	CG7	4	4	16	3	12

With regards to the 2020 surveys, the Ecobat Median for soprano pipistrelle, locations T02, T05, T06 T07 T08 T10, T11 and T12 have a Medium Risk Factor, while the remaining three locations have a Low risk factor. With regards to the maximum percentile location A8 has a Low Risk Factor, while the remaining locations have a Medium Risk Factor. This is presented in Table 9-35.

Table 9-35: Risk assessment for each proposed turbine location – Soprano pipistrelle

Turbine No.	Bat detector ID No.	Site risk value	Ecobat Maximum Percentile	Turbine risk (Site risk x Ecobat maximum percentile)	Ecobat median percentile	Turbine risk (Site risk x Ecobat median percentile)
T01	CG1	4	1	4	1	4
T02	CG2	4	3	12	2	8
T04	CG3	4	2	8	1	4
T05	CG3	4	2	8	1	4
T06	CG4	4	3	12	2	8
T07	CG6	4	3	12	3	12
T08	CG7	4	3	12	2	8
T10	CG9	4	3	12	2	8
T11	CG10	4	3	12	2	8
T12	CG7	4	3	12	2	8

With regards to the 2020 surveys, the Ecobat Median and Maximum Percentiles for Nathusius pipistrelle, all locations have a Medium Risk Factor. This is presented in Table 9-36.

Table 9-36: Risk assessment for each proposed turbine location – Nathusius' pipistrelle

Turbine No.	Bat detector ID No.	Site risk value	Ecobat Maximum Percentile	Turbine risk (Site risk x Ecobat maximum percentile)	Ecobat median percentile	Turbine risk (Site risk x Ecobat median percentile)
T01	CG1	4	2	8	2	8
T02	CG2	4	3	12	2	8
T04	CG3	4	3	12	2	8
T05	CG3	4	3	12	2	8
T06	CG4	4	3	12	2	8
T07	CG6	4	3	12	2	8
T08	CG7	4	3	12	2	8
T10	CG9	4	2	8	2	8
T11	CG10	4	2	8	2	8
T12	CG7	4	3	12	2	8

Habitat Assessment

The habitat assessment determines the value of the habitat to bat species with regards to potential roosting, commuting or foraging value as indicated by current guidelines and literature including (but not limited to) Collins 2016, Denzinger 2013 Kirkpatrick 2016 and Finch 2020.

Plantation woodland

A study by Kirkpatrick (2016) identified that, although bat associations with plantation habitat features are separated into two broad guilds (those using more complex habitats such as soprano pipistrelle and Myotis spp., and open space foragers such as noctule and to some extent common pipistrelle), all species preferentially used stand edges. Plantation edges may also allow both clutter tolerant and clutter sensitive bats access to navigate both within and around stands of plantation. The study further concluded that a possible reason for the higher activity levels found at forestry edges may be due to providing protection from the wind for weak flying prey or acting as windbreaks collecting airborne insects blown in from adjacent open or felled areas and also providing protection from predators.

The edge ecology is considered as *High Ecological value for bats*, while the dense woodland stands (internal ecology) are of *Low Ecological value* for bats at the Site.

Open heathland (wet heath and dry heath)

A study carried out in the UK by Finch *et al*. (2020) found that bat activity for open agricultural habitats is lower than that of linear features and that bats are more likely to be associated with treelines (including mature trees within hedgerows) compared to other linear feature types. The study also found that, of all the records of bat activity, only 10% of the common pipistrelle activity was recorded within open habitats (e.g., open agricultural fields). Soprano pipistrelle also showed to statistically favour linear habitats.

The open heath are considered as *Low Ecological value* for bats.

Watercourses

As highlighted by Altringham (2003) waterbodies and riparian areas provide foraging, commuting, and roosting habitat for bats. Therefore, the existing first orders streams onsite are considered *Moderate to High Ecological value* due to the foraging and commuting potential.

Table 9-37: Summary of bat survey data and assessment

Turbine Location	Risk Assessment Leisler's Bat		Risk Assessment Common Pipistrelle		Risk Assessment Soprano Pipistrelle		Risk Assessment Nathusius Pipistrelle		Clarifying Comment	Bat Habitat within 200m	Bat Habitat along wind farm access tracks	Bat along wind farm access tracks	If no mitigation is applied, what is the potential impact level to the High Risk species?
	Ecobat Maximum Percentile	Ecobat Median Percentile	Ecobat Maximum Percentile	Ecobat Median Percentile	Ecobat Maximum Percentile	Ecobat Median Percentile	Ecobat Maximum Percentile	Ecobat Median Percentile	Is Static at Turbine Location (Y/N)				Taking into consideration the clarifying comment
T01	16	12	16	12	4	4	8	8	Y	N	Y	Y	Medium
T02	16	12	16	12	12	8	12	8	Y	Y	Y	Y	Medium
T04	20	12	16	12	8	4	12	8	N	Y	Y	Y	Medium
T05	20	12	16	12	8	4	12	8	N	Y	Y	Y	Medium
T06	16	12	16	16	12	8	12	8	Y	Y	Y	Y	High
T07	16	12	16	12	12	12	12	8	Y	Y	Y	Y	High
T08	16	12	16	12	12	8	12	8	N	Y	Y	Y	Medium
T10	16	12	16	12	12	8	8	8	N	Y	Y	Y	Medium
T11	16	8	16	8	12	8	8	8	Y	Y	Y	Y	Medium
T12	16	12	16	12	12	8	12	8	N	N	Y	Y	Medium

Bat mortality due to collisions with wind turbines is well known and studies have further shown that bats may be killed without physically contacting turbine blades. The death of bats due to the presence of the operating turbines may reduce local bat populations especially if a turbine is Sited near a roost without appropriate mitigation. Although there are as yet no published results of a study of bat mortality from Irish wind turbines, considering recent research from mainland Europe and North America, there is an increasing amount of detailed published evidence that wind turbines cause bat fatalities. However, many of these overseas turbine/bat mortality studies are at wind farms, with significantly large numbers of turbines, Sited along known bat migration routes where many hundreds or even thousands of bats commute seasonally resulting in numerous deaths and injuries (Bat conservation Ireland, 2012; Dietz and Keifer, 2016).

There is currently no evidence that mortality of bats on the same scale occurs in Ireland. Also, although it is known that Nathusius' pipistrelle migrates from Scandinavia to Scotland and to the north of Ireland and back again (Russ *et al*., 2001), apart from this species, there is currently no evidence that internal or external migration routes of other bat species exist elsewhere in Ireland as no research has been undertaken. Nevertheless, risks to bats from wind turbines need to be acknowledged and there is the potential for some bat mortality to occur during the operation of the proposed development. Therefore, mitigation measures are proposed to reduce the likelihood of such fatalities.

Potential Impacts

As outlined by Scottish Natural Heritage (2021), wind farms can affect bats in the following ways:

- Collision mortality, barotrauma and other injuries
- Loss or damage to commuting and foraging habitat
- Loss of, or damage to roosts
- Displacement of individuals or populations.

Furthermore, as indicated in Richardson *et al* (2021) common pipistrelle bats may be attracted to wind turbines. The study showed common pipistrelle activity was 37% higher at turbines than at control locations. Soprano pipistrelle shows no increase in activity between the turbine and control locations. The study further discussed, the observed higher levels of activity could be because there are more bats around turbines, or because animals spend more time in these locations relative to controls, even if the number of individual common pipistrelles remains the same. We cannot distinguish between these possibilities using acoustic data. However, either way, higher levels of activity around turbines is likely to increase fatality risks and help to explain why fatality rates are often not predicted by acoustic surveys for common pipistrelle activity conducted prior to facility construction.

It has been suggested that lights for civil aviation above the nacelle may also attract bats; a 2014 study by Bennett and Hale (2014) however found there was no increased attraction of bats when red flashing lights were used versus no lighting, indicating the mode and colour of lighting are key factors in whether bats are attracted to aviation lighting. It has been observed that intense lighting can attract insects, which in turn may attract foraging bats. Light sources with an ultraviolet component or a high blue spectral content have been observed to be more attractive to night-flying insects (Bat Conservation Trust/ILP, 2018), and studies have shown that Leisler's and pipistrelle bats can congregate around white mercury streetlights (Rydell J et al 1993, Blake et al. 1994) and white metal halide lamps (Stone et al 2015b) feeding on the insects drawn by the light.

As such, regarding the potential for aviation obstruction lighting to attract bats, the use of red light over white light is preferable, as is flashing over steady light. Therefore, operational stage mitigation in this area is required to ensure the type of aviation lighting selected does not increase the attractiveness of turbine locations to bats.

The cable within the grid connection route will be laid underground and will only be accessed for intermittent maintenance works. As the grid connection is underground, the only locations where bat roosts might be impacted by maintenance works are at water courses. However, the water crossings structure along the GCR have *Negligible* potential for roosting bats. Therefore, there is predicted to be no impact to bats as a result of maintenance works to the grid connection.

The foreseen potential effects during operation are as follows:

Potential Direct Impacts

- Death through collision with turbine blades as bats are known to have difficulty in detecting the moving blades with their echolocation due to the movement and the angle of the blade surfaces
- Death through barotrauma as bats may be killed by the change of atmospheric pressure resulting from the turning blades which can cause their lungs to haemorrhage.

Potential Indirect Impacts

- Indirect effects to nearby roosts are considered unlikely due to the absence of identified roosts from the study area, and intervening buffer provided by woodland plantations and hedgerows mean that no direct or indirect impacts to roosts will occur during operation.

As such, any impacts on bats prior to mitigation are predicted to be *Long-term Significant Impacts* on a *Local Level* and *Reversible*.

