6 BIODIVERSITY

6.1 INTRODUCTION

This Chapter assesses the likely significant effects of Project on terrestrial ecology, and sets out the mitigation measures proposed to avoid, reduce or offset any potential significant effects that are identified. The residual ecological effects are then assessed.

The Project refers to all elements within the Redline Boundary, as set out in detail in **Chapter 2: Project Description**. This includes all elements within the Redline Boundary, the wind turbines, permanent 110kV Substation, Access Tracks, Met Mast, turbine hardstands, temporary compound and all site infrastructure. The proposed Project also includes the temporary accommodation requirements along the proposed Turbine Delivery Route (TDR), which are outside the Redline Boundary and which together with the works within the Redline Boundary are defined as the Project.

The assessment considers the potential effects during the following phases of the proposed Project:

- Construction of the Project
- Operation of the Project
- Decommissioning of the Project

This chapter of the EIAR is supported by **Figures 6.1 - 6.3** provided in Volume III:

- **Figure 6.1:** Distribution of European Sites within a 15 km radius of the Site
- **Figure 6.2:** Distribution of NHAs and pNHAs within a 15 km radius of the Site.
- **Figure 6.3:** Distribution of principal habitats within the Site.

The following Appendix documents are provided in Volume IV of this EIAR:

- **Appendix 6.1** Bat Survey Report, Garrane Wind Farm, Co. Limerick. Eire Ecology Environmental Consultants, June 2025.
- **Appendix 6.2** Biodiversity Enhancement and Management Plan (BEMP).

A Construction and Environmental Management Plan (CEMP) is appended to the EIAR in Technical **Appendix 2.1**. This document will be a key construction contract document, which will ensure that all mitigation measures, which are considered necessary to protect biodiversity and the environment, are implemented.

6.1.1 Project Description

Permission is being sought by the Developer for the construction of 9 No. wind turbines, a permanent Met Mast, a permanent on-site 110kV Substation with a 'loop in' Grid Connection to the existing 110kV OHL between Charleville and Killonan, and all ancillary works. Temporary accommodation requirements at locations along the TDR are not included in the planning application but are assessed as part of the EIAR.

The proposed works within the Redline Boundary will include the following main components:

- Erection of 9 No. wind turbines with a tip height of 170m. The wind turbines will have a rotor diameter of 150m and a hub height of 95m.
- Upgrade of existing Access Tracks and construction of new Access Tracks, turbine hardstand areas and turbine foundations.
- Construction of two new bridge crossings on-site, one over the River Maigue and one over the Charleville Stream.
- Upgrade of existing site drainage network and installation of new site drainage.
- Wind Farm Internal Cabling connecting the wind turbines to the electrical substation.
- Construction of an on-site AIS 110kV Substation with a 'loop in' Grid Connection to the existing 110kV overhead line between Charleville and Killonan.
- Construction of double circuit 110kV underground cable and two steel cable interface masts to connect to the existing overhead line.
- Erection of a permanent 60m Meteorological Mast for monitoring wind speeds.
- Construction of a Temporary Construction Compound for use during construction.
- Upgrade of the existing entrance on the N20 (Site Entrance 1) (to be used for abnormal loads and turbine component delivery) and upgrade of an existing site entrance on the L1537 (Site Entrance 2) (to be used for all construction traffic except for abnormal loads and turbine component delivery).
- 6 No. temporary spoil storage areas and 1 No. permanent spoil storage area.
- Biodiversity enhancement and improvements associated with the Project.
- Landscaping, fencing and all associated ancillary works.

A 10-year planning permission and 35-year operational life from the date of commissioning of the entire wind farm is being sought.

A permanent planning permission is being sought for the Grid Connection and the Substation as these will become an asset of the national grid under the management of ESB & EirGrid and will remain in place upon decommissioning of the wind farm.

6.1.1.1 Grid Connection

Connection will be sought from the national electricity network operators by application to the transmission operator Eirgrid. Possible grid connection options for the Project were assessed and it was found that a 'loop in' Grid Connection to the existing 110kV OHL between Charleville substation and Killonan substation was the most viable option. Grid connection options are assessed in **Chapter 3: Alternatives**.

The Grid Connection can be summarised as follows:

- Underground ducting Grid Connection from the on-site 110kV Substation to the lattice end masts (as shown on Drawing No. **3337-SUIR-SS-DR-C-2411**) with a 'loop in' Grid Connection to the existing 110kV OHL between Charleville substation and Killonan substation.

The above Grid Connection design is shown in **Figure 2.4**.

The power generated by each wind turbine will be transmitted via underground Wind Farm Internal Cabling to the new 'loop-in' Substation. The Wind Farm internal cabling network will be installed in trenches 0.6 m wide by 1.3 m in depth and there will be 4,700 m of Wind Farm internal cable trenching (giving a surface area of 2,820 m²). The underground cable (UGC) will be located fully within the Redline Boundary, within or alongside the proposed Access Tracks.

Excavated material derived from trenching will be stored upgradient of the trench excavations (where relevant). Spoil will be temporarily stored in the temporary spoil storage areas shown on **Figure 1.2.** Where any spoil cannot be used for reinstatement and landscaping works it will be permanently stored in the permanent spoil storage area located at the back of the 110kV substation**.** This is further detailed in the **Spoil Management Plan** in **Appendix 2.1: Construction Environmental Management Plan** and fully assessed in **Chapter 9: Soils and Geology**.

6.1.1.2 Turbine Delivery Route (TDR)

The EIAR assesses a preferred TDR from Foynes Port to Site for blades and turbine components and an alternative TDR which includes blade delivery only from the Port of Galway with all other components transported from the Port of Foynes. The EIAR assesses the temporary accommodation requirement works at 6 No. locations along the TDR from Foynes Port to the Site as outlined in Chapter 2, Table 2.6. An additional location (Location 7) is within the Redline Boundary of the Project. No other third party lands are required for the temporary accommodation requirements along the TDR.

Further information on the TDR is outlined in detailed within Chapter 2, Section 2.5.5, Table 2.6 and Table 2.7 and also detailed in Appendix 17.2.

6.1.1.3 Borrow Pit

No borrow pit/s are proposed for this Project.

6.1.1.4 Landscaping and Reinstatement

As part of the design process, significant consideration has been given to the level of excavations required to construct the Project in order to minimise the generation of spoil and, subsequently, to the management of excavated material. Where excess topsoil or subsoil material is generated which cannot be utilised for reinstatement or landscaping purposes, it is proposed to develop a permanent spoil storage area where excess soil and subsoil will be stored permanently. It is estimated that c. 19,432m^3 of excess material (topsoil and subsoil material) will be generated and will be stored in the storage areas.

A detailed Spoil Management Plan (**Appendix 2.1, Management Plan 4**) has been prepared and will address the re-use, reinstatement, storage and restoration of all material excavated during the construction phase including detailed methodologies regarding the establishment and management of the spoil storage area for the entire Project.

6.1.1.5 Watercourse Crossings

There are 2 no. watercourse crossings required to facilitate access to T7 and T3. Water Crossing 1 (WC01) is located on the Maigue River on the Access Track northwest of T7 and Water Crossing 2 (WC02) is located on the Charleville (Stream) on the Access Track east of T3. Both crossings will be a clear span bridge type construction. The Maigue River and Charleville (Stream) crossings are shown on Drawing No. **6839-JOD-GGE-XX-DR-C-0402** and Drawing No. **6839-JOD-GGE-XX-DR-C-0403.**

Abnormal loads will enter the Site via an existing entrance on the N20 (Site Entrance 1) which will be upgraded to allow vehicles to turn into the Site. Due to the fact that the N20 is a very busy National road, the Site Entrance 1 off the N20 will only be used for the transportation of abnormal loads into the Site. These vehicles will enter the Site via this entrance and exit the Site via Site Entrance 2 on the L1537 as they will have unloaded and shortened and will no longer be oversized and will therefore be able to exit onto the L1537 (see Figure 2.2).

The methodology for the crossings WC01 and WC02 is outlined in Chapter2, **Section 2.5.6**. Further details of the proposed bridge construction methodology are contained in the **CEMP** in **Appendix 2.1** and **Appendix 2.3 Bridge Construction Method Statements**.

6.1.2 Project Team

This ecology chapter has been prepared by Dr. Brian Madden (BioSphere Environmental Services) and is informed by ecological survey data and relevant reports from various ecologists as listed in **Table 6.1** below. Appendix 1.1 provides a list of author qualifications and relevant experience.

Table 6.1: Personnel involved in ecological assessment.

Project Team Member	Qualifications & Experience	Role
Dr Brian Madden, BioSphere Environmental Services	BA. Mod. (Hons), PhD, MCIEEM Brian graduated in Natural Sciences from the University of Dublin in 1984 and earned a Ph.D. degree in 1990 from the National University of Ireland for his research on ecosystem processes in raised bogs. Since 1994, Brian has been the principal ecologist with BioSphere Environmental Services. Brian has carried out botanical surveys and habitat assessments for most terrestrial habitats which occur on the island of Ireland. He is also an experienced ornithologist, with particular interests in birds of prey and wetland birds. He has published a range of peer-reviewed research papers.	Preparation of EIAR Chapter 6; habitat assessment; terrestrial mammal survey

Project Team Member	Qualifications & Experience	Role
	Examples of energy projects that Brian has been involved in include: Grousemount Wind Farm, Cos. Cork/Kerry, Oweninny Wind Farm Phases 1 & 2, Co. Mayo, Castlepook Wind Farm, Co. Cork, Letteragh Wind Farm, Co. Clare, Eglish Wind Farm, Co Tyrone, Connemara 110kV Overhead Line Reinforcement Project (40 km from Barna to Screeb Bay)	
Dr John Conaghan, Enviroscope Environmental Consultancy	BSc, PhD, MCIEEM John graduated in Science from University College Galway in 1990, specialising in botany, and subsequently carried out research into the ecology of fens in Ireland for his Ph.D dissertation. John has over 25 years experience of working on botanical projects throughout Ireland. He has particular expertise in peatland and wetland habitats, as well as rare plants. John has worked with Coillte on their LIFE funded habitat restoration programme - he regularly contributes this expertise to Species and Habitat Management Plans. Examples of energy projects that John has been involved in include: Oweninny Wind Farm Phases 1 & 2, Co. Mayo, The Galway Wind Park, Grousemount Wind Farm, Cos. Cork/Kerry, Castlepook Wind Farm, Co. Cork, BGE Corrib Gas Pipeline from Bellanaboy, Co. Mayo to Craughwell, Co. Galway.	Advisory role for habitat and botanical surveys; Rare plants.
John Curtin, Eire Ecology	BSc, Environmental Science (NUI Galway) John has been carrying out bat surveys at wind farm sites since 2012, and has completed all standard training for such work through Bat Conservation Ireland, Bat Detector Workshop and Bat Handling Workshop. John holds the relevant licences for handling and photographing bats. Examples of energy projects that John has provided bat assessments for include Yellow River Wind Farm, Co. Offaly, Boggeragh Wind Farm, Co. Cork, Cappawhite B	Implementation of Bat Survey for project Analysis of bat data and preparation of risk assessment and mitigation report (Appendix 6.1)

Project Team Member	Qualifications & Experience	Role
	Wind Farm, Co. Tipperary, Glenmore Wind Farm, Co. Clare.	
Mr Joe Adamson, associate with BioSphere Environmental Services	MSc, BSc, MCIEEM Joe has over 15 years' experience working in mammals and birds throughout Ireland (and before that has worked in North America). He regularly carries out baseline surveys for wind farm projects and has worked on Grousemount Wind Farm, Cos. Cork/Kerry, Oweninny Wind Farm, Co. Mayo and Firlough Wind Farm, Co. Mayo.	Terrestrial mammal field surveys

6.2 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

6.2.1 Purpose of the Report

The purpose of this report is to:

- Establish and evaluate the baseline ecological environment as relevant to the Project.
- Identify, describe and assess all potentially likely significant direct, indirect and cumulative ecological effects associated with the Project.
- Set out the prevention and mitigation measures required to address any likely significant ecological effects and ensure compliance with relevant nature conservation legislation.
- Provide an assessment of the significance of any residual ecological effects.
- Identify any appropriate enhancement and / or post-construction monitoring requirements.

6.2.2 Relevant Legislation and Policy

The main pieces of legislation relevant to this chapter are as follows:

- The Wildlife Acts 1976 – 2022 as amended
- The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) as amended
- European Communities (Birds and Natural Habitats) Regulations 2011 - 2021
- Flora (Protection) Order, 2022 (S.I. No. 235 of 2022)
- Fisheries (Consolidation) Act, 1959

- Local Government (Water Pollution) Act, 1977 (as amended by Sections 3 and 24 of the 1990 Act)

In considering ecological survey and assessment of impacts of the Project, regard was made to the following key guidance and information documents:

- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (2022).
- European Commission (2017) Environmental Impact Assessment of Projects. Guidance on the preparation of the Environmental Impact Assessment Report. (Directive 2011/92/EU as amended).
- NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes.
- CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.
- Fossitt (2000). A Guide to Habitats in Ireland. Heritage Council, Kilkenny.
- Smith et al. (2011). Best Practice Guidance for Habitat Survey and Mapping in Ireland.
- Bats and onshore wind turbines: Survey, Assessment and Mitigation. Scottish Natural Heritage January, 2019 and revised version August, 2021.
- Northern Ireland Environment Agency, Natural Environment Division (2021) Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland. Version 1.1. Belfast: Department of Agriculture, Environment and Rural Affairs (Northern Ireland).
- Bat Conservation Ireland Guidelines for consideration of bats in wind farm projects - Revision 2014
- BTHK (2018). Bat Roosts in Trees – A Guide to Identification and Assessment for Tree-Care and Ecology Professionals. Pelagic Publishing, Exeter UK.
- CIEEM (2021). Bat Mitigation Guidelines. A guide to impact assessment, mitigation and compensation for developments affecting bats. Beta version 1.0.
- Collins, J. (Editor) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition). Bat Conservation Trust, London
- Kelleher, C. & Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

- Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.
- Limerick Development Plan, 2022-2028.
- Limerick Biodiversity Action Plan, 2025-2030.
- Wetland Surveys Ireland (2019) River Maigue Catchment Riparian Habitat Study. Maigue Rivers Trust, Ireland

6.2.3 The Study Area

For habitats and flora species, the main study area is all land within the Redline Boundary. However, consideration is given to the potential for sensitive habitats, such as bogs or fens, or protected plant species (including bryophytes), to a distance of at least 1 km of the Redline Boundary should ecological or hydrological connectivity exist from the Site to such areas. Such habitats may be part of designated sites at a national or international level.

For terrestrial mammal species, badger *Meles meles* and otter *Lutra lutra* are identified as the principal species likely to be affected by the construction of the proposed Project as these species, and especially badger, live in often complex underground tunnel systems which may have been used by many generations of animals (Hayden & Harrington 2000). For badger, the main study area was a distance of approximately 100 m of the proposed infrastructure locations (after NRA 2006 & NRA 2009b). For otter, the main study area was a distance of at least 150 m upstream and downstream of the sections of river potentially affected by the proposed infrastructural works, including the margins of the river to a distance of 10 m width. Generally, the potential of watercourses to support otter was based on stream size and water quality.

For bats, the desk review study area extended to a distance of 10 km for roost sites and to 4 km for known caves. A habitat assessment for bat potential, including assessment of value of trees and structures as bat roosts, was carried out to a distance of c. 200 m plus rotor radius of the proposed turbines (following BCI Guidelines Ver. 2.8, 2012, NIEA 2021, NatureScot 2021).