9.9.2.6 Aquatic Ecology

Wind Farm

Operational wind farms are not normally considered to have the potential to significantly effect on the aquatic environment. The main risk to watercourses is when oils and lubricants are used on the Site. If such substances leaked from the turbines or maintenance areas or were disposed of inappropriately, there is a risk of water pollution. However, the likelihood of this occurring is very low. Spills of any oil or fuels from Site vehicles onto the access roads may find their way to the local stream network. However, this is unlikely to be a significant effect considering the low numbers of vehicles involved.

Upgrading of the Site track/road network could allow increased public access to the Site. This could potentially result in illegal dumping of domestic rubbish which could impact the watercourses in the area by causing deterioration in water quality. The potential operational phase effects on aquatic ecology are assessed as being *imperceptible negative, temporary and in the local context*.

Grid Connection

Effects on aquatic ecology during the operational phase of the proposed development are unlikely. There is the potential for spills of any oil or fuels from Site vehicles finding its way to the local stream network. In addition, if repairs need to be carried out and soil is excavated there is the potential for effects regarding suspended solids. However, this is unlikely to be a significant effect considering the low numbers of vehicles involved and the unlikelihood of maintenance. Potential operational phase effects on aquatic ecology are assessed as being *imperceptible negative, temporary and in the local context*.

Turbine Delivery Route

Effects on aquatic ecology during the operational phase of the proposed TDR are considered low. Once the turbines have been delivered and installed onsite there will be no further operational works to the TDR, except in the event of turbine replacement being required.

9.9.2.7 Other Species

No other species identified during desktop and baseline surveys will be affected during the operational phase of the wind farm.

9.9.3 Potential Effects during the Decommissioning of the Project

9.9.3.1 European Sites

A Natura Impact Statement (NIS) has been prepared for the proposed development. The NIS addresses potential impacts on European Sites resulting from the proposed project. The Stage One Appropriate Assessment Screening report concluded that, in the absence of mitigation measures (which have not been considered at this screening stage), likely significant effects on the qualifying interests of the Lower River Suir SAC, Blackwater River (Cork/Waterford) SAC, and the Dungarvan Harbour SPA at decommissioning stage cannot be excluded on the basis of objective scientific information. A Stage 2 Appropriate Assessment (Natura Impact Statement) of the potential impact on the Lower River Suir SAC, Blackwater River (Cork/Waterford) SAC, and the Dungarvan Harbour SPA was therefore required.

A Natura Impact Statement was therefore prepared. The Natura Impact statement identified potential for hydrological impacts on the Lower River Suir SAC, Blackwater River (Cork/Waterford) SAC, and the Dungarvan Harbour SPA arising from the decommissioning stage of proposed project in the absence of mitigation..

9.9.3.2 Natural Heritage Areas or Proposed Natural Heritage Areas

On decommissioning, cranes will disassemble the above ground turbine components which will be removed off Site for recycling. All the major component parts are bolted together, so this is a relatively straightforward process. The foundations will be covered over and allowed to re-vegetate naturally.

It is proposed that the internal Site access tracks and turbine hard standings will be left in place. These will continue to be used for forestry and agriculture access. Turbine hard standings shall be covered over with topsoil previously stripped and used for landscaping purposes during the construction stage and left to revegetate naturally.

The temporary accommodation works along the TDR will not be required for the decommissioning phase as turbine components can be broken up on Site and removed using standard HGVs.

Grid connection infrastructure including the on-Site substation and ancillary electrical equipment shall form part of the national grid and will be left in situ.

As such, no direct or indirect effects on pNHAs or NHAs within the potential ZoI of the wind farm or GCR/TDR are anticipated at decommissioning stage, excluding the Dungarvan Harbour pNHA which is assessed in the NIS under Dungarvan Harbour SPA.

9.9.3.3 Habitats and Flora

The decommissioning of the wind farm may result in some temporary loss of habitat, primarily via vegetation which established during the operational phase removal to facilitate the removal of turbine parts. In addition, it is likely that disturbance to habitats which established during the operational phase will arise from the relocation of topsoil from landscaping features to cover turbine foundations and hard standings.

Vegetation clearance and topsoil movement would result in a Short-term Not Significant Reversible Effect at the Local scale.

9.9.3.4 Mammals (excluding Bats)

Vehicular traffic during decommissioning along access roads may result in fatalities; however, this is not expected to be significant due to the mainly diurnal requirement for access and speed restrictions which will be in place. Direct effects on badger during the decommissioning process could occur if setts have become established in locations to be affected. Potential direct effects to badgers in the event of setts becoming established within areas which will be directly affected are Significant, Short-term, Local and Reversible.

The potential exists for indirect effects via both visual and noise disturbance, in particular decommissioning works overlapping with periods of activity by badger. Badgers may also be excluded from foraging areas due to screening/fencing erected during works. Indirect effects could occur if setts have become established in locations to be affected. Potential indirect effects are Moderate-Significant, Short-term, Local and Reversible.

<u>Otter</u>

Sediment and/or contaminated run-off entering streams and waterways could reduce water quality within areas where prey items occur, an increase in sediment could also lead to the smothering of spawning grounds if present thereby inducing longer term effects on prey availability; however, this will be minimal during the decommissioning process. Potential indirect effects are Moderate, Temporary, Local and Reversible.

9.9.3.5 Bats

The possible direct effects on bats during the decommissioning phase of the wind farm are greatly reduced compared with the construction phase of the project; works will be limited to turbine removal, resulting in potential disturbance only.

Indirect effects through limited hedgerow removal for access could occur, however and any sections removed will be short and will not sever foraging or commuting routes.

As such, potential effects due to decommissioning will be limited to:

- disturbance due to increased human activity.
- Trimming of vegetation and/or limited hedgerow removal to accommodate turbine removal.

Potential effects are *Slight, Short-term, Local* and *Reversible*.

9.9.3.6 Aquatic Ecology

The decommissioning phase of the proposed wind farm Site gives rise to similar potential effects as can occur during the construction phase; although the magnitude of the effect of decommissioning is normally reduced as all infrastructure is already in place on the Site. Potential decommissioning effects on aquatic ecology, in the absence of mitigation, are assessed as being slight negative, short-term and in the local context.

During the decommissioning phase, the grid connection will be left in place. The removal of turbine components will not require accommodation works as the components will be dismantled onsite and removed using standard HGVs. Therefore, it is considered that there is no potential for effects.

9.9.3.7 Other Species

Impacts to other species will be similar to the construction phase but greatly reduced.

9.9.4 Potential Cumulative Impacts on Biodiversity

The EC (2001) guidelines on the provision of Article 6 of the Habitats' Directive state that the phrase 'in combination with other plans or projects' in Article 6 (3) of the Habitats Directive refers to the cumulative impacts due to plans or projects 'that are currently under consideration together with the effects of any existing or proposed projects or plans.'

According to the Scottish Natural Heritage, 'the cumulative effect of a set of developments is the combined effect of all the developments, taken together' (SNH, 2005). A cumulative impact arises from incremental changes caused by other past, present or reasonably foreseeable actions together with the proposed wind farm development.

The surrounding environment is dominated by heath, with occasional blocks of forestry and more intensified agriculture. The main damaging operations and threats to the greater regions ecological resources are grazing pressures and forestry operations. Afforestation and agriculture have shaped the habitats within the study area. Forestry and agriculture can create habitat uniformity, negatively impact river catchments, and alter nesting and feeding habitats for animals. The forestry drainage onsite discharges directly into rivers, and the upland nature of the Site means runoff from forestry and agriculture is likely to enter the hydrological network. Intensive agriculture is currently likely to be the most detrimental activity onsite. Drainage associated with forestry and farming has also altered the habitats onsite.

In-combination impacts may occur should indirect impacts such as a decline in water quality be sufficiently significant to cumulatively add to existing pressures on key species and habitats. In-combination impacts may also occur should direct impacts such as bird or bat collision with surrounding operational wind farms be sufficient significant to cumulatively add to existing pressures on these species.

To inform the current appraisal, planning searches were carried using the resources listed below. The planning search was completed on 22nd March 2023 for the previous 10 years within 20 km of the Site.

The following sources were referred to:

- Waterford County Council planning viewer https://www.waterfordcouncil.ie/departments/planning/planning-enquiries/online-planning-enquiries.htm

- An Bord Pleanála webSite (Strategic infrastructure development (SID) applications, Strategic Housing Development (SHD) applications and project applications including wind farms and planning appeals) https://www.pleanala.ie/en-ie/home;
- Irish Wind Energy Association (IWEA) https://www.iwea.com/
- Department of Department of Housing, Local Government and Heritage's EIA Portal https://www.gov.ie/en/publication/9f9e7-eia-portal/.

9.9.4.1 Developments

Existing or Proposed Wind farms and Turbines

A number of operational wind farms exist within 20km of the main wind farm Site; these are detailed and discussed below. Projects along the GCR and TDR were also considered.

There is one operational wind farm within 20 km of the proposed development, Woodhouse Wind Farm (I & II). There are also two privately owned single turbines within 20 km, Tierney and Kilnagrance. There is an additional granted wind farm, a granted private turbine and a proposed windfarm (by EMPower) within 20km of the Site.

The following existing and planned wind farms within 20 km of the proposed development were examined for potential cumulative effects on Biodiversity with the proposed development.

Table 9-38: Existing and permitted/ proposed wind farms within 20 km of the proposed development

Wind Farm Name	Number of Turbines	Distance and Direction from Proposed Development Site	Status
Tierney Single Turbine	1	5.1km west of Site	Operational Privately owned operational (since 2015) single 150 kW turbine (hub height 30 m, tip height 44 m)
Kilnagrance Single Turbine	1	14km east of Site	Operational Privately owned (KWT Energy Ltd) operational (since 2016) single turbine with a 60 m tip height
Woodhouse Wind Farm	8	17.2km west of Site	Operational Woodhouse Wind Farm (ESB) is an operational wind farm (since 2015) and was constructed in 2 phases comprising a total of 8 no. wind turbines with a 126 m tip height (45m blade length).
Knocknamona Wind Farm	8	17.6 km west of Site	Permitted Was granted permission in September 2022 (PL93.309412) and is located immediately south of the existing Woodhouse Wind Farm. The Knocknamona Wind Farm will comprise 8 no. wind turbines with a 146.3 m tip height.