Table 6.2: Summary of study areas for main ecological receptors.

Receptor	Study Area Definition	References
Habitats & Flora	Redline Boundary of site for core baseline survey; Extending to 1 km or beyond Redline Boundary for sensitive habitats and plant species	Department of Environment, Heritage and Local Government 2010
Badger	100 m (minimum) from works area	NRA 2006; NRA 2009b
Otter	150 m (minimum) upstream and downstream of watercourse crossing points	NRA 2008; NRA 2009b
Bats	200 m plus rotor radius of the proposed turbines; Up to 10 km for bat roost desk review	BCI 2012 Nature Scot 2021 NIEA 2021

6.2.4 Zone of Influence

The Zone of Influence (ZoI), or distance over which potentially significant effects may occur, will differ across the Key Ecological Receptors (KERs), depending on the potential impact pathway(s). The results of both the desk study and the suite of ecological field surveys undertaken have established the habitats and species present within, and in the vicinity of, the proposed Project. The ZoI and study area was then informed and defined by the sensitivities of each of the KERs present, in conjunction with the nature and potential impacts associated with the proposed Project.

The ZoI in relation to direct impacts on habitats and flora and fauna species as a result of Garrane Green Energy Project will be confined to the area within the Redline Boundary of the proposed Project, as well as the areas in which works along the Grid Connection and Turbine Delivery route will take place.

The ZoI of general construction activities (i.e. risk of spreading/introducing non-native invasive species, dust deposition and disturbance due to increased noise, vibration, human presence and lighting) is not likely to extend more than several hundred metres from the proposed Redline Boundary. but could be further for bats and birds.

6.2.5 Desk Study

A comprehensive desktop review was carried out to identify features of ecological importance within the proposed development area and surrounding region. This comprised a review of available ecological data, including the following:

- Online web-mapper of National Parks and Wildlife Service (NPWS) for data on sites designated for nature conservation (European & National) and on protected flora species and protected bryophytes (see www.npws.ie/protected-sites),
- Online web-mapper of National Biodiversity Data Centre for protected species datasets (see http://maps.biodiversityireland.ie), with a focus on existing species records for the 10 km square in which the study site is located (R 52).

For bats, a data search of the Wind Farm Site location was conducted in April 2023, February 2024 and in May 2025 to revise existing information from the surrounds of the proposed planning boundary. The following information sources were examined:

- Known bat records within a 10 km radius of the proposed sites from the Bat Conservation Ireland database
- Adhoc and observational bat records from the National Bat Database held by the National Biodiversity Data Centre (www.biodiversityireland.ie)
- Review of Ordnance Survey mapping and aerial photography of the proposed wind farm boundaries and their environs (i.e. 200m plus rotor radius of the proposed turbines)
- Records of designated sites within a 15 km radius of the proposed sites where bats form part or all of the reason for designation (https://www.npws.ie/protected-sites)
- Collation of data on known caves within a 4 km radius of the proposed sites from the Cave Database for the Republic of Ireland, compiled by Trinity College (http://www.ubss.org.uk/search_irishcaves.php)
- Review of bat survey data from Ecological Impact Assessments from proposed and permitted developments within the wider environs of the Site.

The National Parks and Wildlife Service (www.npws.ie) website and online maps were also accessed in relation to designated areas, qualifying interests, and site synopses on relevant Special Areas of Conservation with regard to bats.

6.2.6 Consultation

As part of the study, consultation was made with the following relevant ecological parties (see **Chapter 1: Table 1.7**):

- National Parks and Wildlife Services of the Department of Housing, Local Government and Heritage - email received on 8th July 2024: "*Please note the Department is not in a position to make specific comment on this particular referral at the stage. No inference should be drawn from this that the Department is satisfied or otherwise with the proposed activity. The Department may submit observations/recommendations at a later stage in the process."*
- An Taisce (no response received)
- Irish Peatland Conservation Council (no response received)
- Bat Conservation Ireland – email received on 5th July 2024: "*Unfortunately, as BCI is a very small organisation, with limited resources, we do not have the capacity to get involved in planning issues*".

6.2.7 Field Surveys

6.2.7.1 Habitats, vegetation and flora

The Site was visited on the following dates: 23rd June 2022, 9th August 2023, and 10th May 2024. The prolonged survey period reflected the progression of the layout design during the planning of the proposed Project.

As the site for the proposed development is essentially active farmland, a walkover survey on a field by field basis was systematically carried out in June 2022 with the objective of providing a general classification of habitats on site and the presence of possible habitats of conservation importance. The site surveys in August 2023 and May 2024 focussed on the proposed locations of the wind farm infrastructure, including turbines/hardstands, access tracks, substation and the 'loop-in' grid connection.

The Turbine Delivery Route requires vegetation removal only at the access point to the site on the N20, which is within the Redline boundary survey area (tree trimming is required at various locations along route).

Habitats within the study area were classified in accordance with 'A Guide to Habitats in Ireland' (Fossitt 2000 & 2024). The dominant plant species present in each habitat type were recorded during the field surveys. This is considered sufficient to allow accurate classification of the habitats present. The extents and details of classified habitats were recorded and mapped using GIS. Where relevant, linkages with the EU Habitats Directive classification system are given.

During the various site surveys particular attention was paid to the possible occurrence of plant species listed in either the Flora (Protection) Order 2022 or the Irish Red Data Books (Curtis and McGough 1988, Lockhart *et al.* 2012). Vascular plant species nomenclature in this report follows Stace (2010) while that of mosses follows Smith (2004).

During the surveys, a search for Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 – 2021 was conducted[1]. Invasive alien species which are widespread in Ireland, including Co. Limerick, include Japanese knotweed, giant hogweed, Himalayan knotweed and Himalayan balsam .

The mapping of habitats was assisted by the use of aerial photography (OSI Geohive & BING online websites).

6.2.7.2 Terrestrial fauna

Multi-disciplinary walkover surveys of the Wind Farm Site were carried out for terrestrial mammals, amphibians and reptiles on 14th March and 5th May 2023, and on 10th May 2024. Surveys were in accordance with NRA guidelines on Ecological Surveying Techniques for Protected Flora and Fauna during the planning of National Road Schemes (NRA, 2009b). In addition, observations on fauna were also made during the habitat and vegetation surveys.

The walkover surveys were designed to detect the presence, or likely presence, of a range of protected species, but particularly badger and otter (see section 6.2.3 above). Terrestrial mammal species were detected by direct observations and by search for signs, such as dwellings (*e.g.* setts), tracks or feeding signs.

Survey for badger was focused on the hedgerows and associated banks within a distance of at least 100 m of the wind farm infrastructure. The areas were walked and checked for signs of badger presence, including setts, latrines, snuffle holes, prints, paths and tree scratching.

For otter, emphasis was placed on search for signs of activity, such as spraints, prints, slides, trails and holts along both banks of the main watercourses on site. The dedicated

[1] http://Invasives.biodiversityireland.ie/

otter survey followed the guidance as set out in NRA (2008) *Guidelines for the Treatment of Otters Prior to the Construction of National Roads Schemes.* The otter survey was supplemented by survey information from the **Aquatic Survey** (**Appendix 7.1)**.

Habitats within the Wind Farm Site were evaluated for their potential to support breeding amphibians, namely the common frog *Rana temporaria* and the smooth newt *Lissotriton vulgaris,* as well as the common lizard *Zootoca vivipara.* Observations for these species were also made during the various mammal and habitat surveys.

6.2.7.3 Bats

In order to assess the presence and activity of bats associated with the Proposed Project, the following surveys were undertaken within and adjacent to the proposed planning boundary:

- Preliminary roost assessment
- Bat activity (walked, driven transects and emergence surveys); and
- Static detector surveys.

All surveys adhered to SNH (2021) guidelines and Collins (2023) (4th ed.), while also taking on board aspects of NIEA (2021) guidance.

Potential roost assessment

Trees

A Ground Level Tree Assessment (GLTA) was conducted for all trees within 275 m of each turbine, along access routes (where the potential exists for felling) and within the proposed substation on 5th April 2023 and 7th March 2024 following guidelines set out in Collins (2016) and Collins (2023).

All trees were assessed from ground level using binoculars.

Examples of crevice features include:

- Natural holes;
- Cracks/splits in major limbs;
- Loose bark; and
- Hollows/cavities.

Each tree was assessed and ranked as having either a potential roost feature (PRF), further assessment required (FAR) or no potential (none).

Structures

A single derelict farmstead comprised the only buildings located near to a 275 m buffer of any proposed turbine (see **Appendix 6.1**: structure 2 in table 4-2 & Figure 4-3). Potential roost structures outside the 275 m zone were also examined. A search was conducted of sheds and derelict dwellings of highest potential that showed connectivity. In situations where access was not possible the surveyor conducted night-time surveys from publicly accessible locations examining bats and attempting to locate commuting routes and/or roosts.

Bat activity and emergence surveys

The bat detectors used during the walked and driven surveys were Wildlife Acoustics Inc. (Massachusetts, USA) Echo Meter Touch Pro 2, which are triggered to record when a bat call is emitted louder than 18dB for 1 sec.

Night-time surveys undertaken combined emergence surveys towards dusk and dawn and a combination of walked and driven transects of bat favourable habitats within and surrounding the site. Surveys were conducted between July and September 2022 and August to September 2023.

Transects targeted a range of foraging and commuting habitats present within and surrounding the study area, those associated with linear features such as roadside margins, hedgerows, treelines and waterbodies. Details of transects are presented in **Appendix 6.1 (Table 4-4).**

Where possible, a positive identification to species level was made. Information on the behaviour was also recorded where available.

All field surveys were undertaken within the active bat season and during acceptable weather conditions (dry conditions and temperature at 8°C and greater) (see **Appendix 6.1: Table 4-3**).

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 (Wildlife Acoustic's Kaleidoscope Pro; version 2.1.0).

Static bat detector surveys

Full spectrum bat recorders Song Meter Mini and SM4BAT were deployed within the study area at the sites of the proposed turbines for ten nights in the spring, summer and autumn periods (following SNH 2021 Guidance). See **Plate 6.1** and **Appendix 6.1 (Table 3-1)** for further details for locations of detectors.

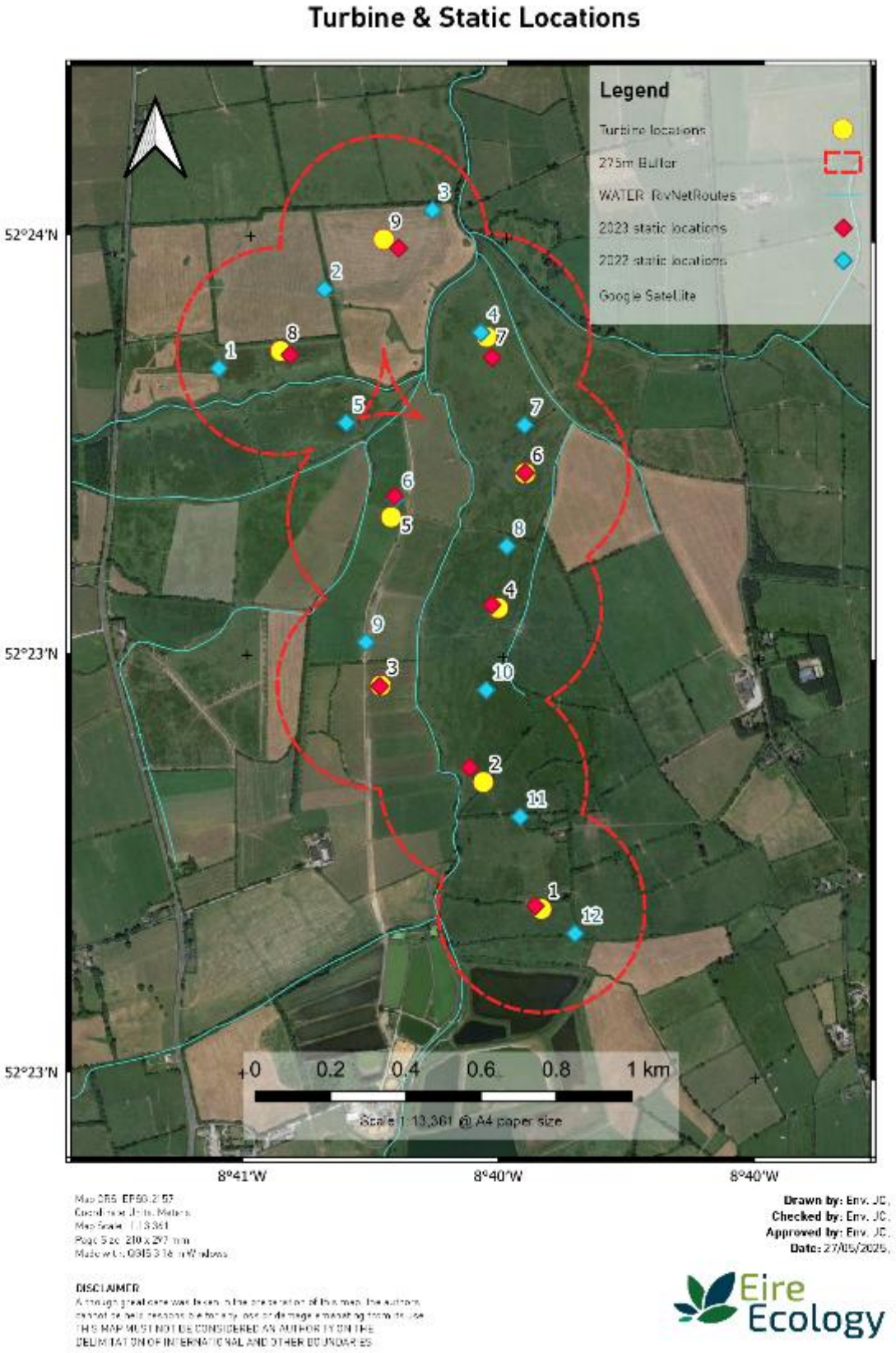

Plate 6.1. Locations of static detectors, 2022 & 2023.

Per SNH (2019) guidance, static units 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.

SNH (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".

The proposed Project has undergone several changes since conception including number and location of turbines. The 2022 surveys were undertaken on a twelve-turbine development thus 12 detectors were set out. Further to a constraints analysis of the Site and as a result changes in Site design and layout, the 2023 static deployment was reduced to a maximum of nine. The statics were positioned in locations as close as possible to where turbines are proposed (see Appendix 6.1: Table 4-1). In 2022 detectors were set out on 5 occasions; Spring, summer, August, autumn and October, while 2023 surveys were set for three survey periods: spring (April - May), summer (July - early August) and autumn (September - October). This represents a very high level of data collection for a wind farm.

The data were analysed with Wildlife Acoustic's Kaleidoscope Pro; (version 2.1.0). This software identifies many of the calls made by Irish bats. All calls were manually verified.

6.2.7.4 Marsh Fritillary

An assessment of the status of the food plant (devil's-bit scabious *Succissa pratensis*) of marsh fritillary *Euphydryas aurinia* was carried out at the time of the botanical surveys of the site (in June 2022, August 2023 & May 2024). This was in accordance with the following: "Ireland's Butterfly Series: Habitat management for the Marsh Fritillary" (Phelan *et al.* 2021) – in this reference, the following is noted:

Habitats that are in good condition for Marsh Fritillary should have three or more well-developed Devil's-bit Scabious plants per square metre, across more than twenty percent of the habitat.

"Ireland's Butterflies: A Review" (Nash *et al.* 2012), in this reference, for marsh fritillary the following is noted (pg. 186):

"All 'good sites' should have a very substantial amount of Devil's- bit Scabious."

6.2.7.5 Survey Limitations

The information provided in this assessment accurately describes the baseline ecological environment within the area of the Wind Farm Site.

The specialist surveys, analysis and reporting have been undertaken in accordance with the appropriate guidelines and within the recommended seasonal time periods.

While "limitations" are acknowledged with the Bat Static Survey and Analysis (see **Appendix 6.1: section 3.2.1**), none are likely to have affected to any significant extent the outcome of the bat assessment and the author (John Curtin) is satisfied survey and analysis sufficiently assesses the scope of the project.

It is considered that the assessment as carried out on the baseline survey data provides an accurate prediction of the likely ecological effects of the proposed Garrane Green Energy Project, prescribes best practice and mitigation as necessary (including monitoring), and describes accurately the residual ecological impacts. It is noted that should pre-construction surveys indicate a requirement for protection of relevant species, appropriate measures (as described in **Section 6.9**) will be taken to comply with all relevant legislation and best practice.

6.2.8 Assessment Approach

The ecological evaluation approach used in this report is based on "Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009a). The impact assessment approach is based on "Guidelines on the information to be contained in Environmental Impact Assessment Reports" (EPA 2022).

6.2.8.1 Key ecological receptors

Ecological receptors can be important for a variety of reasons and the rationale used to identify them is explained in the text that follows. Importance may relate, for example, to the quality or extent of the Wind Farm Site or habitats therein; habitat and/ or species rarity; the extent to which such habitats and/ or species are threatened throughout their range, or to their rate of decline.

6.2.8.2 Determining importance of ecological receptors

The importance of an ecological receptor is considered within a defined geographical context. The following frame of reference has been used in this case (based on NRA

Guidance 2009), relying on known/ published accounts of distribution and rarity where available, and professional experience:

- International and European
- National
- County
- Local Importance (higher value)
- Local Importance (lower value)

The above frame of reference is applied to the ecological receptors identified during the desk study and baseline surveys to inform this report.

The value of habitats and flora has been measured against published selection criteria where available. Examples of relevant criteria include habitats listed on Annex 1 of the Habitats Directive as amended and flora species listed on the Flora (Protection) Order 2022 or on the Irish Red List (Curtis & McGough 1988).

In assigning a level of value to a species, it is necessary to consider its distribution and status, including a consideration of trends based on available historical records. Reference has therefore been made to published lists and criteria where available. Examples of relevant lists and criteria include: species of European conservation importance (as listed on Annexes II, IV and V of the Habitats Directive (as amended) or species protected under the Wildlife Acts as amended etc.

For the purposes of this report ecological receptors of Local importance or greater, and/or subject to legal protection, have been subject to detailed assessment. Effects on ecological receptors rated Local Importance (lower value) are not likely to have significant effects.

6.2.8.3 Characterisation of Impacts and Effects

The impact assessment process involves the following steps:

- identifying and characterising likely significant effects;
- incorporating measures to avoid and mitigate (reduce) these effects;
- assessing the significance of any residual effects after mitigation;
- identifying appropriate measures to offset significant residual effects (if required); and
- identifying opportunities for ecological enhancement.

When describing impacts, reference has been made to the following characteristics, as appropriate (in accordance with EPA 2022):

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

The impact assessment process considers both direct and indirect effects: direct ecological effects are changes that are directly attributable to a defined action, *e.g.*, the physical loss of habitat during the construction process. Indirect ecological effects are attributable to an action but which affect ecological resources through effects on an intermediary habitat process or feature, *e.g.* the construction of a Site access track which causes local hydrological changes, which, in the absence of mitigation, could lead to the drying out of peat bog.

Consideration of conservation status is important for evaluating the effects of impacts on individual habitats and species and assessing their significance:

- Habitats – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area.
- Species – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

6.2.8.4 Significant Effects

The concept of ecological significance is addressed in paragraphs 5.24 through to 5.28 of CIEEM guidelines. Significance is a concept related to the weight that should be attached to effects when decisions are made. For the purpose of ecological impact assessment, a '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 and the scale of

significance of an effect may or may not be the same as the geographic context in which the feature is considered important.

The EPA Guidelines on information to be included in Environmental Impact Assessment Reports (EPA 2022) were adhered to when determining significance and the present assessment is in accordance with those guidelines. Details of the EPA Guidelines, including the criteria used for determining the significance of effects, are presented in **Chapter 1: Introduction.**

6.2.8.5 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. Cumulative effects can occur where a proposed development results in individually insignificant impacts that, when considered in-combination with impacts of other proposed or permitted plans and projects, can result in significant effects.

6.2.8.6 Avoidance, Mitigation, Off-setting and Enhancement

When seeking mitigation or solutions to offset likely effects, efforts should be consistent with the geographical scale at which an effect is significant. For example, mitigation or the off-setting of effects on a species population significant at a county scale should ensure no net loss of the population at a county scale. The relative geographical scale at which the effect is significant will have a bearing on the required outcome which must be achieved.

Where potentially significant effects have been identified, the mitigation hierarchy has been applied, as recommended in the EPA (2022) and CIEEM (2022) Guidelines. The mitigation hierarchy sets out a sequential approach beginning with the avoidance of impacts where possible, the application of mitigation measures to minimise unavoidable impacts and then compensation for any remaining impacts. Once avoidance and mitigation measures have been applied residual effects are then identified along with any necessary compensation measures, and incorporation of opportunities for enhancement.

It is important for the impact assessment to clearly differentiate between avoidance mitigation, compensation and enhancement and these terms are defined here as follows:

- Avoidance is used where an impact has been avoided, e.g. through changes in scheme design;

- Mitigation is used to refer to measures to reduce or remedy a specific negative impact *in situ*;
- Compensation or off-setting describes measures taken to offset residual effects, i.e. where mitigation *in situ* is not possible.
- Enhancement is improved management of ecological features or provision of new ecological features, resulting in a net benefit to biodiversity, which may be unrelated to a negative impact or is 'over and above' that required to mitigate/compensate for an impact.

6.3 BASELINE ECOLOGICAL CONDITIONS

6.3.1 Physical and General Ecological Description of Site

The proposed development is located in south Co. Limerick and just north of the Cork-Limerick county border. It lies approximately 2.5 km north of Charleville, Co. Cork, and just over 2 km south of the village of Bruree in Co. Limerick. The Site is situated within the townlands of Garrane and Garrose in the north and Ballynagoul and Creggane in the south. The redline boundary of the Wind Farm Site covers a total area of 158.75 ha. The Wind Farm Site is accessed via the N20 to the west and the L1537 to the east.

The wind farm site is situated within a largely agricultural landscape, with pastoral farming of varying intensity carried out throughout the entire site. The Rathgoggan North Waste Water Treatment Plant lies immediately to the south of the site. This facility includes various ponds or lagoons, which are nationally important for waterbirds (known as Charleville Lagoons, Crowe 2005).

Topography within the site is generally flat to gently undulating, ranging from approximately 55 m to 65 m OD, with a gentle fall towards the River Maigue.

According to the GSI online database, the proposed Project footprint for Garrane Green Energy Project is immediately underlain by the following rock formations (see details in **Chapter 9: Soils and Geology**):

- Waulsortian Limestones – Massive unbeded limestones
- Visean Limestones – Undifferentiated limestones
- Ballysteen Formation – Dark muddy limestone, shale

Superficial soils present within the Red-line Boundary largely consists of lake (lacustrine) deposits and river deposits (alluvium). The northern and southern extents of the site are

underlain by glacial till, with small pockets of gravels present elsewhere. No peat was recorded during any of the baseline assessments and all organic soils encountered were classified as Topsoil (see details in **Chapter 9: Soils and Geology**).

On a regional scale, the Wind Farm Site is located in the Shannon Estuary South surface water catchment within Hydrometric Area 24 of the Shannon River Basin District (for details of drainage see **Chapter 10: Hydrology and Hydrogeology).** Locally the Wind Farm Site is located within 2 no. principal sub-catchments of the Maigue River: the Maigue_SC_020 to the east, and the Maigue_SC_010 to the west (a small area in the north of the Site is mapped in the Maigue_SC_040).

Within the Maigue_SC_010 sub-catchment, the Site is mapped in the Charleville Stream_020 WFD river sub-basin. The Charleville Stream is a 2nd order stream which more or less dissects the Site, flowing from south to north before discharging into the Maigue River. Several other smaller watercourses are mapped by the EPA in this area (the Graigues Stream, the Creggane Stream). The Maigue River itself flows to the east under the N20 at Creggane Bridge, and dissects the northwestern section of the Site. After flowing eastwards, it veers to the north downstream of the confluence with the Charleville and Graigues streams.

Within the Maigue_SC_020 sub-catchment, the Site is mapped in the Maigue_030 river sub-basin. The main drainage feature in this area is the Loobagh River which enters the Site from the east, flowing under the L1537 at Garroose Bridge and westwards to discharge into the Maigue River. A small locally unnamed stream, also referred to by the EPA as the Loobagh, is mapped to originate in this area of the Site and flows to the north before discharging into the Maigue River just south of the confluence of the Maigue River and the main Loobagh River.

Downstream of the Site, the Maigue River continues to the north, flowing through Bruree and Croom before becoming tidal at Adare, approximately 20 km northeast of the Site (straight line distance).

Ecologically, the area in which the Wind Farm Site is located is dominated by agricultural grassland, which varies from Improved agricultural grassland (GA1) to Neutral grassland (GS1) and Wet grassland (GS4) depending on intensity of current and recent management. The varying levels of management has resulted in marked differences in the grassland

swards to the west (improved) and east (unmanaged) of the Charleville stream. The fields are mostly bounded by Hedgerows (WL1), which are typically of a low stature and often of low species diversity due to the absence of recent management. Treelines (WL2) are also represented though are limited in their occurrence on site. Several very mature poplar and willow tree standards are a feature of the site.

The watercourses within the study site are all classified as Depositing/lowland rivers (FW2). Drainage ditches (FW4), often of substantial depth and width, are associated with most of the field boundaries.

From a wider conservation perspective, the dominant ecological features of the region are the upland Ballyhoura Mountains complex to the south-southeast, the River Blackwater system to the south, and the River Shannon estuarine system to the north.

6.3.2 Designated Sites

The potential for the proposed Project to impact on sites that are designated for nature conservation is considered in this Ecological Impact Assessment (EcIA).

Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are designated under the EU Habitats Directive as amended and EU Birds Directive as amended respectively and are collectively known as 'European Sites'. The potential for significant effects on the European Sites is fully assessed in the Appropriate Assessment (AA) Screening Report and any adverse effects on integrity of those sites are fully assessed in the Natura Impact Statement (NIS) that accompanies this application.

As per EPA Guidance 2022, *"a biodiversity section of an EIAR, for example, should not repeat the detailed assessment of potential effects on European sites contained in documentation prepared as part of the Appropriate Assessment process, but it should refer to the findings of that separate assessment in the context of likely significant effects on the environment, as required by the EIA Directive".* **Section 6.4.2** of this EIAR provides a summary of the key assessment findings with regard to European Designated Sites.

Natural Heritage Areas (NHAs) are designated under Section 18 of 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. However, the potential for effects on these sites is fully considered in this EcIA.

All designated sites that could potentially be affected were identified using a source-pathway – receptor model. To provide context for the assessment, European and national sites within a distance of 15 km surrounding the Wind Farm Site have been considered and are shown in **Figures 6.1** and **6.2** in **Vol III** of the **EIAR** respectively. The distance of 15 km follows guidance from the Department of Environment, Heritage and Local Government (2010). However, sites that were further away from the proposed development were also considered and especially where there is possible hydrological connectivity. Information on the identified sites according to the site-specific conservation objectives (as available) is provided in **Tables 6.3** and **6.4**.

It is noted that no part of the proposed development area is within a site with a nature conservation designation.

6.3.2.1 European Designated Sites

A total of five European designated sites occurs within a 15 km distance of the Wind Farm Site (see **Figure 6.1** in Vol. III). These are listed in **Table 6.3**, along with the reasons for designation, the distance from the Proposed Project and whether any linkages or connectivity exist between the two locations.

The nearest designated European site to the Wind Farm Site is the Blackwater River (Cork/Waterford) SAC, which is at a distance of approximately 6.4 km to the south. The other sites are at distances of between 9 km (Ballyhoura Mountains SAC) and 14.7 km (Glen Bog SAC). For these five European sites, there is no ecological or hydrological connectivity with any component of the site for the proposed Wind Farm.

Two additional sites at distances further than 15 km have hydrological connectivity with the Site via the River Maigue, namely the Lower River Shannon SAC (approximate straight-line distance of 20 km) and the River Shannon and River Fergus Estuaries SPA (approximate straight-line distance of 25 km) and are considered in this assessment.

The European sites are discussed in detail in the AA Screening Report and NIS which accompany this application.

6.3.2.2 Natural Heritage Areas and Proposed Natural Heritage Areas

There are no Natural Heritage Areas with at least a 15 km radius of the Site.

A total of eleven proposed Natural Heritage Areas (pNHAs) occurs within a 15 km radius of the Wind Farm Site (see **Figure 6.2** in Vol III and **Table 6.4**).

The closest site is Mountrussell Wood pNHA, which is at a distance of approximately 7 km from the proposed Project Site.

None of the eleven sites have ecological or hydrological connectivity with the proposed Project Site.

Table 6.3: Relevant European sites, reasons for designation, distances from Project Area and summary of connectivity.

European Site	Reasons for designation (information correct as of 1st August 2025) (*denotes a priority habitat)	Distance from Project Area and summary of connectivity
	SPECIAL AREAS OF CONSERVATION	
Blackwater River (Cork/Waterford) SAC (site code 002165)	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 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	The Redline boundary of the proposed Project, which includes the grid connection, as well as the section of the TDR where is approximately 6.4 km north of the SAC (closest straight-line distance). The Turbine Delivery Route requires habitat removal (other than tree pruning) only at the access point to the site on the N20 (which is within the Redline boundary). There is no ecological connectivity, such as wetland or woodland corridors, between the Project site and the SAC. There is no hydrological connectivity between the wind farm site and the SAC. It is concluded that there is no ecological or hydrological connectivity between the proposed Project and the SAC.

European Site	Reasons for designation (information correct as of 1st August 2025) (*denotes a priority habitat)	Distance from Project Area and summary of connectivity
	According to this SAC's site Conservation Objectives document: NPWS (31 July 2012) Conservation Objectives: Blackwater River (Cork/Waterford) SAC, Version 1.0. Department of Arts, Heritage and the Gaeltacht, for each of the listed QIs, the Conservation Objective is to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.	
Lower River Shannon SAC (site code: 002165)	Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] *Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] 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 Callitricho-Batrachion vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410] *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] Margaritifera margaritifera (Freshwater Pearl Mussel) [1029] Petromyzon marinus (Sea Lamprey) [1095] Lampetra planeri (Brook Lamprey) [1096] Lampetra fluviatilis (River Lamprey) [1099]	The Redline boundary of the proposed Project, which includes the grid connection, is approximately 20 km south-southeast of the SAC (closest straight-line distance). The Turbine Delivery Route requires habitat removal (other than tree pruning) only at the access point to the site on the N20 (which is within the Redline boundary). There is ecological connectivity between the Project Site and the SAC via the River Maigue system. The proposed Project drains to the River Maigue, a main tributary of the River Shannon. The SAC extends to the N69 at Ferry Bridge. Hence, the proposed Project Site is hydrologically linked with the SAC via the River Maigue. It is concluded that there is ecological and hydrological connectivity between the proposed Project and the SAC.