Wind Farm Name	Number of Turbines	Distance and Direction from Proposed Development Site	Status
Dyrick Hill Wind Farm	12	7.9 km southwest of Site	Proposed (at planning) Proposed private development (EMPower) submitted for planning in June 2020 (Case reference: PA93.317265) comprising a 12-turbine array with a 185m tip height.

The construction phase of Coumnagappul Wind Farm has the greatest potential to contribute suspended solids/pollutants to nearby watercourses due to excavation works and general construction works.

The granted Knocknamona Wind Farm is within the Colligan river catchment, however, is not upstream of the Colligan River, and the hydrologically connected Brickey River enters Dungarvan Harbour at a different point to the Colligan. As such, if both wind farms were constructed at the same time, there could be potential for cumulative effects on the aquatic receiving environment of Dungarvan Harbour only. The potential for cumulative effects on habitats, flora and less mobile species of fauna are considered negligible due to the separation distance between the points where the rivers enter the harbour, and the natural tidal processes of the harbour separating these two points.

The potential for cumulative impacts to bats from both existing and proposed turbines within 20 km is considered further below.

Large Scale/Infrastructure Projects:

The following projects within c. 20 km of the proposed Site are consented:

Housing Developments

An application for completion of 361 no. residential units (207 no. houses and 154 no. apartments), creche and associated Site works permitted under planning Case reference: TA93.304423 in Knockboy, Co. Waterford is permitted, located c. 3 km south west from the wind farm Site.

An application for completion of 115 no. residential units (68 no. houses and 47 no. apartments), creche and associated Site works permitted under planning Case reference: TA92.311290 in Croan Lower, Co. Tipperary is permitted, located c. 11.6 km north from the wind farm Site.

An application for c the demolition of existing buildings and the construction of 61 dwellings permitted under planning Case Reference PL92.308934 in Clonmel, Co. Tipperary is permitted, located c. 12.6 km north from the wind farm Site.

An application for completion of 44 houses which comprise of 22 detached and 22 semidetached houses permitted under planning Case reference: PL92.304695 in Clonmel, Co. Tipperary is permitted, located c. 12.8 km north from the wind farm Site.

An application for completion of 218 no. residential units (176 no. houses, 42 no. apartments), creche and associated Site works permitted under planning Case reference: TA93.310782 in Duckspool, Co. Waterford is permitted, located c. 16.8 km south from the wind farm Site.

An application for completion of 138 no. residential units, 24 no. 'step down/independent living' units and associated Site works permitted under planning Case reference: TC92.303786 in Clonmel, Co. Tipperary is permitted, located c. 13.6 km north from the wind farm Site.

The construction of 25 no. dwelling houses (Case reference: PL92.309325) in Carrickbeg, Co. Tipperary is permitted, located c. 18.1 km northeast from the wind farm Site.

An application for completion of 361 no. residential units (207 no. houses and 154 no. apartments), creche and associated Site works permitted under planning Case reference: TA93.304423 in Knockboy, Co. Waterford is permitted, located c. 3 km south west from the wind farm Site.

The only housing development within the same sub catchment as the proposed Comnagappul Wind Farm is in Duckspool, Co. Waterford, within the Colligan_SC_010. However, it is not hydrologically linked to the Site, with the closest waterbody to Dusckspool being the Deelish Stream, which enters Dungarvan Harbour at a different point to the Colligan River. This, along with a separation distance of 16.8 km, indicates that cumulative impacts between the Site and the development in Duckspool are unlikely.

Renewable Energy Developments

There are four solar farm applications located within 20 km of the proposed wind farm Site,:

1. Cooltubbrid West, Co. Waterford (Ref 248413; permitted) (11.6 km from wind farm)
2. Poulbautia, Co. Waterford (Ref 18598; permitted) (12.1 km from wind farm)
3. Curraghduff and Mothel, Co. Waterford (Ref 19183; permitted) (14.5 km from wind farm) (NIS submitted)
4. Rathnaskilloge (E.D. Ballylaneen), Glen West (E.D. Fox's Castle) , & Curraheen (E.D. Stradbally), Co. Waterford (Ref. 19290; permitted) (14.9 km from wind farm)
5. Ballynagrana and Deerparklodge, Co. Tipperary (Ref 16600640; permitted) (18.7 km from wind farm) (NIS Submitted)
6. Baskilloge (E.D. Ballylaneen), Glen West (E.D. Fox's Castle) , & Curraheen (E.D. Stradbally), Co. Waterford

An electrical substation and associated 110kV and MV infrastructure required to connect ground mounted solar PV generation to the electricity transmission system with all associated ancillary Site development work. Rathnaskilloge, Stradbally, Co. Waterford VA93.304558

There is a 10-year permission for a 110kV electricity substation, two control buildings, radio mast, four number lattice towers, modifications and connection to the existing on-Site 110kV transmission line, perimeter fencing and access gate and all ancillary development services and works at the Townland of Curraghduff, Co. Waterford. VA93.303930.

The application for the development of Knocknamona Windfarm Grid Connection (KWF Grid Connection) development comprises; a)1940m of underground medium voltage electrical cabling(up to 33kV), in Keereen Upper & Knocknamona townlands, linking Knocknamona Windfarm (to be constructed) & Woodhouse 110kV Substation (operational).

In terms of acting cumulatively with the proposed development, the most relevant projects are those that may be constructed at the same time as the proposed Coumnagappul Wind Farm project and are within the same catchment, as this increases the likelihood of impacts acting cumulatively. Solar farms have no moving parts and installation of panels creates minimal disturbance to the ground. No cumulative effects are envisaged in this regard.

The above solar farms are located in a different sub-catchment and as such no cumulative hydrological effects are likely. Due to the distance between the Site and these solar farms, no other cumulative effects are likely.

9.9.4.2 Farming

Intensive grassland management is prevalent in parts of the wind farm Site and is the dominant land use along the GCR and TDR. The diversity of flora within the habitats has been reduced dramatically by drainage, reseeding, fertilisation and intensive grazing by cattle. The main potential impact would be an increase in nutrient levels of local watercourses. There is potential for the proposed wind farm to contribute to a cumulative effect on water quality in drains within the Site and local watercourses further downstream of the Site, through the potential for sediments and other pollutants entering the watercourses as a result of felling, construction activities in addition to ongoing farming operations.

The risk of such effects would, for example, greatly increase if such works were taking place during the winter months or times of very high rainfall. Due to the small sizes and fisheries values of the watercourses draining the proposed development Site, any additional pressures such as release of suspended solids and or nutrients as a result of the construction, operational and or decommissioning phases could result in a Medium-term Moderate Reversible Cumulative effect.

9.9.4.3 Forestry

Forestry is one of the main land uses within the wind farm Site and is relatively common within the greater area, particularly on hillsides at higher elevations. Conifer plantation is common within the proposed Site at surrounding area. Effects often associated with forestry on the local environment are habitat loss, habitat alteration and potential reduction in water quality.

While forestry may have resulted in a reduction in water quality locally closer to the time of establishment, the water quality in the majority of the streams within the study area is more closely dependent on agricultural activities.

There is potential for felling and construction activities at the wind farm Site to act cumulatively with other forestry activities in the same catchment, particularly harvesting operations. While it is difficult to quantify the level of resultant effects with certainty, in-combination effects are considered likely. These would include the increased release of sediments and nutrients to receiving watercourses.

In the absence of mitigation potential indirect cumulative effects to the rivers draining the proposed Site could occur further downstream and a Medium-term Moderate Reversible Cumulative effect is considered likely.

9.9.4.4 Cumulative Impacts during Construction on Key Receptors

Designated Nature Conservation Sites

The wind farm Site is not within the boundaries of any designated nature conservation Site. The grid connection route does not traverse any designated nature conservation Site. Therefore, there will be no direct effects to designated nature conservation Sites for the wind farm Site or the grid connection.

Prior to mitigation, there is potential for indirect cumulative effects on the Lower River Suir SAC, Blackwater River (Cork/Waterford) SAC, and the Dungarvan Harbour SPA/ pNHA to arise from wind farm construction and grid cable installation in conjunction with consented large-scale housing developments, large-scale developments and one-off housing projects in the Suir_SC_130, Finisk_SC_010 and Colligan_SC_010 and where mitigation is not evident. Cumulative effects may also arise in conjunction with agricultural and forestry activities.

No effects are predicted to any other Nature Conservation Sites during construction of the proposed wind farm project and no additive effects due to in combination direct effects with other existing sources of direct impact are predicted.

An accompanying Natura Impact Statement (NIS) has been prepared for the proposed development and accompanies this EIAR. The NIS addresses potential impacts on European Sites resulting from the proposed development. Where European Sites overlapping with nationally designated Sites were identified as being subject to likely significant effects, the conclusions from the NIS for said European Sites is shown here.

The possibility of significant effects to these European Sites were identified:

- Lower River Suir SAC
- Blackwater River (Cork/Waterford) SAC
- The Dungarvan Harbour SPA/ pNHA

The cumulative assessment in the NIS identified potential for cumulative impacts on the Lower River Suir SAC, Blackwater River (Cork/Waterford) SAC, and the Dungarvan Harbour SPA/ pNHA arising from the proposed project in the absence of mitigation.