European Site	Reasons for designation (information correct as of 1st August 2025) (*denotes a priority habitat)	Distance from Project Area and summary of connectivity
	Salmo salar (Salmon) [1106] Tursiops truncatus (Common Bottlenose Dolphin) [1349] Lutra lutra (Otter) [1355] According to this SAC's site Conservation Objectives document: NPWS (7 August 2012), Conservation Objectives for Lower River Shannon SAC [002165]. Version 1.0. Department of Arts, Heritage and the Gaeltacht, for each of the listed QIs, the Conservation Objective is to maintain the favourable conservation condition of the Annex I habitats and/or the Annex II species for which the SAC has been selected.	
Tory Hill SAC (site code : 000439)	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210] Calcareous fens with Cladium mariscus and species of the Caricion davallianae [7210] Alkaline fens [7230] According to this SAC's site Conservation Objectives document: NPWS (3 August 2018): Conservation Objectives: Tory Hill SAC, Version 1. Department of Culture, Heritage and the Gaeltacht, for each of the listed QIs, the Conservation Objective is to maintain the favourable conservation condition of the Annex I habitats and/or the Annex II species for which the SAC has been selected.	The Project Site is located approximately 11 km north of the SAC. The Turbine Delivery Route requires habitat removal (other than tree pruning) only at the access point to the site on the N20 (which is within the Redline boundary). The Redline boundary of the proposed Project, which includes the grid connection, is approximately 14.4 km south of the SAC (closest straight-line distance). There is no ecological connectivity, such as wetland or natural grassland corridors, between the Project Site and the SAC. There is no hydrological connectivity between the Project Site and the SAC. It is concluded that there is no ecological or hydrological connectivity between any aspect of the Project and the Tory Hill SAC.

European Site	Reasons for designation (information correct as of 1st August 2025) (*denotes a priority habitat)	Distance from Project Area and summary of connectivity
Glen Bog SAC (site code: 001430)	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0 According to this SAC's site Conservation Objectives document: NPWS (28 November 2017), Conservation Objectives for Glen Bog SAC [001430]. Version 1.0. Department of Culture, Heritage and the Gaeltacht, for each of the listed QIs, the Conservation Objective is to maintain the favourable conservation condition of the Annex I habitats and/or the Annex II species for which the SAC has been selected.	The Redline boundary of the proposed Project, which includes the grid connection, is approximately 14.7 km southwest of the SAC (closest straight-line distance). The Turbine Delivery Route requires habitat removal (other than tree pruning) only at the access point to the site on the N20 (which is within the Redline boundary). There is no ecological connectivity, such as wetland or woodland corridors, between the Project Site and the SAC. There is no hydrological linkages between the Project Site and the SAC. It is concluded that there is no ecological or hydrological connectivity between the Project Area and the SAC.
Ballyhoura Mountains SAC (site code: 002036)	Northern Atlantic wet heaths with Erica tetralix [4010] European dry heaths [4030] Blanket bogs (* if active bog) [7130] According to this SAC's site Conservation Objectives document: NPWS (18 August 2016), Conservation Objectives for Ballyhoura Mountains SAC [002036]. Version 1.0. Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, for each of the listed QIs, the Conservation Objective is to maintain the favourable conservation condition of the Annex I habitats and/or the Annex II species for which the SAC has been selected.	The Redline boundary of the proposed Project, which includes the grid connection, is approximately 9 km northwest of the SAC (closest straight-line distance). The Turbine Delivery Route requires habitat removal (other than tree pruning) only at the access point to the site on the N20 (which is within the Redline boundary). There is no ecological connectivity, such as peatland corridors, between the Project Site and the SAC. There is no hydrological connectivity between the Project Site and the SAC. It is concluded that there is no ecological or hydrological connectivity between Project Area and the SAC.
	SPECIAL PROTECTION AREAS	

European Site	Reasons for designation (information correct as of 1st August 2025) (*denotes a priority habitat)	Distance from Project Area and summary of connectivity
Kilcolman Bog SPA (site code: 004095)	Whooper Swan (Cygnus cygnus) [A038] Teal (Anas crecca) [A052] Shoveler (Anas clypeata) [A056] Wetland and Waterbirds [A999] According to this SPA's site Conservation Objectives document: Conservation Objectives Series: Kilcolman Bog SPA [004095]. Version 1.0, 24th January 2025, Department of Housing, Local Government and Heritage, for each of the listed SCIs, the Conservation Objective is to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA. In recognition of wetland habitat, the Conservation Objective is: To maintain or restore the favourable conservation condition of the wetland habitat in Kilcolman Bog SPA as a resource for the regularly-occurring migratory waterbirds that utilise these areas.	The Redline boundary of the proposed Project, which includes the grid connection, is approximately 14.1 km north-northwest of the SPA (closest straight-line distance). The Turbine Delivery Route requires habitat removal (other than tree pruning) only at the access point to the site on the N20 (which is within the Redline boundary). There is no ecological connectivity, such as wetland corridors, between the Project Site and the SPA. There is no hydrological connectivity between the Project Site and the SPA. While the improved grassland could potentially support feeding whooper swans, the bird surveys (Chapter 8) recorded only a single whooper swan feeding within the Site on one date (March 2023), one record of a flying bird over the south-west sector of Site (November 2022) and two other records of whooper swans flying off-site. The study concluded that the habitat within the Site is not considered to be of value for whooper swan or any other waterbird species. The study also concluded that there was no evidence of connectivity between the Kilcolman Bog SPA and the Site. It is concluded that there is no ecological or hydrological connectivity between the Wind Farm Project Area and the SPA.
River Shannon and River Fergus Estuaries SPA (site code: 004077)	Cormorant (Phalacrocorax carbo) [A017] Whooper Swan (Cygnus cygnus) [A038] Light-bellied Brent Goose (Branta bernicla hrota) [A046] Shelduck (Tadorna tadorna) [A048]	The Redline boundary of the proposed Project, which includes the grid connection, is approximately 25 km south-southeast of the SPA (closest straight-line distance). The Turbine Delivery Route requires habitat removal (other than

European Site	Reasons for designation (information correct as of 1st August 2025) (*denotes a priority habitat)	Distance from Project Area and summary of connectivity
	Wigeon (Anas penelope) [A050] Teal (Anas crecca) [A052] Pintail (Anas acuta) [A054] Shoveler (Anas clypeata) [A056] Scaup (Aythya marila) [A062] Ringed Plover (Charadrius hiaticula) [A137] 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] Greenshank (Tringa nebularia) [A164] Black-headed Gull (Chroicocephalus ridibundus [A179] Wetland and Waterbirds [A999] According to this SPA's site Conservation Objectives document, Conservation Objectives Series: River Shannon and River Fergus Estuaries SPA 004077. Version 1.0, 17th September 2012, Department of Arts, Heritage and the Gaeltacht), for each of the listed SCIs, the Conservation Objective is to maintain the favourable conservation condition of the species for which the SPA has been selected. In recognition of wetland habitat, the Conservation Objective is:	tree pruning) only at the access point to the site on the N20 (which is within the Redline boundary). There is ecological connectivity between the Project Site and the SPA via the River Maigue system. While improved grassland within the Site could potentially support herbivorous waterfowl, including whooper swans, baseline bird surveys (EIAR Chapter 8) showed that such species do not frequent the Site. Further, the distance between the Site and the SPA (c.25 km) is beyond the normal commuting range of wetland birds (SNH 2017). It is concluded that the Site is not utilized by any of the SCIs of the SPA. The proposed Project drains to the River Maigue, a main tributary of the River Shannon. The SPA extends to the Ferry Bridge along the N69, where the River Maigue is tidal. Hence, the proposed development site is hydrologically linked with the SPA via the River Maigue. It is concluded that there is ecological and hydrological connectivity between the Proposed Project and the SPA.

European Site	Reasons for designation (information correct as of 1st August 2025) (*denotes a priority habitat)	Distance from Project Area and summary of connectivity
	To maintain or restore the favourable conservation condition of the wetland habitats in the River Shannon and River Fergus Estuaries SPA as a resource for the regularly-occurring migratory waterbirds that utilise these areas	

Table 6.4: Proposed Natural Heritage Areas, reasons for designation (as known), distances from Garrane Green Energy Project Site (Redline boundary) and summary of connectivity.

Site	Reasons for designation (information correct as of 1st August 2025)	Distance from Garrane Green Energy Project Site and summary of connectivity
PROPOSED NATURAL HERITAGE AREAS		
Ballyhoura Mountains pNHA (site code: 002036)	Not stated but presumed as with SAC – heath and blanket bog	The Redline boundary of the proposed development, which includes the grid connection, is approximately 9 km northwest of the pNHA (closest straight-line distance). There is no ecological linkages, such as peatland habitat corridors, between the Wind Farm Site and the pNHA. There is no hydrological linkages between the Wind Farm Site and the pNHA. It is concluded that there is no ecological or hydrological connectivity between Wind Farm Project Area and the pNHA.
Mountrussell Wood pNHA (site code: 002088)	Not stated but supports mixed broadleaved woodland.	The pNHA is located approximately 7 km southeast of the Wind Farm Site.

Site	Reasons for designation (information correct as of 1st August 2025)	Distance from Garrane Green Energy Project Site and summary of connectivity
		There is no ecological connectivity, such as woodland corridors, between the proposed Project Site and the pNHA. There is no hydrological connectivity between the proposed Project Site and the pNHA.
Ballyroe Hill & Mortlestown Hill pNHA (site code 002089)	Not stated	The pNHA is located approximately 11.3 km southeast of the Site. There is no ecological connectivity, such as woodland or natural grassland corridors, between the proposed development Site and the pNHA. There is no hydrological connectivity between the proposed Project Site and the pNHA.
Castleoliver Woods pNHA (site code: 002090)	Not stated but supports mixed broadleaved woodland	The pNHA is located approximately 11.8 km southeast of the Wind Farm Site. There is no ecological connectivity, such as woodland corridors, between the proposed development Site and the pNHA. There is no hydrological connectivity between the proposed Development Site and the pNHA.
Kilcolman Bog pNHA (site code: 004095)	Not stated but supports bog and wetland system and of importance for birds.	The pNHA is located approximately 14 km south of the Wind Farm Site. There is no ecological connectivity, such as wetland corridors, between the proposed development and the pNHA. There is no hydrological connectivity between the proposed Project Site and the pNHA.
Ballinvoner Pond pNHA (site code: 000012)	Not stated but supports wetland habitats	The pNHA is located approximately 12 km south of the Wind Farm Site.

Site	Reasons for designation (information correct as of 1st August 2025)	Distance from Garrane Green Energy Project Site and summary of connectivity
		There is no ecological connectivity, such as wetland corridors, between the proposed development Site and the pNHA. There is no hydrological connectivity between the proposed Project Site and the pNHA.
Eagle Lough pNHA (site code 001049)	Not stated but supports wetland habitat	The pNHA is located approximately 14 5 km south of the Wind Farm Site. There is no ecological connectivity, such as wetland habitats, between the proposed Project Site and the pNHA. There is no hydrological connectivity between the proposed Project Site and the pNHA.
Heathfield Wood pNHA (site code: 001432)	Not stated but is a broadleaved woodland (beech & oak)	The pNHA is located approximately 13 km west-northwest of the Wind Farm Site. There is no ecological or hydrological connectivity between the proposed Project Site and the pNHA.
Ballintlea Wood pNHA (site code: 002086)	Not stated but is a mixed broadleaved woodland	The pNHA is located approximately 13 km southeast of the Site. There is no ecological connectivity, such as woodland corridors, between the proposed Project Site and the pNHA. There is no hydrological connectivity between the proposed Project Site and the pNHA.
Tory Hill pNHA (site code: 000439)	Not stated but presumed similar to SAC (see Table 6.3)	The pNHA is located approximately 14.4 km north of the Wind Farm Site. There is no ecological connectivity, such as wetland or natural grassland corridors, between the proposed Project Site and the pNHA. There is no hydrological connectivity between the proposed Project Site and the pNHA.
Glen Bog pNHA (site code:001430)	Not stated but presumed similar to SAC (see Table 6.3)	The pNHA is located approximately 14.7 km northeast of the Wind Farm Site.

Site	Reasons for designation (information correct as of 1st August 2025)	Distance from Garrane Green Energy Project Site and summary of connectivity
		There is no ecological connectivity, such as woodland corridors, between the proposed Project Site and the pNHA. There is no ecological or hydrological connectivity between the proposed Project Site and the pNHA.

6.3.3 Habitats, Vegetation and Flora

As noted, the entire site is actively farmed for cattle and sheep production. Grassland habitats occur throughout the site, with the type present reflecting the intensity of current and recent management practices. Improved agricultural grassland (GA1) is dominant in the western sector (west of the Charleville stream), while Neutral grassland (GS1) and Wet grassland (GS4) are dominant in the eastern and northern sectors.

Hedgerows (WL1) and in places Treelines (WL2) typically form the boundaries of the fields and are often in association with Drainage ditches (FW4).

Scrub occurs scattered mainly in the less managed eastern sector. Some buildings and farm tracks, classified as Buildings and artificial surfaces (BL3), are present within the site.

Watercourses are a feature of the site and are classified as Depositing/lowland rivers (FW2).

The watercourses within the study site are described in detail in the Chapter 7: **Aquatic Ecology Assessment**, as well as in **Chapter 10: Hydrology and Hydrogeology**.

There follows a general description of the principal habitats within the redline boundary (see **Figure 6.3** in Vol. III) and then a summary of the principal habitat(s) at each turbine location as well as at the other main infrastructure locations (met mast, substation, etc.).

6.3.3.1 Improved agricultural grassland (GA1)

Improved agricultural grassland occurs in the western sector and in parts of the northern and southernmost sectors of the site (see **Plates 6.2 & 6.3**). In places this is best described as a semi-improved sward, which often grades to wet grassland (GS4) depending on drainage and management (see **Plate 6.4**). Rushes, mainly soft rush *Juncus effusus*, are a feature of most fields and even in the better managed swards may attain a coverage of 50% or even more. Cattle and sheep are the main stock animals.

Widespread grass species include perennial rye grass *Lolium perenne* and meadow grass (*Poa* spp.), with common bent *Agrostis capillaris*, Yorkshire fog *Holcus lanatus*, and sweet vernal grass *Anthoxanthus odoratum* also present. Herbaceous species present include white clover *Trifolium repens*, ribwort plantain *Plantago lanceolata*, creeping buttercup *Ranunculus repens*, meadow buttercup *Ranunculus acris*, creeping thistle *Cirsium arvense,* self heal *Prunella vulgaris*, common sorrel *Rumex acetosa*, daisy *Bellis perennis,* dandelion *Taraxacum officinale* and common mouse-ear *Cerastium fontanum.*

Plate 6.2: Improved grassland is the dominant habitat in the western sector of site. View is looking northwards towards T03 location (August 2023).

Plate 6.3: View of recently cut grassland field in northern sector of site (T09 location) – this is improved though with high proportion of rushes (August 2023).

Plate 6.4: Some of the fields in the northern part of site are best described as semi-improved, with high rush cover (c.50%) in places (June 2022).

6.3.3.2 Wet grassland (GS4)/Neutral grassland (GS1)

The sector of the site to the east of the Charleville stream and the Maigue River is characterised by low intensity management for cattle grazing. The water table is often close to the surface and much of the area is prone to flooding. Wet grassland and/or Neutral grassland (latter typically associated with low intensity agriculture) dominate throughout and occur in mosaic (see **Plates 6.5 & 6.6**). In very wet areas, **marsh (GM1)** is developing though this only occurs in relatively small patches. Wet grassland also occurs in some of the fields to the north of the River Maigue, as well as within the fields where the substation is to be located (see **Plate 6.7**).