Habitats and Flora

Potential direct impacts during construction have been identified as land take during construction of the wind farm (including turbine hardstands, compound, substation, sections of new access roads and internal cabling), which will lead to some permanent loss of habitat. Other existing or planned sources of land take in the vicinity of the proposed wind farm may result in cumulative effects. The potential spread of invasive species recorded along the GCR and TDR could result in cumulative effects with other projects. Cumulatively there is likely to be a Permanent Moderate Reversible Cumulative Effect at the County scale without mitigation.

Mammals (excluding Bats)

Mammal breeding or resting Sites may be cumulatively affected by other developments which either remove potential breeding Sites and foraging habitats (e.g. road construction) or farming and forestry activities which may for example remove badger setts, pine marten breeding Sites, red squirrel dreys, etc.

Prior to the implementation of mitigation cumulative effects are likely to be Short-term Moderate Cumulative Effects at the Local scale which are potentially Reversible.

Bats

Potential cumulative impacts on bats during the construction phase would be as follows:

- Displacement of populations
- Abandonment of young
- Mortality.

Bat surveys were completed for Knocnamona Wind Farm recorded common and soprano pipistrelle, brown long eared bat, Myotis spp. and Leisler's bat. A moderate temporary impact from the loss of woodland habitat and anthropogenic disturbance was expected on bats during the construction phase, with an unlikely significant impact.

The bat surveys for the proposed Dyrick Hill concluded that there is a potential High impact to bat species for all turbine locations in the absence of mitigation. Eight species of bats were recorded during static detector surveys, Daubenton's bat, whiskered bat, Natterer's bat, Leisler's bat, Nathusius' pipistrelle, common pipistrelle soprano pipistrelle and brown long-eared bat. In total, five Sites within the proposed wind farm boundary were confirmed to host bat roosts of single species or multiple species of bat.; Brown Long-eared Bat, Whiskered Bat, Soprano Pipistrelle, and Common Pipistrelle.

The remaining wind farms are operational, therefore construction-stage cumulative effects on bats are not likely.

Considering the distance between the proposed Site and consented large-scale housing developments and wind farms, a Long-Term Slight Cumulative Effect at the County scale is predicted for bats.

Aquatic Ecology

Wind Farm

The area of the proposed Site is subject to additional pressures on water quality and aquatic ecology, particularly in relation to agricultural activities and drainage maintenance works. Where wind farm construction and agricultural activities occur at the same time there is the potential for cumulative effects on local watercourses. The risk of such effects would, for example, greatly increase if such works were taking place during the winter months or times of very high rainfall. Conifer forestry and peat extraction and associated operations could also have the potential to adversely affect water quality in the area; therefore, these could effect watercourses in-combination with the proposed Coumnagappul wind farm. There is a granted wind farm in the River Colligan catchment. This wind farm called Knocknamona Wind Farm is located c. 17.2west km south of the current proposed wind farm. If both of these developments were constructed at the same time, there is the potential for cumulative effects. It is noted however that the Knocknamona Wind Farm is not hydrologically linked to the Colligan River, and its connected river, Brickey River, enters Dungarvan Harbour at a different point to the Colligan. Potential cumulative effects on aquatic ecology, in the absence of mitigation, would be limited to Dungarvan Harbour area and are assessed as being slight negative, short-term and in the local context.

The proposed Dyrick Hill is located in a different catchment, Blackwater (Munster) catchment, to the proposed Coumnagappul Wind Farm, within the Colligan-Mahon catchment. Cumulative effects with these developments on aquatic ecology are considered to be negligible.

GCR

Where construction and agricultural activities occur at the same time there is the potential for in-combination or cumulative effects on local watercourses. The risk of such effects would, for example, greatly increase if such works were taking place during the winter months or times of very high rainfall. Conifer forestry and associated operations could also have the potential to adversely affect water quality in the area; therefore, these could effect watercourses in-combination with the proposed Coumngappul Wind Farm. There is a proposal for another wind farm in the area. The potential cumulative effects on aquatic ecology, in the absence of mitigation, are assessed as being moderate negative, short-term and in the local context.

TDR

Some of the watercourses present in the area of the proposed TDR are under significant pressures and at risk of not meeting their objectives as set out in the WFD by 2027. The Sites are subject to additional pressures on water quality and aquatic ecology, particularly in relation to agricultural activities. Where construction and the above activities occur at the same time there is the potential for cumulative effects on local watercourses. The risk of such effects would, for example, greatly increase if such works were taking place during the winter months or times of very high rainfall. Conifer forestry and associated operations could also have the potential to adversely affect water quality in the area; therefore, could affect watercourses cumulatively along with the proposed TDR. It is noted that proposed TDR works are limited to tree removal, and placement of a load bearing surface in the road verge, not in close proximity to watercourses.

Potential cumulative effects on aquatic ecology, in the absence of mitigation, are assessed as being moderate negative, short-term and in the local context.

Other Species

Given the amount of displacement and alternative habitats available as well as the retention of semi-natural areas within the adjacent to the Site, the overall in combination effect is assessed as a *Short-term Slight Cumulative Impact* which is *Reversible in the local context*.

9.9.4.5 Cumulative Impacts during Operation on Key Receptors

Designated Nature Conservation Sites

As no direct or indirect effects are predicted on Nature Conservation Sites during the operation of the proposed wind farm then no additive effects due to in combination direct impacts with other existing sources of direct impact are predicted.

An accompanying Natura Impact Statement (NIS) has been prepared for the proposed development and accompanies this EIAR. The NIS addresses potential impacts on European Sites resulting from the proposed development.

Where European Sites overlap with nationally designated Sites, the conclusions from the NIS for said European Sites is shown here.

The NIS stated that it is possible that cumulative impacts of sedimentation could arise from surrounding land practices. It is noted however that mitigation measures have been proposed to avoid such an occurrence.

Habitats and Flora

No cumulative operational stage effects on terrestrial habitats are predicted. See Aquatic ecology below for details of possible effects on aquatic habitats.

Mammals (excluding Bats)

Mammal breeding or resting Sites may be cumulatively impacted by other developments which either remove potential breeding Sites (e.g. road construction) or farming or forestry activities which may for example remove Badger setts, Pine Marten or Red Squirrel breeding Sites etc.

Since no land take is predicted for the operational phase, a Local S*hort-term Not Significant Reversible* cumulative effect is predicted.

Bats

Potential Cumulative impacts on Bats during operation would be as follows:

- Mortality
- Reduction of local populations.

Bat surveys were completed for the private turbine Tierney planning application. Low levels of bat activity was recorded. A potential pipistrelle roost was recorded in an adjacent farm building. This building will remain.

No bat surveys results are available for the Kilnagrance private turbine.

The application Woodhouse Wind Farm (Planning reference 041788, Waterford City and County Council) took place in in the early 2000s (EIA published September 2004), before rigorous methodologies were in place, and there is no mention of bats in the Environmental Impact Statement.

A slight/moderate irreversible impact to common and soprano pipistrelle, brown long-eared bat and Leisler's bat was assessed due to the potential risk of collision during the operational phase of Knocknamona Wind Farm, with an unlikely significant impact. A bet felling buffer of greater than 60m was implemented as mitigation to avoid bat collisions.

The bat surveys for the proposed Dyrick Hill concluded that there is a potential High impact to bat species for all turbine locations in the absence of mitigation. Eight species of bats were recorded during static detector surveys, Daubenton's bat, whiskered bat, Natterer's bat, Leisler's bat, Nathusius' pipistrelle, common pipistrelle soprano pipistrelle and brown long-eared bat. In total, five Sites within the proposed wind farm boundary were confirmed to host bat roosts of single species or multiple species of bat.; Brown Long-eared Bat, Whiskered Bat, Soprano Pipistrelle, and Common Pipistrelle.

Due to the limited information on bat activity available for the more distant wind farms and the fact the Ecobat analysis tool was not used as standard practice for these applications, it is not possible to carry out a strictly objective analysis. However, when the patterns of activity, species composition, nature of the Sites, distance between these Sites and the proposed wind farm, and limited ecological connectivity are considered cumulatively, the potential for effects is very low. Therefore, cumulative impacts to bats during the operational phase would be a *Long-Term Significant Cumulative Impact*.

Aquatic Ecology

Operational wind farms are not normally considered to have the potential to significantly impact on the aquatic environment. The main risk to watercourses is via water quality impacts, when oils and lubricants are used on the Site (e.g. infrastructure maintenance). If such substances leaked from the turbines or maintenance areas or were disposed of inappropriately, there is a risk of water contamination and subsequent impacts to aquatic ecology.

However, the likelihood of this occurring is very low and unlikely to be a significant impact considering the low volumes of vehicular traffic involved in typical wind farm operations.

Due to the natural 'grassing-over' the drainage swales and revegetation of other exposed surfaces, and the non-intrusive nature of Site operations, there is a negligible risk of sediment release to the watercourses during the operational stage. Potential cumulative operational phase impacts on aquatic ecology are considered *Short-term Slight Cumulative Reversible Impacts* and in the *Local Context*, in the absence of mitigation.

Other Species

Given the large amount of displacement and alternative habitats available the overall in-combination effect is assessed as being likely to result in a Short-term Imperceptible Cumulative Reversible Impacts.

9.9.4.6 Cumulative Impacts during decommissioning on key receptors

The potential cumulative effects during decommissioning are considered to be the same as those described for the construction phase of the proposed development.

9.10 Mitigation Measures for Biodiversity

Mitigation measures are described below which will avoid, reduce and where possible, offset likely significant impacts arising in relation to biodiversity from the construction, operation and decommissioning of the Site. These mitigation measures shall be implemented in full.

9.10.1 Mitigation by Avoidance and design

The following measures are incorporated into the proposed wind farm design to reduce impacts on designated Sites, flora and fauna through avoidance and design:

- The hard-standing area of the wind farm has been kept to the minimum necessary for the maximum turbine envelope proposed, including all Site clearance works to minimise land take of habitats and flora.
- Site design and layout deliberately avoided direct impacts on designated Sites.
- All cabling for the project will be placed undergroundt; this significantly reduces collision risk to birds over the lifetime of the wind farm (Drewitt and Langston, 2006).
- The grid connection routes have been selected to minimise land take of potentially sensitive habitats by following the Site access tracks and public roads.
- Care has been taken to ensure that sufficient buffers are in place between wind farm infrastructure and hydrological features such as rivers and streams. Buffers of 50m from natural watercourses have been maintained, excepting where crossing points occur.
- Three new stream crossings shall be required within the main wind farm Site. A clear-span design has been selected to avoid instream works, and to minimise disturbance of banks and associated indirect effects such as siltation. Pre-cast concrete culverts will be used in the other two smaller streams.
- Directional drilling is the proposed installation method where the grid connection crosses an unnamed tributary of Skeheens Stream. As such, in-stream works will not be required and the potential for contaminant or pollutant input will be greatly reduced as a result.
- The grid cable will be incorporated in the culverted road where it crosses Ballynaguilkee_lower and the clear span bridge where it crosses the Colligan River.

- The design of the grid connection was also carried out with cognisance to ecological features. Cables are to be placed underneath public roads where possible to avoid impact to roadside hedgerows.
- The design of TDR identified is constrained to the existing public road network with cognisance to ecological features.

9.10.2 Mitigation measures during the construction phase of the project

9.10.2.1 Introduction

Construction of this project is expected to cause temporary (disturbance) adverse impacts on local ecological receptors. The mitigation measures described below will reduce these impacts significantly.

9.10.2.2 Project Ecologist

A Project Ecologist/Ecological Clerk of Works (ECoW) will be employed for the duration of the construction phase to ensure that all the mitigation measures outlined in relation to the environment are implemented. The Project Ecologist/EcoW will advise on environmental effects and communicate with the project owner and contractor to ensure the required actions to implement the mitigation prescribed in this EIAR are carried out.

9.10.2.3 Habitats and Flora

The area of the proposed works will be kept to the minimum necessary, including all Site clearance works, to minimise disturbance to habitats and flora. In this case, the footprint of the proposed development has been kept to the minimum necessary, including the use of layout design methods including existing roads and stream crossings to minimise excavation works.

No disturbance to habitats or flora outside the proposed development area will occur. Works will be restricted to the immediate footprint of the development (see CEMP; Appendix 2.1). Machinery, and equipment will be stored within the Site compound. Designated access points will be established within the Site and all construction traffic will be restricted to these locations. Access to the Site will be primarily via the existing unnamed local road to the west of the Site. HGVs shall approach the Site via this road.

Hedgerow a Reinstatement at TDR PoI 24

Vegetation removal is required which could have a Long-term Significant Reversible impact. This is primarily due to the presence of sections of good-quality mature hedgerow along this part of the TDR which may be removed or damaged as a result of TDR PoI works. Therefore, as a mitigating action, hedgerows removed or lowered by TDR PoI works will be reinstated using the same native species present in original hedgerows: Hawthorn, Grey Willow, Rowan. Note Ash Fraxinus excelsior is not proposed to be used, due to its vulnerability to ash dieback disease. Semi-mature specimens of native provenance will be included to accelerate rehabilitation.

All hedgerow planting is required to use plants of native provenance (local if possible). Locally sourced willow cuttings are suitable where this genus is specified.

Management of the spread of non-native invasive Species

According to Invasive Species Ireland (ISI) invasive non-native species are the second greatest threat (after habitat destruction) to worldwide biodiversity. Invasive species negatively impact Ireland's native species; changing habitats and ultimately threatening ecosystems which impacts on biodiversity as well as economics as they are costly to eradicate.

Halting the spread of non-native invasive species at the Site, GCR and TDR will be achieved via prevention, containment, treatment and eradication.

Prevention

Wind Farm Site

No Third Schedule invasive species are present within the proposed wind farm footprint. As such, if baseline conditions remain unchanged, interaction with proposed works is avoidable for invasive species.

GCR and TDR

Prior to trimming or vegetation removal along the grid connection an invasive species survey will be undertaken to reconfirm the findings of the EIAR. Containment and eradication measures are detailed in the Invasive Species Management Plan (Appendix 9.2, Volume III) which will be used as required where avoidance of invasive species is not possible.

9.10.2.4 Mammals (excluding bats)

A preconstruction mammal survey will be undertaken to reconfirm the findings of the EIAR.

An ecologist will supervise areas where vegetation removal and tree felling will occur prior to and during construction as appropriate (e.g., an ecologist may be required during some clearance works of areas where vegetation is too dense to check beforehand). This will ensure that any Site-specific issues in relation to wildlife not currently present (Badger setts, Red squirrel dreys, Pine marten dens) on Site will be reconfirmed prior to commencement of works so as to allow appropriate mitigation measures to be put in place.

In the event that the afformentioned mammals, or their resting places are recorded, the consenting authority will be updated, consulted with, relevant guidelines will be followed for the management of such species.

Construction operations will take place predominantly during the hours of daylight to minimise disturbances to faunal species at night. Some works along the grid connection route and wind farm Site may occur at night but the project ecologist/ECoW will limit night-time works to sections of the route / Site which avoid sensitive features (e.g. forestry edges, mature treelines).

Badgers

There is the potential for setts to be discovered during vegetation clearance works. Care will be taken during this early stage of the development and a competent ecologist will be on-Site for these works. If setts are discovered all works within 30m of the sett will cease including vegetation clearance. The consenting authority will be contacted and measures to manage the species confirmed.

Otter

No evidence of otter holts was observed within the development boundary, with limited otter signs suggesting the Colligan stream being used as a commuting corridor. The watercourses within the proposed development boundary are sub-optimal as otter resting and breeding places due to absence of riparian vegetation.

Red Squirrel

Where possible, any required felling of trees in forestry areas will be limited to time periods outside which Red Squirrel may have young in dreys (peak period January to March).

If this is unavoidable then areas to be clear felled will be surveyed in advance by a suitably qualified ecologist to determine whether any occupied dreys are present. Suitable mitigation measures comprising a derogation/disturbance licence will be sought if dreys are found within the felling footprint or adjacent areas.

Pine Marten

Where possible, felling of trees in forestry areas will be limited to time periods outside which pine martens may have young in dens (March and April). If this is unavoidable, then areas to be clear felled will be surveyed in advance by a suitably qualified ecologist to determine whether any occupied pine marten dens are present. Suitable mitigation measures comprising a derogation/disturbance licence will be sought if dens are found within the felling footprint or adjacent areas.

9.10.2.5 Bats

Buffer Zone

To minimize risk to bat populations, a buffer zone will be provided around any treeline, hedgerow, woodland feature, into which no part of the turbine should intrude.

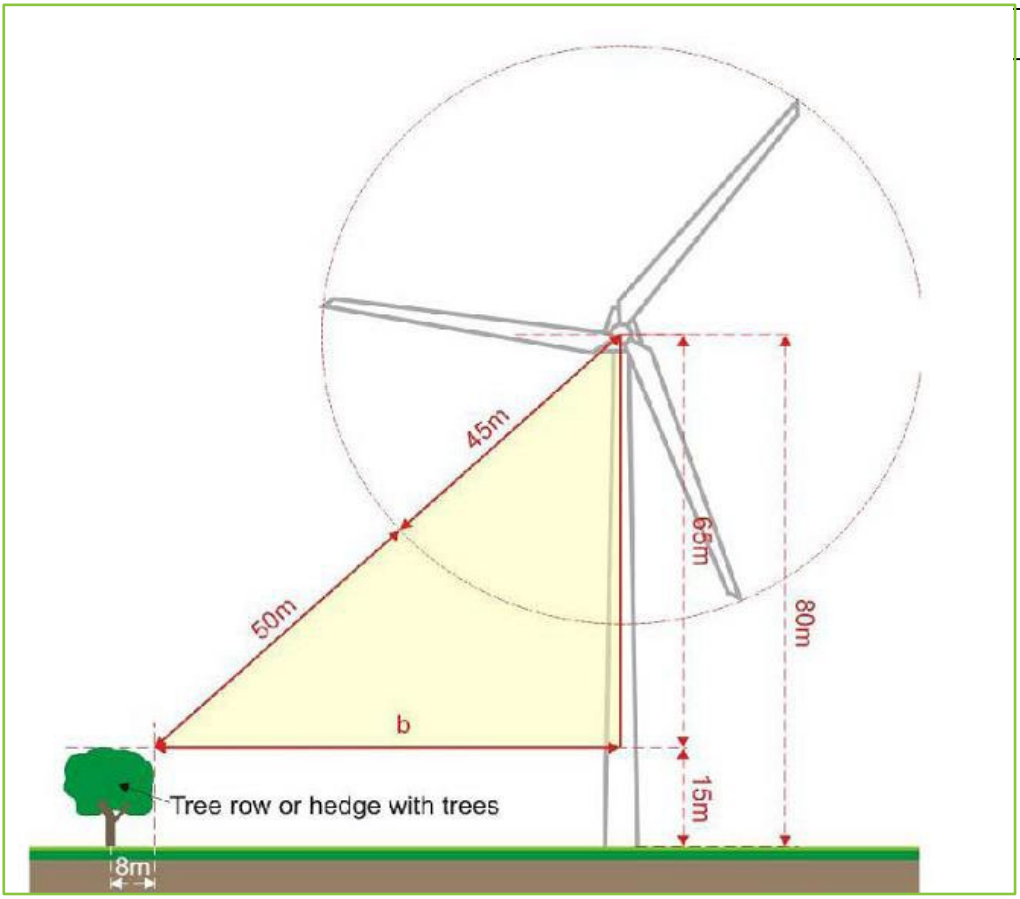
According to SNH (2021) guidance:

> *"The Eurobats guidance recommends a 200m buffer around woodland areas. There is, however, currently no scientific evidence to support this distance in the UK and it is recommended that a distance of 50m between turbine blade tip and nearest woodland (or other key habitat features such as wetlands etc.) is adequate mitigation in most, lower risk situations. Exceptionally, larger buffers may be appropriate, e.g. near major swarming and hibernation Sites. The longevity of wind farms should also be taken into account and the maximum growth, or management, of woodland and other relevant habitat features considered in their planning."*

These distances were taken into account during the design phase of the proposed Coumnagappul Wind Farm Development.