Rushes are frequent, especially soft rush *Juncus effusus* but also hard rush *Juncus inflexus*, jointed rush *Juncus articulatis* and bulbous rush *Juncus bulbosus.* Creeping bent *Agrostis stolonifera* is locally abundant, along with small sedges such as *Carex flacca* and *Carex hirta*. Yellow iris *Iris pseudacorus,* indicative of waterlogged ground, is a feature in many of the fields, and is a widespread species within the eastern sector of the site. Herbaceous species present indicative of wet conditions include water mint *Mentha aquatica,* lesser spearwort *Ranunculus flammula*, marsh thistle *Cirsium palustre*, silver weed *Potentilla anserina*, meadow sweet *Filipendula ulmaria*, marsh cinquefoil *Potentilla palustris*, wild angelica *Angelica sylvestris*, ragged robin *Lychnis flos-cuculi*, marsh bedstraw *Galium*

palustre, purple *loosestrife Lythrum salicaria,* cuckoo flower *Cardamine pratensis*, devil's-bit scabious *Succissa pratensis*, and cat's paw *Hydrochoeris radicata.* Horsetails *Equisetum palustre* were also present though localised.

The somewhat drier areas, which conform to neutral grassland, supported common knapweed *Centaurea nigra*, meadowsweet, creeping buttercup *Ranunculus repens*, clovers (*Trifolium repens* & *Trifolium pratense)*, narrow leaved-plantain *Plantago lanceolata*, self-heal *Prunella vulgaris*, meadow vetchling *Lathyrus pratensis*, common mouse-ear *Cerastium fontanum*, yarrow *Achillea millefolium*, and red bartsia *Odontites vernis*, *Lotus uliginosus,* as well as common grass species such as *Deschampsia flexuosa*, *Holcus lanatus* and *Dactylis glomerata*. Coarser species, such as thistles (*Cirsium spp.),* docks (*Rumex spp*.), ragwort *Jacobea vulgaris* and nettle *Urtica dioica*, were also present in the sward and locally frequent. Brambles *Rubus fruticosus* are present in places on drier ground.

Mosses are a feature of wet grassland swards, with frequent species such as *Hylocomium splendens*, *Hynum jutlandicum*, *Polytrichum commune,* and *Rhytidiadelphus squarrosus*.

Plate 6.5: Wet grassland with rushes is a dominant habitat in eastern sector of site. The more open drier areas are classified as neutral grassland (June 2022).

Plate 6.6: The wetter areas of grassland in eastern sector of site support species such as yellow iris. These areas are used for rough grazing by cattle (August 2023).

Plate 6.7: View of location for substation, looking northwards towards tall treeline of poplar and willow. Wet grassland is the dominant habitat here (May 2024).

6.3.3.3 Hedgerow (WL1) / Treelines (WL2)

Hedgerows, and to a lesser extent treelines, are a feature of the site and provide the main type of field boundary (see **Plate 6.8**). However, the quality of the hedgerows varies across the site according to the intensity of current and past management. In particular, the hedgerows in the eastern sector of the site have not been maintained in recent years and many are no longer stock-proof due to substantial gaps or part removal in places (these can be described as intermittent or remnants) (see **Plate 6.9**). Most have grown higher than the typical hedge height of c.5-6 m and are also expanding in width at the base. Diversity of herbaceous species within such hedgerows is low due to the dominance of brambles in the ground layer. In contrast, the hedgerows in the western sector of the site are maintained at a low height (2-3 m), while some in the northern sector have been recently cut back to near ground level. (see **Plate 6.10**). Hedging also occurs along sections of the watercourses, though this is in parts intermittent, such as along sections of the Charleville stream. However, the hedging along the southern section of the Charleville stream (both sides of stream) forms a canopy and provides good riparian habitat. Also, hedging and treeline along the River Loobagh channel, which forms the northeast boundary of the site, provides good riparian habitat.

The main tree/shrub species are hawthorn *Crataegus monogyna,* blackthorn *Prunus spinosa,* ash *Fraxinus excelsior,* sycamore *Acer pseudoplatanus*, hazel *Corylus avellana,* elder *Sambucus nigra* and willow species (mostly grey willow *Salix cinerea* subsp. *oleifolia,* as well as goat willow *Salix caprea* and eared willow *Salix aurita)* and gorse *Ulex europaeus*. Less common tree/shrub species include downy birch *Betula pubescens*, alder *Alnus glutinosus*, holly *Ilex aquifolium*, rowan *Sorbus aucuparia,* elm *(Ulmus spp.)* and crab apple *Malus sylvestris*.

Ash is the principal tree standard (most showing signs of ash dieback disease). A treeline of mature poplar, probably a hybrid of black poplar *Populus nigra*, and a large willow (probably crack willow *Salix fragilis*) occurs to the north of the location for the proposed substation (see **Plate 6.11**). A specimen mature willow occurs in the hedge to the west of the location for the substation. Three very large specimen poplar trees occur within the hedging in the southern sector of the site (see **Figure 6.3** & **Plate 6.12**). Treelines of mature poplar, along with willow and ash, occur along the most northerly stretch of the Maigue River within the survey area, and also outside of the redline boundary along the meander section of the River Loobagh leading to the confluence with the Maigue. Pines have been planted in treelines in the northernmost sector the site.

Ivy *Hedera helix* is often frequent on the larger trees, with bramble a very common component of the understorey and ground layers. Wild roses (*Rosa* spp.) and honeysuckle *Lonicera periclymenum* are a feature of the understorey.

Herbaceous species occurring within the ground layer include hogweed *Heracleum sphondylium*, nettle *Urtica dioica,* bush vetch *Vicia sepium*, cleavers *Galium aparine*, lesser celadine *Ranunculus ficaria,* primrose *Primula vulgaris,* herb Robert *Geranium robertianum*,and lords and ladies *Arum maculata*. The fern species *Dryopteris dilatate, Dryopteris filix-mas* and *Phyllitis scolopendrium* are present within hedgerows.

The hedgerows are typically laid on clay banks and are usually associated with a drainage ditch (as part of field boundary).

Plate 6.8: Hedgerows within site are mostly of hawthorn, blackthorn, ash and willow. View is of low hedge in southern sector site (near T01 location) (May 2024).

Plate 6.9: The hedgerows in the eastern part of site have not been managed in recent years and are increasing in height and width. Gaps are present in places (August 2023).

Plate 6.10: View of hedgerow in northern sector of site (T08 location) which had been severely cut back (May 2024).

Plate 6.11: A mature treeline occurs along the northern boundary of the field in which the proposed substation is to be sited. This is mostly of poplar, with some willow (May 2024).

Plate 6.12: View of large specimen poplar tree at location for T02. The associated hedgerow is unmanaged and the base heavily overgrown with bramble. (June 2022).

6.3.3.4 Watercourses (FW2)

The rivers and streams within the study are described in detail in the Aquatic Ecology Assessment (**Chapter 7**). All of the watercourses on site are slow moving systems and are classified as Depositing/lowland rivers (FW2).

As already noted, some of the banks are lined, often intermittently, with hedging dominated by willow and hawthorn. Tall poplars (Populus spp.) occur along the northern section of the River Maigue within the redline boundary.

All of the watercourses on site show signs of channel straightening and dredging.

The River Maigue channel in particular has good bankside and marginal fringes of wetland vegetation, which can be classified as Reed and large sedge swamp (FS1) (see **Plate 6.13**). Common club-rush *Schoenoplectus lacustris* is the dominant plant species, with reed canary-grass *Phalaris arundinacea,* common reed *Phragmites australis*, branched bur-reed *Sparganium erectum*, bulrush *Typha latifolia*, bottle sedge *Carex rostrata*, yellow iris and soft rush also present. The upper disturbed sections of bank (where dredgings have been deposited in the past) were dominated by nettles and willowherbs (mostly *Epilobium hirsutum*), with brambles also frequent.

Plate 6.13: View of section of the River Maigue with a well-developed fringe of swamp vegetation. Dense nettles occur on the dredgings which from the high banks (June 2022).

6.3.3.5 Drainage ditches (FW4)

Drainage ditches accompany most of the hedgerows and treelines within the site. Some of these, especially in the northern sector of site, have been deepened and cleaned recently (see **Plate 6.14**). However, most have a fairly stagnant flow and support an aquatic or semi-aquatic vegetation. Frequent plant species growing in these ditches include starwort species (*Callitriche* spp.), fool's watercress *Apium nodiflorum,* floating sweet-grass *Glyceria fluitans*, bulbous rush *Juncus bulbosus*, jointed rush *Juncus articulatus*, pondweed *Potamogeton natans* and yellow iris. The margins of many of the drains were heavily vegetated with coarse species such as nettles, brambles, fireweed (*Epilobium* spp,), meadowsweet *Filipendula ulmaria* and docks (*Rumex* spp.), along with young willow (see **Plate 6.15**).

Plate 6.14: View of recently deepened drain along northernmost boundary of site (August 2023).

Plate 6.15: View of field ditch in western sector of site, looking westwards. This ditch is heavily vegetated with a low water flow (June 2022).

6.3.3.6 *Buildings and artificial surfaces (BL3)*

The site includes several internal hardcore or clay tracks associated with the agricultural activities within the site. The access entrance from the N20 comprises a hardcore parking area.

Table 6.5: Summary of the main habitat(s) occurring at turbine and other infrastructure component locations.

Location	Main habitat(s) present
T01	Neutral grassland (GS1)/Wet grassland (GS4)
T02	Neutral grassland (GS1)/Wet grassland (GS4)
T03	Improved grassland (GA1)
T04	Neutral grassland (GS1)/Wet grassland (GS4)
T05	Improved grassland (GA1)
T06	Neutral grassland (GS1)/Wet grassland (GS4)
T07	Neutral grassland (GS1)/Wet grassland (GS4)
T08	Improved grassland (GA1)/Wet grassland (GS4)
T09	Improved grassland (GA1)/Wet grassland (GS4)
Substation & Construction Compound (south)	Wet grassland (GS4)
Met Mast 1	Improved grassland (GA1)
Access tracks	Improved grassland (GA1)/Neutral grassland (GS1)/Wet grassland (GS4)/existing tracks (BL3)

6.3.3.7 *Invasive species*

During the field surveys, a search for Invasive Alien Plant Species (IAS) was carried out. The main regulations influencing Ireland's invasive species lists are:

- the Third Schedule list of the European Communities (Birds and Natural Habitats) Regulations 2011-2021;
- the Invasive Alien Species of Union concern listed under the EU IAS Regulation [1143/2014].

No species listed on the Third Schedule were recorded within the Project Site during the surveys.

6.3.3.8 *Protected Flora*

In order to determine if any legally protected plant species listed in the Flora Protection Order, 2022 (Government of Ireland 2022), have been previously recorded from within the

wind farm development area at Garrane and adjoining areas, a search was made of the online NPWS Flora (Protection) Order 2022 Map Viewer and the Botanical Society of Britain and Ireland (BSBI) online plant distribution Atlas (https://bsbi.org/maps). Information from these sources was accessed on the 15th of January 2025. The searches reveal that there are no records for species listed in the 2022 Flora Protection Order from within the wind farm development footprint or the 10 km x 10 km square R52, in which the area is located. The main habitats within the proposed Project site are a mix of improved grassland (GA1), neutral grassland (GS1) and wet grassland (GS4), which do not generally provide suitable habitat for any rare or protected plant species. **Table 6.6** below outlines previous records for rare and protected plant species which have been noted in adjoining 10 kilometre squares, along with comments regarding the likelihood of presence within the Garrane Green Energy Project site.

Table 6.6: Rare/protected vascular plant species which have been previously recorded in 10 km squares adjoining R52, along with comments on their possible occurrence within the study area.

Species	Occurrence in relation to the survey area	Comments
Colchicum autumnale (*Autumn crocus*)	There is a record of this species from a field south-east of Kilfinny village, located approximately 14 kilometres north-west of the project area. The population was last seen in 1995 however it has not been recorded since then despite a number of searches (Reynolds 2013).	This species is largely confined to low-growing, wet meadow habitat which is periodically flooded. The more un-disturbed areas of permanently wet grassland in the eastern sector of Site could possibly provide suitable habitat for this species.
Trichomanes speciosum (Killarney fern)	Killarney fern has been recorded from the Ballyhoura Mountains in the past, within hectad R61. Exact locational details of this protected species are not available as it has been subject to over collection in the past.	The main habitat of this species is damp, shaded crevices in rocks/cliffs, often close to flowing water. Suitable habitat does not occur within the survey area.
Alopecurus aequalis (Orange foxtail)	Orange foxtail has been recorded from the shores of Eagle Lough, East/North-east of Buttevant, Co. Cork, which is located 17 kilometres south of the survey area.	This wetland species is confined to the margins of lakes/turloughs where the habitat is subject to regular flooding. Suitable habitat does not occur within the survey area.

6.3.3.9 Grid Connection Route description

The Project will be connected from the on-site 110kV substation to the existing 110KV overhead line via a loop-in connection between Charleville substation and Killonan substation.

In order to connect the Project and provide the 'loop in/loop out' infrastructure, it is proposed to install two new masts and c. 771m of underground electricity transmission line to each Mast. The route of the underground cables and the locations of the two masts are in fields of wet grassland (GS4) and improved or semi-improved grassland (GA1). A low hawthorn hedge, with one ash standard, occurs at the loop-in location (see **Plate 6.16**).

Plate 6.16: View of 'loop-in' location, looking southwards towards a low hawthorn hedge with one ash standard. The field here is improved grassland (May 2024).

6.3.3.10 Turbine Delivery Route description

The turbine components will be landed in Foynes Port, Co. Limerick. From there, they will be transported to the Site via the N69, N18, M20 and N20 to the upgraded Site Entrance 1 (see route in **Figure 2.4** & full details in the Traffic Management Plan contained in **Appendix 17.2**).

There are 7 no. locations along the Foynes Port Turbine Delivery Route that will require temporary works in third party lands (see Chapter 2: Table 2.6). These are all on the margins of roads, including through roundabouts, with principal habitats being Amenity grassland (GA2) and Grassy verges (GS2). Hedgerows and trees are frequent along the roads but will be largely unaffected (other than trimming or tree pruning as required).

Impact location no. 7 of the Foynes route is the site entrance to the Project on the N20. This will require the permanent removal of 80m of hedging. This is mostly a low hedge (c.2 m) of hawthorn, as well as some elm (*Ulmus* spp.) and ash (see **Plate 6.17**), and one medium sized poplar near the existing gate entrance (south side - see **Plate 6.18**).

Plate 6.17: View of N20 existing access point – the low hedging (red arrows) will be removed to facilitate the delivery of turbine components, looking westwards. The tall trees shown in image are all along the western side of the N20 road, (May 2024) and will not be effected by the Project.

Plate 6.18: View of N20 existing access point – the medium sized poplar tree on south side of entrance (red arrow) will be removed to facilitate the delivery of turbine components, looking westwards. The other tall trees in the image are all along the western side of the N20 road, (May 2024) and will not be effected by the Project.

Enabling works along the Galway Port Turbine Delivery option (for blades only) are detailed in **Chapter 2: Table 2.7**. At two locations vegetation will be trimmed for load oversail, while at location no. 10 (M20/M18 Junction), vegetation will be removed from inside of slip lane. The slip lane here is edged by amenity grassland (GA2).

6.3.4 Terrestrial Mammals, Amphibians and Reptiles

The Irish hare *Lepus timidus hibernicus* was widespread within the Wind Farm study area, especially within the improved and semi-improved pasture fields. Sightings of rabbit *Oryctolagus cuniculus* were also made throughout much of the site.