The following formula was used to calculate the required felling buffer for each turbine (taking into account the height of surrounding woodland/plantations at each turbine location). Calculations were run for each set of proposed optional turbine dimensions.

EXAMPLE



$b = \sqrt{\{(50 + bl)^2 - (hh - fh)^2\}}$ where: b = the distance on the ground between the edge of the canopy and the turbine (m) bl = blade length (m) 81m hh = hub height (m) 104m fh = feature height (m) 20m
$b = \sqrt{\{(50 + 81)^2 - (104 - 20)^2\}} = 101m$

Locations representative of the habitat types and features at turbine locations were surveyed, and the bat activity survey findings recorded informed the application of the 101m buffer described above at all proposed turbine locations 9note that this calculation used a 20m features height, while in reality there are no trees at the turbine locations, as such this buffer is overly precautionary).

No existing trees or hedgerows are within the bat buffers for any proposed turbine locations. Buffers will be maintained throughout the lifetime of the wind farm as tree-free areas. This will be achieved through mechanical means only; the use of chemical substances is prohibited.

The following mitigation measures for bats will be implemented in full:

Supervision of vegetation clearance

An ecologist/ECoW will supervise areas where vegetation, scrub and hedgerow removal will occur prior to and during construction as appropriate (e.g., ecologist may be required during some clearance works of areas where vegetation is too dense to check beforehand). This will ensure that any Site-specific issues in relation to wildlife not currently present (e.g., Bat roost locations) on Site will be discovered prior to commencement of works to allow appropriate mitigation measures to be put in place. In the unlikely event that a bat roost is found , the NPWS will be informed and the relevant guidelines will be implemented as appropriate (e.g. NRA guidelines).

Habitat retention and replacement

Existing hedgerows and semi-natural scrub or semi-natural grasslands within the Site outside of the footprint of the development will be retained. Disturbed areas will be allowed to recolonise naturally.

A native broadleaf treeline will be planted within the agricultural lands adjacent to Temporary Construction Compound # 2 which will comprise Pedunculate Oak, Alder, Hawthorn, Rowan, and Grey Willow (refer to Figure 9.6, Volume IV). This will enhance feeding opportunity for bats.

Lighting restrictions

In general, artificial light creates a barrier to bats so lighting has been avoided where possible. Construction operations within the wind farm Site will take place during the hours of daylight where possible to minimise disturbances to faunal species at night. Some works along the cable route and wind farm Site may occur at night but the project ecologist/ECoW will limit night-time works to sections of the route / Site which avoid sensitive features (e.g. mature treelines, conifer plantation edge and tracks). Where lighting is required, directional lighting (i.e. lighting which only shines on work areas and not nearby countryside) will be used to prevent overspill.

This will be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only.

9.10.2.6 Aquatic Ecology

Proposed Mitigation Measures for the Construction Stage of the project

Construction phase mitigation for hydrology and water quality will follow that outlined in Chapter 12, and the mitigation measures outlined will be adhered to in conjunction with those outlined in this section.

All measures for the protection of water quality within the proposed development, as detailed in the CEMP and Chapter 12, will also protect the aquatic ecology and fisheries value of downstream watercourses.

The measures adopted within the CEMP will ensure effective protection of aquatic ecological interests downstream of the proposed development, including the habitats supporting sensitive aquatic species and with connectivity to the Blackwater River (Cork/Waterford) SAC (002170), Dungarvan Harbour SPA (004032) and Lower River Suir SAC (002137).

9.10.2.7 Other Species

In the event that construction is required to proceed during the breeding season of common frog (approximately January – midsummer), a preconstruction amphibian survey will be completed and translocation under licence will be required where active breeding drains are within the development footprint.

Protection of existing hydrological conditions where drains are adjacent to or within the zone of influence (i.e. could be impacted by drainage works elsewhere) is required. In the event that the hydrology of existing breeding areas within the zone of influence cannot be maintained, translocation to suitable receptor Sites will be used.

9.10.3 Mitigation measures during operation

9.10.3.1 Designated Nature conservation Sites

Mitigation measures outlined Chapter 12 - Hydrology and Water Quality of this EIAR, will be implemented, in addition to those described in the NIS to minimise and prevent the identified indirect effects on water quality as outlined previously.

9.10.3.2 Habitats and Flora

Mitigation measures outlined in Chapter 12 - Hydrology and Water Quality of this EIAR, will be implemented, in addition to those described in the NIS, to ensure that there will be no contamination of water bodies due to siltation or contaminated run-off during the operational phase.

Invasive species will continue to be monitored, and where required, treated within the project area according to the invasive species management plan for as long as they persist within the Site (Appendix 9.2).

9.10.3.3 Bats

Feathering of Blades

Turbines will operate in a manner which restricts the rotation of the blades as far as is practicably possible below the manufacturer's specified cut-in speed (SNH 2021). This is achieved by feathering the blades during low wind speeds; the angle of the blades is rotated to present the slimmest profile possible towards the wind, ensuring they do not rotate or 'idle' when not generating power.

Turbine blades spinning in low wind can kill bats, however bats cannot be killed by feathered blades which are not spinning (Horn et al., 2008). The reduction in speed resulting from feathering compared with normal idling may reduce fatality rates by up to 50% (SNH 2021).

As such, the feathering of blades to prevent 'idling' during low wind speeds is proposed for all turbines.

Cut-in Speeds/Curtailment

Increasing the cut-in speed above that set by the manufacturer can reduce the potential for bat/turbine collisions. A study by Arnett *et al*., (2011) showed a 50% decrease in bat fatality can be achieved by increasing the cut-in speed by 1.5 m/s.

Species with elevated risk of collision (Leisler's bat, soprano and common pipistrelle) in particular would benefit from increasing the cut-in speed of turbines, as dictated on a case-by case basis depending on the activity levels recorded at each turbine.

While bat activity varied considerably by species, T06 and T07 had a High risk of impact to High Risk species, with the remaining turbine locations all having Medium risk of impact. Therefore, increased cut-in speeds will be implemented for all turbines from commencement of operation. Cut-in speeds will be increased during the bat activity season (April-October) and/or where weather conditions are optimal for bat activity (see below) from 30 minutes prior to sunset and to 30 minutes after sunrise at all turbines.

Cut-in speeds restrictions will be operated according to specific weather conditions:

1. When the air temperature is above approximately 10 to 11°C at nacelle height; and
2. Where the wind speed range is between 5.0 to 6.5m/s (at nacelle height).

Due to the considerable unnecessary down time resulting from the proposed "blanket curtailment" (above) and the advances in smart curtailment, a focused curtailment regime is proposed as described below from year four of operation. This will focus on times and dates, corresponding with periods when the highest level of bat activity occur within the Site. This includes the use of the SCADA (Supervisory Control and Data Acquisitions) operating system (or equivalent) to only pause/feather the blades below a specified wind speed and above a specified temperature within specified time periods.

Post-constructions surveys will be undertaken for the first three years of operation to confirm if blanket curtailment restrictions can be amended in line with post-construction activity levels.

The post construction surveys will be used to update the current curtailment regime (blanket curtailment) designed around the values for the key weather parameters and other factors that are known to influence collision risk. This will include all of the following:

- Wind speed in m/s (measured at nacelle height)
- Time after sunset
- Month of the year
- Temperature (ºC)
- Precipitation (mm/hr)

Post Construction surveys

Monitoring will take place for at least 3 years from operation commencing, providing sufficient data to detect any significant change in bat activity relative to pre-construction levels. It will assess changes in bat activity patterns and the efficacy of mitigation to inform any changes to curtailment.

During years one to three of operation (under blanket curtailment restrictions) bat activity will be measured continuously between April and mid-October at each turbine location, in combination with carcass surveys. In addition, wind speed and temperature data will be continuously recorded at the nacelle height of each turbine.

Modern remotely-operated wind turbines as proposed here allow cut-in speeds to be controlled centrally/automatically, facilitating an operation regime designed to minimise harmful impacts to bats.

The feathering of turbine blades combined with increased cut-in speeds have been shown to reduce bat fatalities from 30% to 90% (Adams et al., 2021, Arnett et al., 2008, 2011, 2013; Baerwald et al., 2009). The most recent of studies showed a 63% decrease in fatalities (Adams et al., 2021).

Monitoring Curtailment

If, following the initial 3 years of post-construction surveys, bat activity increases above the baseline and/or remains consistently high and carcass searches indicate fatalities are occurring (refer below), increased cut-in speeds will continue. This will subsequently be monitored in years 5, 7, 10, 15, 20, 25 and 30 with further review after each monitoring period.

Alternatively, if it is found that the results of bat activity surveys and fatality searches confirm that the level of bat activity at turbine locations is reduced (to low) then consent will be sought from Cork County Council (in consultation with NPWS) for the cessation in the requirement for these cut-in speeds / curtailment measures, or a reduction on the timing restrictions for these measures.

Where post construction acoustic surveys are undertaken, they will utilise full spectrum automatic detectors deployed, as a minimum, for one complete bat activity season.