Red fox *Vulpes vulpes* is widespread, with two observations within site as well as a fresh road casualty near Creggan Bridge on the N20 on 9th August 2023. Various ubiquitous small mammal species, including pygmy shrew *Sorex minutus,* bank vole *Myodes glareolus*, hedgehog *Erinaceus europaeus* (road casualties on N20 near entrance to water works on 9th August 2023 and on local road just north of site access track for substation on 10th May 2024), field mouse *Apodemus sylvatica* and brown rat *Rattus norvegicus,* are expected to

be widespread within the Wind Farm study area. The proposed Project is within the main distribution range of the recently established greater white-toothed shrew *Crocidura russula*.

The site does not have habitat which would support pine marten *Martes martes* or red squirrel. The presence of Irish stoat *Mustela erminea* is possible but unlikely as the site lacks woodland edge, dry hedgerow bank and stone walls.

Badger

There was no evidence, such as setts, feeding marks or latrines, of badger *Meles meles* activity within at least a 100 m distance of any of the main wind farm infrastructure. The absence of any evidence of badger presence within the site is likely to reflect the generally wet ground conditions and susceptibility of much of the site to flooding. Badgers tend to dig setts on sloping ground in well drained friable soils (Lysagh & Marnell 2016) and to avoid ground that is prone to flooding (Hayden & Harrington 2000). However, badger may at times forage within the site as it has a presence in the surrounding areas, as shown by a road kill recorded just south of the N20/R516 junction in June 2022 as well as previous records of the species for the hectad R52 (the 10 km square of the study area). Also, an inactive badger sett was recorded within the Rathgoggan Waste Water Treatment Plant facility during baseline surveys in 2016 for the Kerry Ingredients Ireland Ltd EIAR (OES Consulting April 2018).

Otter

Signs of otter *Lutra lutra* presence were recorded along the west bank of the Charleville stream on 14th March 2023 (see **Plate 6.19**). These comprises two sections of mammal trails, large enough for otter, through the grassland strip just above the bank and both leading into the stream, as well as two fresh otter spraints (grid refs: E54299 N26984 & E54396 N26992). Despite intensive search of both stream banks (and further search in May 2024), no signs of any dwellings (holts) or resting places were found.

The baseline Aquatic Ecology Report did not record any signs of otter during the kick sampling and water quality surveys undertaken on the watercourses within the site on various dates in 2022 and 2024 (see **Appendix 7.1**). However, the report notes that "*the presence of otter in the area cannot be ruled out due to the presence of otter in the wider catchment, and the availability of suitable foraging in the form of fish within the watercourses*." The Aquatic Ecology assessment (Chapter 7) notes the following in respect of the sampling stations: "*All stations were classified as (FW2) Depositing/lowland rivers under the Fossitt (2000) classification system. Potential sources of nutrient pollution through*

runoff from adjacent farmland was noted as a cause of eutrophication across each watercourse. The watercourses present within the site are subject to regular maintenance of the channel by the Office of Public Works (OPW)."

Signs (spraints, tracks) of otter had been recorded on the Glen River, which flows through the Rathgoggan Waste Water Treatment Plant, as well as an observation on the Maigue River approximately 2.1 km north of the WWTP, during baseline surveys in 2016 for the Kerry Ingredients Ireland Ltd EIAR (OES Consulting April 2018).

From the baseline survey and the Aquatic Assessment, and considering previous surveys on the Maigue system, it is concluded that otter utilises the watercourses within the site for feeding purposes but that the watercourses are generally not suitable for breeding locations due both to the flood level heights and the regular maintenance of the channel by OPW.

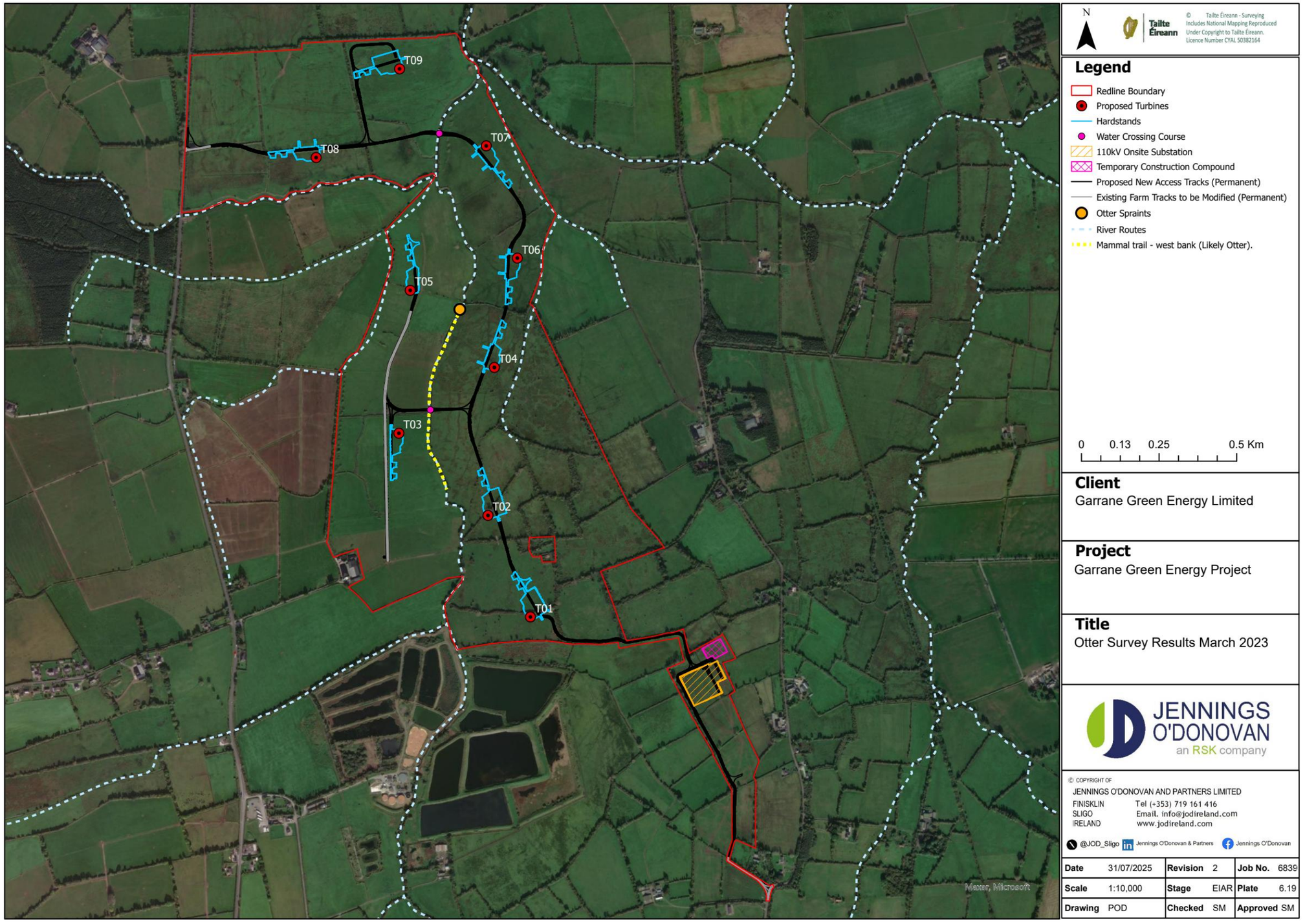

Plate 6.19: Results of otter survey, 2023.

Amphibians and reptiles

The common frog *Rana temporaria* is widespread within the Wind Farm Site study area, principally associating with field drains and wet grassland fields.

Permanent freshwater ponds are absent from the Wind Farm study area and there was no evidence of the presence of the smooth newt *Lissotriton vulgaris* within the site of the proposed development.

The habitats within the site are considered unsuitable for the common lizard *Zootoco vivipara*.

6.3.5 Bats

6.3.5.1 Desk review results: historical records

The NBDC and Bat Conservation Ireland database was consulted (08/04/2023, 23/02/2024 & 28/05/2025) for details on historical bat records held for the site and the surrounding 10 km (details in **Appendix 6.1**).

The closest historical roost is located 560 m to the south-west of the Site where a Daubenton's bat roost was noted at a bridge along the N20. Further Daubenton's roosts have been recorded to the north; over 6.5 km (single bat) and 8.5 km (3 bats) from the site.

Regarding the roost located 560 m from the site. The bridge consists of a single masonry arch. The recorder (Caroline Shiels) has found up to 5 Daubenton's using crevices (singly) but is of the view the bridge is not used as a maternity roost.

Baring this Daubenton's roost record, all other records within 6 km of the site are adhoc; the majority from Bat Conservation Irelands' Batlas and records from Bat Eco Services. Species recorded include, *Myotis Daubentonii, Myotis mystacinus, Myotis nattereri, Nyctalus Leisleri, Pipistrellus pipistrellus, Pipistrellus pygmaeus, Pipistrellus spp, Plecotus auritus* as well as *unidentified Myotis* and an unidentified bat.

The site does not lie within a lesser horseshoe bat range, with the closest records for this species lying 18 km to the northwest at Grange.

6.3.5.2 Bat landscape

The bat landscape association model (Lundy *et al.* 2011) suggests that the overall suitability for the Garrane site is high for brown long-eared bat, Leisler's bat, common pipistrelle and soprano pipistrelle (see **Appendix 6.1, Table 2.2** for details).

6.3.5.3 Roost surveys

Tree roosts

As noted, each tree was assessed and ranked from category 1 – 4 (following Collins 2016 and Collins 2023)). In total, 20 potential roost feature (PRF) trees were recorded, alongside 13 trees requiring further assessment (FAR), the majority of which were found to the south of the Site where the substation is proposed (see **Plate 6.20 & Appendix 6.1** for details). Ten PRF trees were found within a 275 m buffer of the proposed turbine locations.

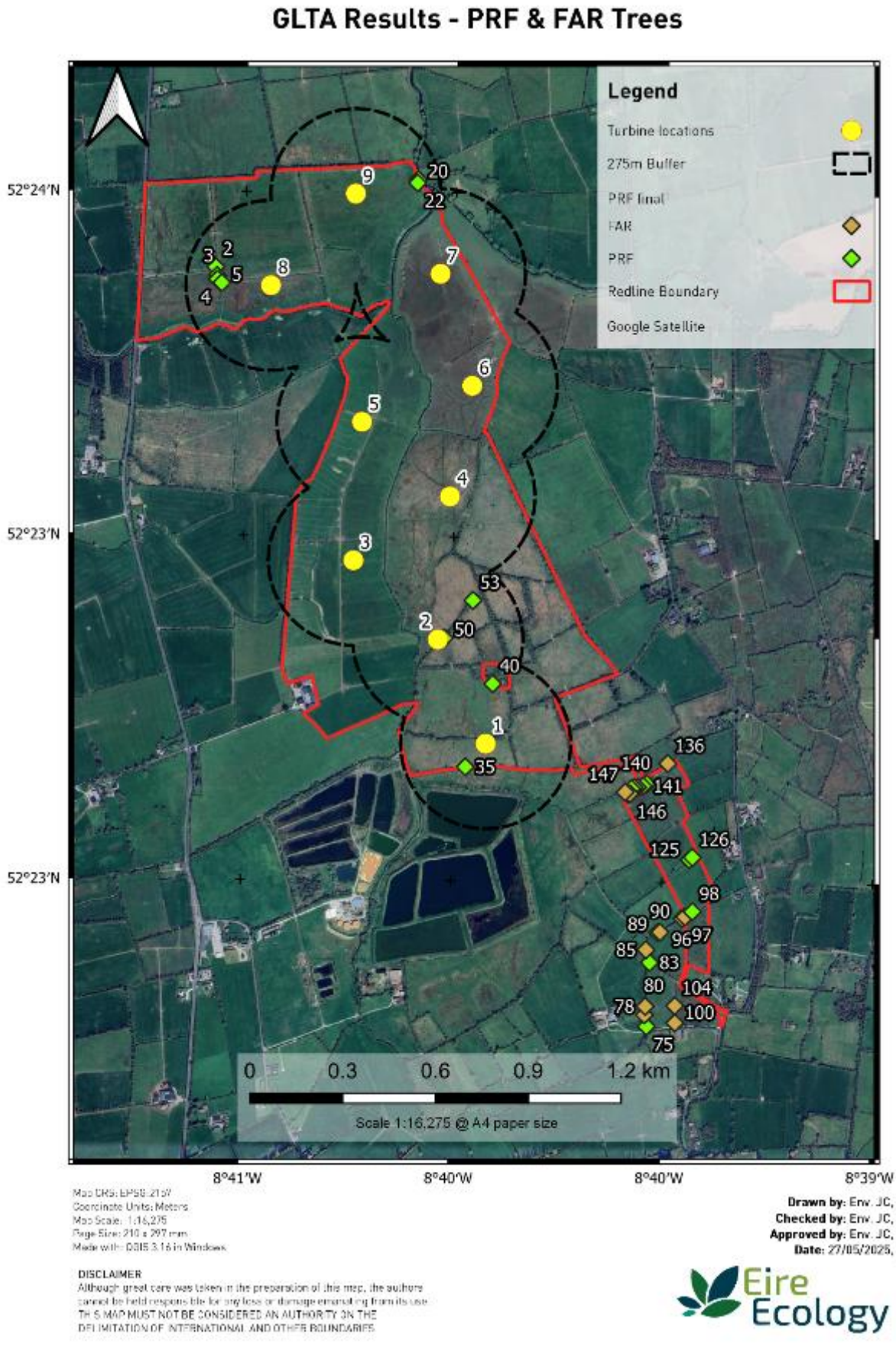

Plate 20: Preliminary bat tree roost survey results (Category 1 and 2 only).

Structures

During the daylight search no evidence of bats were noted from any of the structures checked (see **Plate 21** & **Appendix 6.1**, **Table 4.2**). A survey in July 2022 indicated a bat roost located at a derelict dwelling (no. 3) where good pipistrelle activity was recorded although an exact roost was not determined. Sheds (2) were examined in 2022 and again in 2023. While no bats were found in 2022, a Natterer's satellite bat roost (2 bats) was recorded in 2023. Bridge (no. 6) was found to contain a soprano pipistrelle satellite roost (2 bats) during the 2023 surveys, while Bruree Tower House and Church (no. 11) was found to contain a soprano pipistrelle, common pipistrelle and probable brown long-eared roost. Structures 12 (culvert), 13 (culvert) and 14 (bridge) were examined during a daylight search on the 7th March 2024 as these are located along the proposed grid route. They showed no potential to host a bat roost.

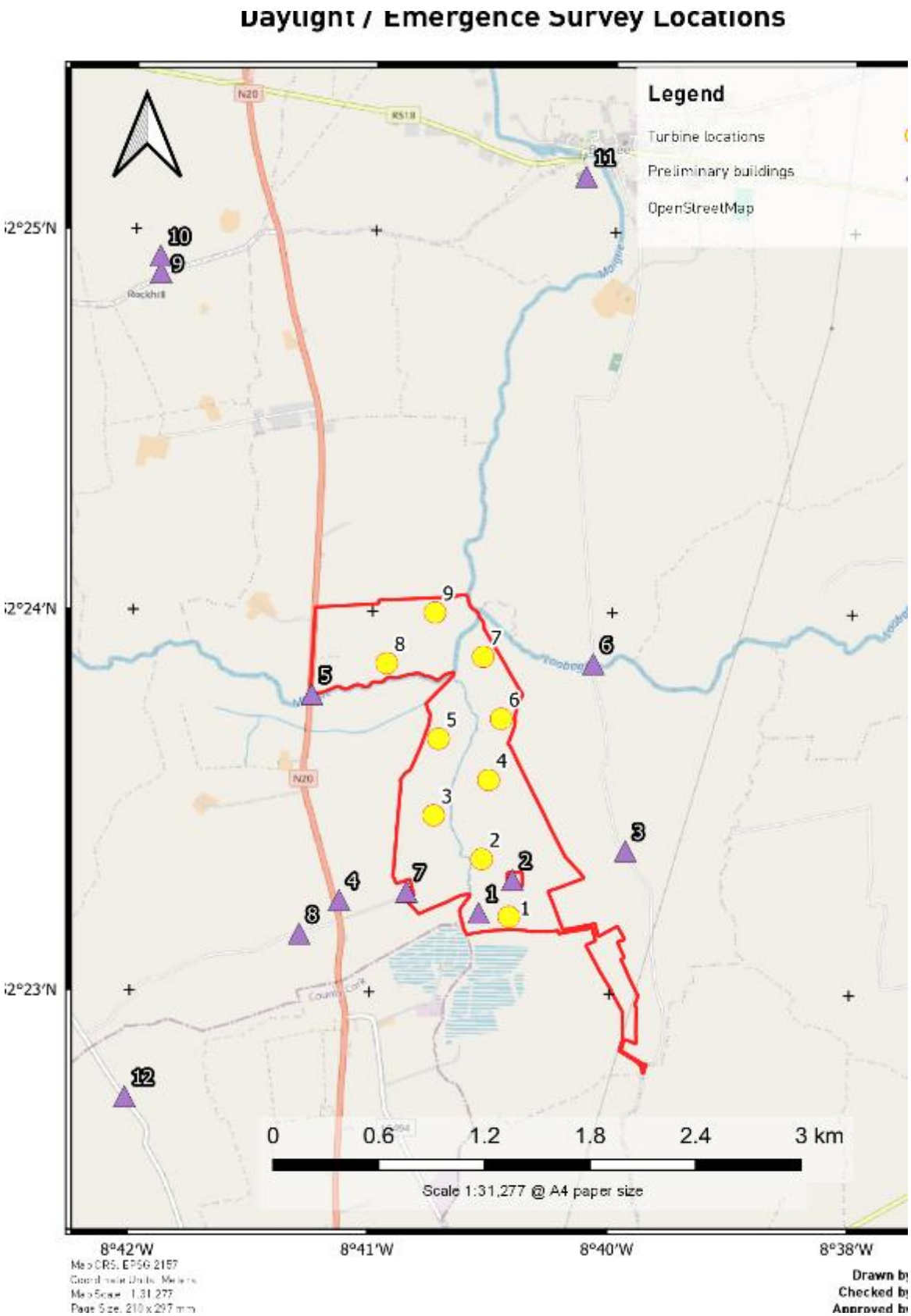

Plate 21: Structures checked for bat presence in daylight / emergence bat survey (numbers correspond to Table 4.2 in Appendix 6.1).

6.3.5.4 Bat Activity Surveys

During walked surveys, a total of six species of bats were recorded: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long-eared bat, Daubenton's and Natterer's bat. In addition, unidentified Myotis species were recorded. Where the call could not be identified to species, the identification was determined to the highest possible level. The most recorded species was common and soprano pipistrelle, followed by Leisler's, with lower levels from other species. A single roost was found within a 275 m buffer of the turbines; a satellite roost for Natterer's bats found 205 m south-east of T2 and 215 m north of T1. A soprano pipistrelle satellite roost was also found c. 600 m to the north-east of T6.

6.3.5.5 Bat static Detector Surveys

During static surveys, a total of eight species of bats were recorded: common pipistrelle, soprano pipistrelle, Leisler's bat, Nathusius's pipistrelle, brown long-eared bat, Natterer's bat, Daubenton's bat and lesser horseshoe bat. Where the call could not be identified to species, the identification was determined to the highest possible level. The most recorded species was soprano pipistrelle followed by Leisler's and common pipistrelle, with lower levels from other species.

The results of the static detector surveys deployed over eight rounds in 2022 and 2023 are shown below (for details, see **Appendix 6.1, appendix 14**). Detailed results on a seasonal basis for all the detectors are provided in **Appendix 6.1 (Table 4-6**) and summarised in **Plate 22**.

Table 6.7: Total recordings for all static detectors at Garrane Green Energy Project Site for 2022 and 2023 seasons.

Common Name	Species	No. of recordings	%
Brown long-eared bat	*Plecotus auritus*	1,442	1.1
Common pipistrelle	*Pipistrellus pipistrellus*	19,104	14.2
Daubenton's bat	*Myotis daubentoniid*	13	0.01
Leisler's bat	*Nyctalus leisleri*	37,221	27.6
Lesser Horseshoe bat	*Rhinolophus hipposideros*	1	0.001
Nathusius' pipistrelle	*Pipistrellus nathusii*	54	0.04
Natterer's bat	*Myotis nattereri*	470	0.3
Soprano pipistrelle	*Pipistrellus pygmaeus*	66,090	49.0
40 kHz Pipistrelle	-	2,224	1.6
Unidentified Myotis species		8,360	6.2
Total registrations		134,979	

Highest overall activity was recorded to the south of the site closest to proposed turbine T01. In 2022 Detector 12, set to the south-east of the proposed turbine had an overall rate of 37.3 bat passes per hour, while in 2023 detector 1 recorded a rate of 29 BP/Hr. Both years saw highest activity here from soprano pipistrelle (15.3Bp/hr in 2023 and 26.5 Bp/Hr in 2022). Both detectors were set close to treelines and hedgerows.

Detector 8 also showed relatively high bat activity during the 2023 spring and autumn surveys particularly for Leisler's bat with an average rate of 14.7Bp/Hr for 2023. The overall rate (all bats) from here in 2023 was 29.4Bp/Hr. This is in marked contrast to the 2022 surveys. The closest detector to this location (D1 2022) showed an average rate of 3.2Bp/Hr for all species and 1.3BpHr for Leisler's bats. Both detectors were set a similar distance to the Maigue River (60m and 80m respectively) in similar habitats.

Lowest activity was recorded at turbines 03, 04, 05, 07 and 09 in 2023. These are all locations where turbines are proposed within the centre of a field, away from landscape features usable by bats.

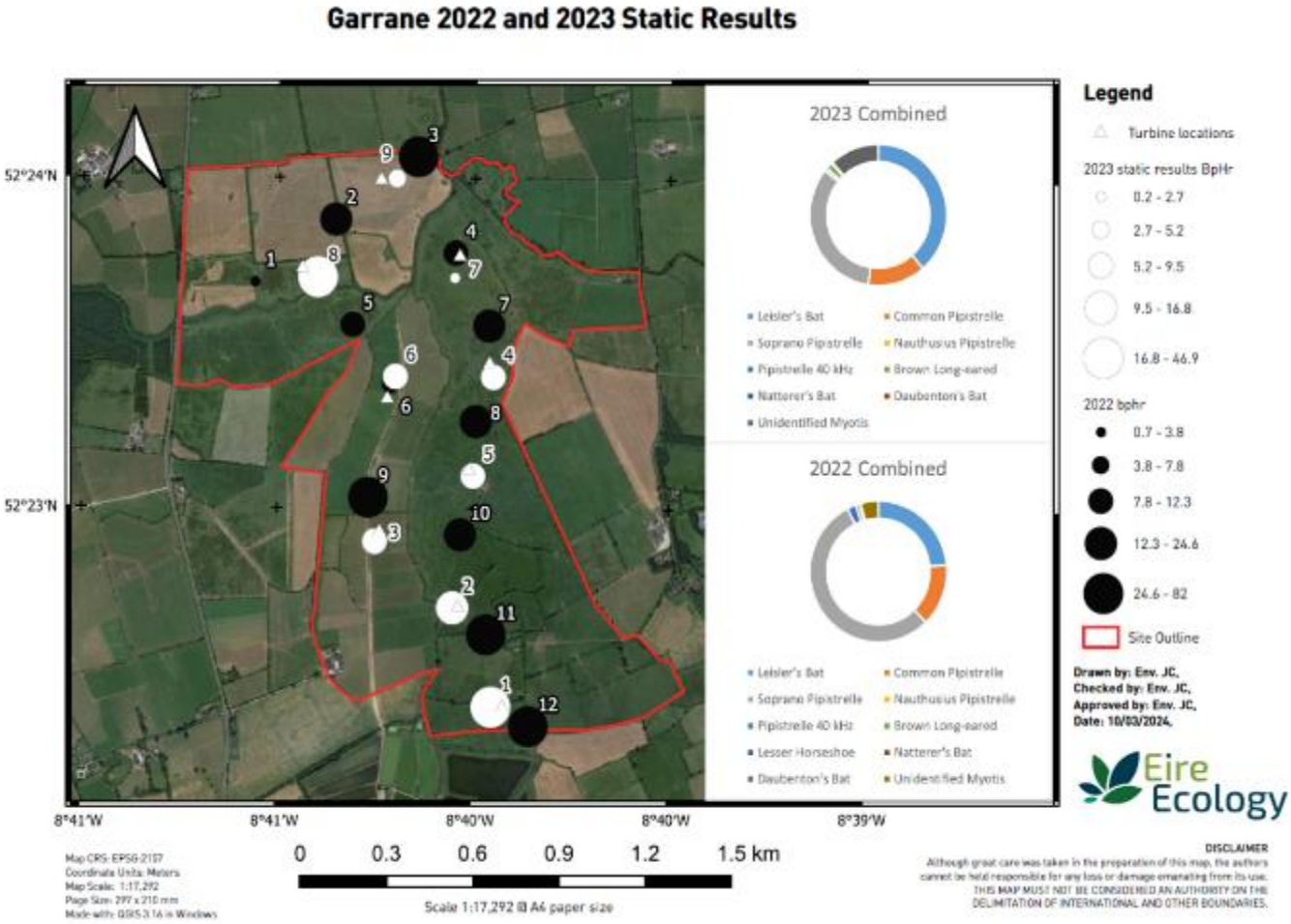

Plate 22: Static Detector Summary Results (Bp/Hr) for 2022 and 2023.

6.3.5.6 Ecobat

Static results were interpreted through ECOBAT type analysis. Ecobat was an online tool which makes assessments of bat activity levels by comparing data entered by the user with bat survey information from similar areas. Specifically, a median bat activity level is calculated which corresponds to a bat activity category (**Table 6.8**). This software however has not been operational since November 2022 prior to the analysis of the Garrane dataset.

Table 6.8: Media percentile range and corresponding bat activity.

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

To prepare a risk assessment for the site, previous ECOBAT data the author has analysed were used to derive both an activity level and a median percentile. Data from numerous sites with similar habitat types were examined and compared with data from the subject site. Garrane detectors were condensed into two groups; open grassland without a landscape feature within 25 m of the turbine and locations close to edge habitat (be that hedgerow or treeline). The percentile rating for each night's total passes per species from the comparison sites were ranked and averaged in order to derive a percentile score for the Garrane detectors. Following Lintott (2017), a minimum range of 200 nights with at least one night of bat passes was compiled.

An assessment was conducted only for those species identified as being at high risk of turbine collision, namely Leisler's bat, common, soprano and Nathusius pipistrelle. Full details of the analysis are presented in **Appendix 6.2: section 4.5**.

During the static surveys, a total of eight species of bats were recorded: common pipistrelle, soprano pipistrelle, Leisler's bat, Nathusius's pipistrelle, brown long-eared bat, Natterer's bat, Daubenton's bat and lesser horseshoe bat. Where the call could not be identified to species, the identification was determined to the highest possible level. The most recorded species was soprano pipistrelle followed by Leisler's and common pipistrelle, with lower levels from other species.

Due to the levels of nightly bat activity (regarding median values as determined by Ecobat type analysis) at each of the static locations, all turbines are deemed high risk for at least one species.

A single Lesser Horseshoe bat record was noted from detector 12 on 2nd October 2022. This detector was positioned to the very south of the site. The site does not lie within a lesser horseshoe bat region and the closest historical record from this species recorded on the NBDC lies 18 km to the north-west at Grange and 20 km to the north-west towards Rathkeale. Given the time of year recorded and the fact that it is only a single record out of 134,979 total recordings, it is safe to assume this is a vagrant bat potentially moving between summer and winter roosts.

6.3.6 Marsh Fritillary

While *Succissa pratensis* (foodplant of marsh fritillary) was often a component of the vegetation in wet grassland, the distribution was localized and nowhere abundant. As the

criteria for habitat in good condition for marsh fritillary, *i.e*. three or more well-developed devil's-bit scabious plants per square metre across more than twenty percent of the habitat, were not present within the survey area, further survey for this species was not merited.

Marsh fritillary has not been recorded within the 10-kilometre square (R52) in which the subject site is located (NRBD database).

6.3.7 Summary of Ecological Receptors and Conservation Value of Project Area

6.3.7.1 Habitats, Vegetation and Flora

The Wind Farm Site is dominated by improved agricultural grassland, wet grassland and neutral grassland (all of which are in current agricultural practice). Improved grassland is a habitat of low botanical interest - rated as Negligible Importance. Wet grassland and neutral grassland can vary in ecological interest depending on wetness and management practices but in general these habitats are rated as Local Importance (lower value). However, the very wet grassland areas to the east of the Charleville stream provide habitat for protected species including the common frog and breeding snipe, and are therefore rated as Local Importance (lower-higher value).

The hedgerows and treelines, with associated drainage ditches, within the Wind Farm Site vary in quality due mainly to recent management history. However, all provide useful habitat for local wildlife within a landscape dominated by agriculture - rated as Local Importance (higher value).

Watercourses are an ecological feature of the site and are assessed in detail in **Chapter 7: Aquatic Ecology**.

No nationally rare or legally protected plant species listed in the 2022 Flora (Protection) Order were recorded from within the Wind Farm Site during the surveys nor are there any past records of such species from the study area.

6.3.7.2 Terrestrial Mammals, Amphibians and Reptiles

The Wind Farm Site supports a typical mammalian fauna of agricultural pastoral land.
The Irish hare is protected under the Wildlife Acts, as is the pygmy shrew and hedgehog (both expected on site).

The watercourses within the Wind Farm Site provide feeding habitat for otter, though there was no evidence of otter breeding within the site. Otter is listed on Annex II and Annex IV of the EU Habitats Directive as amended.

All mammal species recorded within the Wind Farm Site, or expected to occur, are listed as 'Least Concern' on the Irish Red List (Marnell *et al*. 2019). The Site is within the core range of the recently established greater white-toothed shrew, an invasive species which is known to compete with the native pygmy shrew.

The common frog is protected under the Wildlife Acts, though is listed as 'Least Concern' on the Irish Red List (King *et al*. 2011).

6.3.7.3 Bats

The bat landscape association model suggests that the overall suitability for the Garrane site is high for brown long-eared bat, Leisler's bat, common pipistrelle and soprano pipistrelle.

Relatively high levels of bat activity were recorded during the walked activity surveys (6 species) and the static activity surveys (8 species).

All bats recorded are classified as 'Least Concern' on the Irish Red List (2019) and protected under the EU Habitats Directive as amended under Annex II (lesser horseshoe) and Annex IV and the Wildlife Acts as amended.

6.4 ASSESSMENT OF POTENTIAL EFFECTS

6.4.1 The 'Do-Nothing' Impact

Without the proposed Wind Farm Project proceeding, it is expected that the present main land-use within the area of the Wind Farm Site, namely agriculture, will continue. Over time, the intensity may be increased and especially in the eastern sector of the site which is currently in a largely unmanaged state.