Acoustic monitoring will be supplemented with thermal imaging cameras etc. to provide more detailed information on bat activity in the vicinity of turbines. Due to the level of Leisler's activity within the study area, nacelle-level surveys[6] are also proposed for the post construction surveys. These will be used to identify the level of Leisler's bat activity above the tree canopy and within the height of the rotor-swept area.

An assessment of static data gathered during operational surveillance will be completed using the online analysis tool Ecobat as recommended by SNH (2021) as a minimum, or other equivalent guidance as dictated by up-to date standards and practices.

Lighting

It appears that the lighting on top of wind turbines may affect the likelihood of bats colliding with turbines. Research on this topic, which is reviewed in Powelsland (2009), indicates that intermittent lighting is less likely to cause species to collide with turbines.

As such, flashing red aviation obstruction lights will be provided on perimeter turbines, subject to approval by the IAA. These will not negatively impact bats (Bennett and Hale 2014).

Buffer zones

The tree-free buffer zones around the turbines will be managed and maintained during the operational life of the development. These will be kept clear by mechanical means only (no chemicals / herbicides) and maintained on an annual basis in the same condition as during first clearance.

Due to mitigation by design, all other turbines are proposed to be Sited at a suitable separation distance from trees and trees or shrubs which establish are to be removed to ensure a woodland-free buffer zone.

The immediate surroundings of individual turbines will be managed and maintained so that they do not attract insects (i.e. the concentration of insects in the wind turbine vicinity should be reduced as much as possible, but not such that insect abundancies affected elsewhere on the Site). This will be achieved through physical management of habitats without the use of toxic substances.

[6] Used to supplement ground-based equipment designed to replicate the survey effort undertaken at the pre-application stage (see Roemer et al., 2017). They are particularly useful at woodland key-holed Sites.

The radii of the buffer zone is determined by the height of surrounding vegetation. It is noted that there are no trees around any of the turbines and as such felling is not required at any of the turbine locations. However, a precautionary buffers of 101m surrounding the turbines for vegetation management have been applied. These will apply in the case that regular grazing of this area ceases, and targeted intervention is required to keep vegetation short.

Monitoring of mitigation measures

The success of the implemented mitigation measures for bats on the project will be monitored for a period of no less than three years post construction and appropriate measures taken to enhance these if and where required.

Bat fatality monitoring

Whilst no significant residual impacts on bats are predicted, the proposed development could provide an opportunity to gain baseline data on bat/turbine interaction and the scheme will be monitored for bat fatalities for the first three years of operation (post construction surveys) and subsequently in years 5, 7, 10, 15, 20, 25 and 30 as part of the additional curtailment monitoring schedule. A comprehensive onsite avian fatality monitoring programme will be undertaken following published best practice. This fatality monitoring programme will be extended and duplicated for bat fauna.

The primary components of the bird mortality programme are outlined below, and an assessment of bat mortality will essentially follow the same methodology:

a) 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.

b) Turbine searches for fatalities will be undertaken following best practice in terms of search area (focusing on the hard standing) (SNH, 2019; 2021) while also encompassing the wider search radius defined by bird fatality monitoring requirements, and at intervals selected to effectively sample fatality rates as determined by carcass removal trials in (a) above.

c) 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).

d) Recorded fatalities will be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

Table 9-39: Monitoring schedule proposed for bat mitigation measures

Mitigation measure	Monitoring required	Description	Duration
Mortality study	Fatality monitoring	Corpse searches beneath turbines to assess the impact of operation on bats.	From initial operation conducted during years 1, 2, 3, 5, 7, 10, 15, 20, 25 and 30 post construction.

Table 9-40: Summary of Operational-phase Mitigation Measures for Bats

Moderate-High Level Bat Mitigation Applies to all turbines	Category
Operate the wind turbines in a manner that reduces the movement of the blades below the cut-in speed (e.g. by feathering the blades).	Feathering
Implement blanket curtailment during year 1-3 while post construction surveys are undertaken. The curtailment will involve operating the selected wind turbine from 30 minutes prior sunset to 30 minutes after sunrise at a cut-in speed of 5.5 m/s during specified weather conditions (10-11 °C and wind speed 5.0 to 6.5 m/s at nacelle hight) and during the active bat season (April to October).	Blanket curtailment
Implement a monitoring programme during years 1 – 3 post construction to detect any large-scale changes in bat activity including carcass surveys. Bat activity will be measured continuously between April and mid-October at each turbine location. In addition, wind speed and temperature data will be continuously recorded at the nacelle height of each turbine.	Post construction monitoring
If, following the initial 3 years of post-construction surveys, bat activity increases above the baseline and/or remains consistently high and carcass searches indicate fatalities are occurring, increased cut-in speeds will continue. This will subsequently be monitored in years 5, 7, 10, 15, 20, 25 and 30 with further review after each monitoring period. Alternatively, if it is found that the results of bat activity surveys and fatality searches confirm that the level of bat activity at turbine locations is reduced (to low) then a derogation will be sought from Waterford County Council (in consultation with NPWS) for the cessation in the requirement for these cut-in speeds / curtailment measures, or a reduction on the timing restrictions for these measures through SCADA (or equivalent) operating systems.	Smart curtailment
Undertake a carcass search during years 1-3, and subsequently in years 5, 7, 10, 15, 20, 25 and 30 as part of the additional curtailment monitoring schedule.	Carcass monitoring
Maintain immediate area (81 m) around the wind turbines in a manner that does not attract insects.	Maintain vegetation free buffer

9.10.3.4 Aquatic Ecology

The operational wind farm will have a negligible effect on aquatic ecological interests and fisheries, as there are no further potential impacts on surface water run-off or watercourses within the Site. During the operation phase, oils will be required for cooling the transformers giving rise to the potential for oil spills within the Site. However, this will not be associated with the TDR and any potential TDR works during the operational phase will be limited to temporary accommodation works in the event that turbine replacement is required.

It is not envisaged that maintenance will involve any significant impacts on the hydrological regime of the area. Weekly inspections of the erosion and sediment control measures on Site will be required during the construction period, followed by fortnightly inspections until the risk of erosion or siltation has declined following the successful establishment of vegetation during the operational phase.

Localised water quality impacts as a result of construction phase will be reduced by undertaking the most sensitive elements of the works outside the salmonid close season and protection of water quality following the implementation of the water management measures. Sensitive elements or work include any instream works in addition to works near watercourses where significant releases of silt / sediment could occur.

9.10.4 Mitigation Measures during the Decommissioning of the project

The same mitigation measures for the wind farm and GCR will apply for the decommissioning phase as for the construction phase.

In relation to aquatic ecology, the same mitigation measures will apply for the decommissioning phase as for the construction phase. In the event of decommissioning of the Coumnagappul wind farm, the access tracks may be used in the decommissioning process. Mitigation measures applied during decommissioning activities will be similar to those applied during construction but will be of reduced magnitude and will be agreed with the planning authority prior to decommissioning.

It is proposed that turbine foundations and hardstand areas will be left in place and covered with local soil/topsoil to revegetate at the decommissioning stage. It is considered that leaving the turbine foundations, access tracks and hardstand areas in-situ will cause less environmental damage than removing them. The grid connection cable, ducting and substation will be left in situ as part of the national grid, therefore no potential impacts during decommissioning stage are likely to occur. Hence no mitigation measures are required for these elements.

9.10.5 Enhancement Measures

A series of enhancement measures are proposed to increase the biodiversity value of the proposed Site. These are detailed in the Biodiversity Enhancement & Management Plan (see Appendix 9.1, Volume III).

9.10.6 Vulnerability to Major Accidents or Disasters

Should a major accident or natural disaster occur, the potential sources of pollution onsite during the construction and operational phases of the Coumnagappul Wind Farm are limited. The primary sources with the potential to cause significant environmental pollution and associated negative impacts on human health and the environment include the bulk storage of hydrocarbons, chemicals and wastes. In the case of the proposed Coumnagappul Wind Farm development Site, the storage of chemicals of this kind are strictly limited. For biodiversity, the main possible impacts are considered to be the release of sediment and pollutants into watercourses, which could negatively impact upon aquatic habitats and species.

Potential vulnerabilities relevant to the proposed project are limited to:

- Flooding;
- Fire;
- Major incidents involving dangerous substances;
- Catastrophic events; and
- Landslides.

The risk of flooding is addressed in Chapter 12: Hydrology and Water Quality, which concludes that the wind farm Site will have a negligible impact on flood risk in the surrounding area, as a result of the proposed development. Furthermore, there is no expected increase to flood risk along the GCR or TDR.

In the event of extreme weather conditions, the proposed surface water drainage will manage storm water avoiding significant negative impact on the project's infrastructure. Therefore, it is unlikely that the proposed development will result in increased flood risk, and it is unlikely that flood risk would result in effects on human safety (including traffic), water quality, biodiversity, soil stability, material assets and archaeological or architectural heritage, as the increased flood risk is considered negligible.

Mitigation measures are set out in Chapter 12: Hydrology and Water Quality to avoid potential negative impacts during the construction stage with respect to flood risk.

The potential for fire at the proposed Coumnagappul Wind Farm is mitigated against by design. Furthermore, the wind farm will be remotely monitored, and potential accidents will be quickly identified and reported.

In line with IWEA Health and Safety Guidelines for the Onshore Wind Industry (2011), Emergency Response Plans will include emergency response procedures for initial actions in the event of a fire. Records will be kept for testing of fire alarms and drills and maintenance/inspection of fixed and portable firefighting equipment. Information will be provided to employees on fire safety and fire prevention, including risks of and control measures to prevent fire outbreak, evacuation procedures and those responsible for their implementation, and the use of firefighting equipment, in line with HSA guidance.

During the construction phase of the proposed development, an emergency response plan will be in place as set out in the CEMP, included in Appendix 2.1 of Volume III of this EIAR.

Given the nature of the proposed development, coupled with the lack of proximity to established Seveso Sites, there is a negligible potential risk of negative impact to the proposed development and its receiving environment, as set out throughout this EIAR, arising from the occurrence of major incidents involving dangerous substances.

Potential catastrophic events associated with operational wind turbines include:

- Wind turbine toppling (due to foundation or tower failure);
- Wind turbine rotational failure in extreme wind conditions (due to control system or rotor break failure); and
- Fire.

The primary mitigation against a catastrophic event that may endanger biodiversity has been implemented at design stage through adequate siting of wind turbines which provide sufficient set back distances from occupied buildings and other infrastructure to avoid the risk of negative impact in the event of wind turbine collapse.

The proposed hub height for wind turbines at the Coumnagappul Wind Farm is 104m. No wind turbine is located within 500m of a residential dwelling. No turbines have been located within 1.5 x tip height of the proposed on-Site substation.

Turbines have been Sited with consideration for existing ground conditions to minimise the risk of turbine foundation failure, toppling and landslide. Intrusive Site investigations have been carried out to confirm ground conditions at turbine locations as well as slope stability analysis throughout the wind farm Site. Other design mitigation measures employed for the siting of wind turbines include the following:

- Areas mapped by GSI as having a high susceptibility to landslides have been avoided;
- Turbine locations have been assessed by Site investigation and visually by geotechnical engineers prior to confirmation of final siting;
- Care has been taken in design of road and hard standing alignments, cutting and filling and drainage;
- Peat probing has been carried out at turbine locations with maximum peat depths of 700mm.

As detailed in Chapter 11: Soils, Geology and Hydrogeology susceptibility to slope failure is considered 'low' to on the Site. Site investigation was conducted which revealed maximum peat depths of 700mm.

Wind turbines are fitted with sophisticated remote monitoring and control systems to manage rotational speed. Turbines also have the capability to shut down in storm conditions through adjustment of blade pitch. Turbines are also fitted with emergency power supply (EPS) units to provide backup power in the event of a loss of mains power supply that could impact the control system.

Wind turbines will be fitted with fire suppression systems and will have emergency escape procedures in place for operational staff in the event of fire in a wind turbine.

In relation to potential vulnerability of the project to major accidents and natural disasters it is concluded that the potential susceptibility to natural disaster of the proposed Coumnagappul Wind Farm is negligible. Therefore the potential for any related effects on biodiversity and the environment arising from fire or pollution are also negligible.

9.11 Residual Ecological Impacts

9.11.1 European Sites

The Natura Impact statement concluded that, on the basis of objective scientific information, the main wind farm Site, TDR, and GCR will not, either alone or in combination with other plans or projects, adversely affect any of the constitutive interests of the Lower River Suir SAC, Blackwater River (Cork/Waterford) SAC, and the Dungarvan Harbour SPA (or any other European Site), in light of the Sites' conservation objectives.

9.11.2 Natural Heritage Areas or Proposed Natural Heritage Areas

One pNHA within 15 km of the wind farm overlaps a European Site which was considered to have potential for significant effects as part of the NIS:

- Dungarvan Harbour SPA/ pNHA

Whilst it has been acknowledged that there could be potential for the main wind farm Site and grid connection to have significant effects on the Dungarvan Harbour SPA/ pNHA, with the implementation of the detailed mitigation measures identified in the NIS it is concluded beyond reasonable scientific doubt that the integrity of the European Site listed above will not be adversely affected. The implementation of detailed mitigation measures specified in this EIAR will in ensure the integrity of the associated pNHA listed above will not be adversely affected.

The NIS report has assessed the potential effects on the integrity of the Dungarvan Harbour SPA and the associated pNHA in light of the Sites' conservation objectives and mitigation measures have been developed to prevent such potential effects occurring.

In the light of the conclusions of the assessment which it shall conduct on the implications for the Dungarvan Harbour SPA and the associated pNHA, the competent authority is enabled to ascertain that the proposed project will not adversely affect the integrity of the Dungarvan Harbour SPA/ pNHA.

No significant effects are predicted for the remaining national Sites within 15 km of the proposed wind farm and within 500m of the GCR and TDR PoIs which are not overlapped by European Sites:

- Comeragh Mountains pNHA (001952)
- Nier Valley Woodlands pNHA (000668)
- Toor Wood pNHA (001708)
- Glenboy Wood pNHA (000952)
- Kilsheelin Lake pNHA (001701)
- Stradbally Woods pNHA (001707)
- Marlfield Lake pNHA (001981)

As such no residual impacts to designated Sites will occur from the Project during construction, operation, and decommissioning phases.

9.11.3 Habitats and Flora

Construction of the wind farm will lead to some permanent loss of habitat. The habitat loss will be the total area covered by the roads plus the footprint of each of the proposed turbines and all other wind farm infrastructure and associated felling buffers. For clarity, associated infrastructure includes the construction compounds and a substation. Land take at junctions along the proposed turbine delivery route will be minimal.

Not all land take is permanent as modifications along the turbine delivery route will be reinstated and felling areas will become different habitats rather than being lost within the development footprint. The construction compound supporting wet grassland will be allowed to recolonise naturally following construction.

Mitigation measures as outlined in the current chapter and Chapter 12 - Hydrology and Water Quality' as well as the use of HDD at a grid connection watercourse crossing will ensure no significant loss of aquatic habitat of higher value.

With the application of the mitigation measures as outlined, it is considered that the impacts of the Proposed Development, GCR and TDR will be minimised for other habitats to an acceptable level during construction, operation and decommissioining phases, resulting in no Significant residual effects.

9.11.4 Mammals

Measures to protect Red Squirrel and Pine Marten include restricting felling operations to outside their breeding periods, and pre-felling surveys where this cannot be facilitated. Pre-clearance vegetation checks to protect Badger, Irish Stoat, Irish Hare, Pygmy Shrew and Hedgehog will be carried out by an ecologist as required.

Some permanent loss of areas of grassland and plantation woodland habitats which could be used by foraging and breeding mammals for shelter/breeding will occur form constructing the Proposed Development, GCR and TDR. While Scrub may develop in these areas. The implementation of mitigation measures will reduce residual impacts during construction, operation and decommissioning phases to *Long-term Imperceptible Negative Reversible Impacts* in the local context.

The habitats used by protected mammal species within the proposed development footprint and felling areas represent a small amount of the total available within the study area and are also present within the wider landscape.

9.11.5 Bats

Based on Lundy et al., (2011) habitat suitability index, the overall suitability for the 5x5 km squares which the wind farm Site is spread between have been scored as holding low to moderate suitability for all bats. The proposed Site and its environs are of moderate suitability for common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle, and Leisler's bat, low to moderate suitability for Daubenton's bat and Natterer's bat., and of low suitability for whiskered bat *Myotis mystacinus*, Nathusius' pipistrelle (P. nathusii) and lesser horseshoe bat *Rhinolophus hipposideros* (being outside of the distribution range for lesser horseshoe bat).

A total of eight bat species, in addition to genus -level records of Myotis Spp. have been recorded as present within the study area during the 2020/2021 bat surveys. All bat species occurring in Ireland are listed as 'Least Concern' on the Irish Red List (2019), and Annex IV of the EU Habitats Directive.

This assessment identifies that the bat activity levels with the Site are high, and the proposed turbines have been Sited within areas of expected lower activity (open space), in order to reduce the potential for impact to the bat population of the area. Furthermore, with the implementation of extensive mitigation outlined above potential risk of fatality from collision and/or barotrauma events to foraging and/or commuting high risk species such as pipistrelle and Leisler's have been significantly reduced (Behr, O. et al., 2017).

The assessment has been undertaken in accordance with all the latest available guidance and the mitigation proposed include those that have been previously described in guidance relating to windfarms and/or have direct evidence supporting there efficacy at reducing / avoiding impacts.

The resulting impact of the Proposed Development, GCR and TDR on local bat populations, with implemented mitigation measures, is considered to be a *Not Significant-Slight Residual Negative Reversible Impact* and In the *Local Context* during construction, operation and decommissioning phases with the favourable conservation status (FCS) of bat species being unaffected and all species confirmed or expected on or near the study areas predicted to persist.

9.11.6 Aquatic Ecology

The watercourses on the proposed Wind Farm Site are all small streams with sensitive ecological receptors, notably salmonid species. The GCR traverses sensitive ecological areas near salmonid and lamprey nursery and spawning habitat. Effects will be effectively reduced to an imperceptible negative effect during construction, operation and decommissioning phases with the mitigation measures from the Proposed Development, GCR and TDR as set out in Chapter 12- Hydrology and Water Quality. The limitation through mitigation of effects arising from water quality pollution events such as siltation and run-off of suspended solids will significantly reduce the potential for impacts affecting aquatic ecological interests within the Site.

All mitigation measures provided for the protection of aquatic ecology and fisheries (particularly Annex II Species recorded during the current surveys) within the proposed development Site will effectively protect aquatic ecological interests downstream of the proposed development.

It is noted that with the implementation of mitigation measures, the proposed development will not cause any WFD Waterbody to deteriorate and will not in any way prevent or jeopardise any WFD Waterbody meeting the biological and chemical characteristics for good status under the WFD. This is equally applicable to both categorised and uncategorised WFD Waterbodies.

9.11.7 Other Species

Residual effects are assessed as *Not Significant Reversible Residual Impacts* and in the local context.

9.11.8 Overall residual impact

With the implementation of the detailed mitigation measures (outlined in the Natura Impact Statement, this chapter, Chapter 11 Soils, Geology and Hydrogeology and Chapter 12 Hydrology and Water Quality and the CEMP) there will be no significant residual impacts from the Site, GCR and TDR on biodiversity.

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