Overall, in the absence of the proposed Project, the ecology of the Wind Farm Site would be expected to remain fairly similar as at present.

6.4.2 Potential Impacts on European Conservation Sites

The AA Screening report that accompanies this planning application has shown objectively that for five of the European sites identified (as in **Table 6.3** above) there are no realistic

Source-Pathway-Receptor linkages and hence there is no potential for effects on the Qualifying Interests or Special Conservation Interests as a result of the Project. These sites are:

- Ballyhoura Mountains SAC (code: 002036)
- Blackwater River (Cork/Waterford) SAC (code: 002170)
- Tory Hill SAC (code: 000439)
- Glen Bog SAC (code: 001430)
- Kilcolman Bog SPA (code: 004095)

Two sites, the Lower River Shannon SAC (code: 002165) (approximate 20 km distance from the Site) and the River Shannon and River Fergus Estuaries SPA (code: 004077) (approximate 25 km distance from the Site), have ecological and hydrological connectivity with the proposed Project via the River Maigue. In the absence of mitigation, likely or possible significant effects on these two sites could not be excluded during the construction, operational and/or decommissioning stages of the proposed Project (as discussed in detail in the AA Screening Report).

6.4.3 Potential Impacts on Proposed Natural Heritage Areas

There is a total of eleven proposed Natural Heritage Areas (pNHAs) within the zone of influence of the proposed Project (see **Figure 6.2** and **Table 6.4**).

The closest site is Mountrussell Wood pNHA, which is at a distance of approximately 7 km from the proposed Project site. Four of the sites (Ballyhoura Mountains, Kilcolman Bog, Tory Hill, Glen Bog) are also designated as SACs.

None of the eleven sites have ecological or hydrological connectivity with the proposed Projectsite.

On the basis that there is no pathway between the Source (proposed development) and Receptor (pNHA), it can be concluded with a high degree of scientific certainty that the proposed Project will not have any effects on the interests of any pNHA during the construction, operational and/or decommissioning stages of the Project.

6.4.4 Impacts on Habitats, Vegetation and Flora

The construction of the Project will result in the following impacts on terrestrial habitats and flora:

- permanent loss of habitat
- temporary loss of habitat
- disturbance to habitats

In addition, some tree trimming or pruning works will be required along parts of the Turbine Delivery Route(s) (outside of the Redline boundary) to facilitate large transport vehicles.

6.4.4.1 Permanent Loss of Habitat

The permanent loss of habitat at the Wind Farm Site, *i.e.* habitat which will be replaced by wind farm infrastructure including turbine foundations, hardstand areas, substation, new access tracks, access track upgrades and a met mast, is estimated at 6.69 ha.

Apart from hedgerows and sections of existing tracks, the permanent habitat loss is entirely improved grassland, neutral grassland and wet grassland. These grassland habitats are widespread within the site and throughout the local area, as well as throughout the island of Ireland. The effect by the loss of improved grassland (0.59 ha) is rated as Not Significant. The significance by the loss of neutral and wet grassland (6.04 ha), with patches of marsh sometimes occurring with wet grassland, is rated as a Slight adverse effect of permanent duration at the Local level of importance.

The proposed Project will result in the permanent loss of 1,008 m of hedgerow to facilitate the construction of the wind farm infrastructure, including internal access tracks and access points from public roads. In addition, an additional 641 m of hedging outside of the civil works will be removed for the purpose of providing bat buffers around turbines (where relevant) to minimise collision risk (see **Section 6.5.6.1**). The total loss of hedgerows is 1,649 m.

The hedgerows affected are typical of the area (see **Section 6.3.3.8**), being mostly on low banks and associated with field ditches. As noted, many of the hedges to be removed are in an unmanaged state and are no longer stockproof. A section of mature treeline will be breached to the north of the substation (see **Plate 6.12**), while a large specimen poplar will be removed at T02 location (see **Plate 6.13**).

Hedgerows, treelines and individual trees are important habitats in the local area, rated Local Importance (higher value), and support a range of flora and fauna species including breeding and feeding birds, foraging bats and small mammal species.

The Limerick County Development Plan 2022-2028 recognises the importance of trees and hedgerows in section 6.3.5: "Trees, Tree Preservation Orders and Hedgerows". OEH O10 Trees and Hedgerows notes the following:

It is an objective of the Council to:

a) Retain and protect amenity and biodiversity value of the County and City by preserving as far as possible trees, woodlands and hedgerows, having regard to the significant role that trees and hedgerows play in local ecology, climate change and air quality and their contribution to quality place making and the associated health and wellbeing benefits.
b) Require, in the event that mature trees or extensive mature hedgerow is proposed to be removed, that a comprehensive tree and hedgerow survey be carried out by a suitably qualified tree specialist to assess the condition, ecological and amenity value of the tree stock/hedgerow proposed for removal and to include mitigation planting and a management scheme. The Council will seek in all cases to ensure when undertaking development, or when permitting development, that the loss of, or damage to, existing trees is minimised.
c) Require the planting of native trees, hedgerows and vegetation and the creation of new habitats in all new developments and public realm projects. The Council will avail of tree planting schemes administered by the Forest Service, in ecologically suitable locations, where this is considered desirable.

The importance of promoting the protection of hedgerows and trees is also a key feature of the Limerick Biodiversity Action Plan, 2025-2030.

The significance of the loss of hedgerows due to the proposed Project is rated as an Adverse Significant Effect of Permanent Duration at a Local level of importance. The loss of hedgerows will be offset through an extensive planting scheme within the Redline boundary of Site (see **Section 6.5.2.1 & Appendix 6.2**).

6.4.4.2 Temporary Loss of Habitat

Excess topsoil and subsoil will be stored permanently at 6 no. selected spoil deposition areas within the site (see **Chapter 2: section 2.5.16, Figure 1.2 & Appendix 2.1: Management Plan 4**). Following completion of construction, the deposition areas will be graded to match the profile of the surrounding land, covered with topsoil and reseeded with grassland. There will be further temporary loss of habitat at the locations for the construction compound and the assembly pad for the grid connection.

The above areas amount to an estimated 2.41 ha and are all existing grassland (improved, neutral, wet) of negligible to low ecological value. The temporary loss of such habitats is not considered a significant effect – rated Not Significant.

6.4.4.3 Disturbance to Habitats

Areas of habitats adjoining the infrastructure at the Wind Farm Site will be disturbed by the construction works, including the construction of an onsite drainage system. This will result in areas and strips of bare soil, which would be prone to erosion. At the Garrane site, the disturbance will be to grassland (improved to wet), habitats which are of low ecological value. For such habitats, this effect is rated as Not Significant. Mitigation, however, will be implemented to maximise the rate of re-vegetation and minimise the areas of bare soil so as to limit the potential for soil erosion leading to potential effects on local watercourses.

6.4.4.4 Works along Turbine Delivery Route

There are seven locations along the Foynes Port Turbine Delivery Route where temporary works are required. At six of these, the trimming or pruning back of branches of overhanging trees will be required for blade oversail (see details of locations in **Chapter 2: Table 2.6** & **Chapter 17: section 17.2.10**). The effect of pruning back of branches along public roads is Not Significant, though seasonal mitigation will apply for breeding birds.

At the N20 site entrance (Location no. 7, within the Redline Boundary), a section of approximately 80 m of hedging will be removed permanently. This is mostly a low, hawthorn dominated hedge but includes one medium sized poplar tree (see **Plate 6.18**). This loss has been assessed as part of the total hedgerow loss as a result of the proposed Project (see **section 6.4.4.1** above), which is rated as an Adverse Significant Effect of Permanent Duration at a Local level of importance. The loss of hedgerows will be offset through an extensive planting scheme within the Redline boundary of the Site (see **Section 6.5.2.1**). Enabling works along the Galway Port Turbine Delivery option (for blades only) are detailed in **Chapter 2: Table 2.7**. At two locations vegetation will be trimmed for load oversail. As already noted, the trimming or pruning of vegetation along public roads is Not Significant, though seasonal mitigation will apply for breeding birds.

At location no. 10 (M20/M18 Junction), vegetation comprising amenity grassland will be removed from inside of slip lane. The effect of such removal is Not Significant.

6.4.5 Potential Impacts on Terrestrial Mammals and Amphibians

6.4.5.1 General effects from loss of habitats

The effect on terrestrial mammal species by the loss and disturbance of grassland habitats at the Wind Farm Site is considered to be Not Significant on the basis that the species involved, such as the Irish hare, are widespread species of the countryside which will still occur within the study area, where grassland is the dominant habitat, as well as in the wider environs.

The permanent loss of hedgerows will affect a range of small mammal species, including protected species such as pygmy shrew and hedgehog . The effect on terrestrial mammal species by the loss of hedgerows is rated as a Slight Adverse effect of Long-term duration. It is noted that hedgerow loss will be off-set by a Biodiversity Enhancement Management Plan, which will result in a net gain of hedgerow and native woodland within the Site.

6.4.5.2 Disturbance to Mammal Species

Construction activity would be expected to cause disturbance to mammal species, including Irish hare and otter. Such species would likely remain in cover whilst the works are on-going. However, this will be a localised and temporary effect, and considering many mammal species are largely nocturnal, the effect is considered to be Not Significant.

6.4.5.3 Otter

The baseline assessment has shown that otter is present within the Site and is likely to feed along the various watercourses. However, there was no evidence of otter breeding sites on site. The two watercourse crossings required for the Project (over the Maigue River and Charleville Stream) will be clear span bridges and will not affect the passage of otter along these watercourses. A confirmatory survey for otter breeding sites will take place at the crossing locations (upstream and downstream on both banks) prior to the commencement of works on site (see **section 6.9.3**).

As noted, the construction phase of the Project has potential to give rise to temporary disturbance to otter due to work activities within the site. However, this is likely to be, at most, a Slight Adverse effect of Temporary duration, for the following reasons:

- A key mitigation measure during the construction phase is the avoidance of sensitive hydrological features, by application of suitable buffer zones, i.e. 50 m to main watercourses, and 10 m to main drains (see Chapter 10: section 10.6.2.1). The only infrastructure elements located within the 50 m watercourse buffers are the river

crossings over the River Maigue and the Charleville Stream. With a buffer of 50 m in place for the duration of the works, semi-aquatic species such as otter are likely to commute along the river corridors other than when the above-mentioned bridge works are being undertaken.

- Otter are primarily nocturnal and are mainly active after dusk and just before dawn. However, animals may be more active by day during cold weather (Hayden & Harrington 2000). Given construction phase works will be undertaken largely in daytime hours (from 07:00 to 19:00 hrs on weekdays, with reduced working hours at weekends, from 08:00 to 13:00 hrs on a Saturday, and no work on Sundays or Public Holidays – see Chapter 2: section 2.6.6), the construction works are unlikely to have a significant effect on the foraging activities of the local otter population and especially from spring to autumn when the species is mostly likely to breed.

However, the local otter population within the watercourses associated with the site, as well as downstream of the proposed Project, could be affected adversely if contaminants generated during the construction phase, such as suspended solids, hydrocarbons and cementitious materials, were to enter the watercourses and affect the prey items (fish etc.) of the otter. In the absence of mitigation, the effect on the otter population could be Significant. Mitigation to maintain water quality during the construction and operational phases of the Project will minimise the risk to the otter population.

6.4.5.4 Common frog

The common frog is widespread throughout the area of the proposed Project Site. The construction works will have effects on some drainage ditches and wet grassland areas which are utilised by the species. As a viable breeding population of the common frog is likely to remain within the Site (where suitable breeding habitat will still be frequent), the significance of the effect is rated as, at most, a Slight Adverse effect. Mitigation will be implemented for the common frog to minimise direct effects on spawn, tadpoles and adult frogs during construction (see **Section 6.5.4).**

6.4.6 Impact on Bats

Common, Nathusius's and soprano pipistrelle alongside Leisler's bats are high risk species for wind farm collisions (see **Table 6.9** below from NIEA 2021). NIEA (2021) states that peaks of bat activity should be accounted for in addition to median levels to appropriately quantify risk. The report also noted the Leisler's bats, while fairly rare in Britain, are one of the commonest species found in Ireland. However, given their rarity in the rest of the UK,

and indeed Europe, the Irish population is considered a global stronghold for the species and therefore we have an international responsibility for its protection.

Table 2: *Level of potential vulnerability of populations of British bat species.*
(Adapted from Wray et al., 2010)

Yellow = low population vulnerability
Beige = medium population vulnerability
Red = high population vulnerability

Relative abundance	England	Collision risk		
		Low collision risk	Medium collision risk	High collision risk
	Common species	Brown long eared bat		Common pipistrelle Soprano pipistrelle
	Rarer species	Daubenton's bat Natterer's bat Whiskered bat Brandt's bat Lesser horseshoe	Serotine bat	Nathusius' pipistrelle Noctule bat Leisler's bat
	Rarest species	Alcathoe bat Bechstein's bat Greater horseshoe Grey long eared bat	Barbastelle bat	

Table 6.9: Level of potential vulnerability of populations of British bats.

6.4.6.1 Initial Site Risk Assessment

An initial risk assessment is based on an assessment of habitats and the size of the development. Habitat suitability is ranked either low, moderate and high while project size is ranked from small, medium and large. Habitats surrounding the subject turbines are ranked as High given connectivity to the wider landscape with the presence of hedgerows / treeline and rivers and the presence of bat roosts in the wider landscape. The Maigue River provides connectivity between the site and the bat roost located in the village of Bruree, while the Loobagh stream provides connectivity to the small roost located within the bridge to the west. No other wind farm occurs within 5 km of the site. The closest turbines are located 5.2 km south-east where a 2-turbine windfarm (Rathnacally) is located. The next closest is Boolard windfarm; a 2-turbine windfarm found 7.39 km to the south-west.

Regarding project size; the project is categorised as medium, while the proposed development contains a low number of turbines (9), with no other operational windfarms within a 5 km radius, and proposed turbines reach over 100 m in height.

The proposed Garrane Green Energy Project thus derives an Initial Site Risk Assessment Value of *4; high site risk*.

6.4.6.2 Overall Risk Assessment

The output from the initial site risk assessment is used in a matrix (see **Appendix 6.1, table 5-1**) to derive an overall risk assessment based on the activity level of high collision risk species, namely common pipistrelle, soprano pipistrelle, Nathusius's pipistrelle and Leisler's bat.

Due to the high levels of nightly bat activity at each of the static locations, all turbines are deemed high risk for at least one species. Mitigation will be implemented to reduce this risk.

6.4.6.3 Impacts on Potential Bat Roosts

Roost located 205 m from T02

A natterer's roost was found to the south of the site within the Core Sustenance Zone (CSZ) for this species (4 km). Natterer's bats typically forage at heights of less than 5 m, but occasionally may reach 15 m in the tree canopy (BCT, 2010). This species typically flies close to vegetation such as trees and prefer semi-natural woodlands. Smith (2008) shows that while semi-natural woodland and river corridors are the most favoured feeding habitats for this species, they also utilise improved grassland. Key to negating the impact on bats using this roost is the retention of scrub and woodlands.

Scottish Natural Heritage (2021) states that Natterer's bats are a low turbine collision risk species, likely due to this species flying below the turbine blade height. The removal of landscape features leading to the turbines should be sufficient mitigation (see **section 6.5.6.1** below) to direct this species away from the wind turbines, while the compensatory planting will ensure no net loss of feeding or commuting features.

Roost located c. 600 m to north-east of T6

A small bat roost was found within a bridge located to the east of the site. This bridge was examined in 2022 and 2023. The 2022 survey did not find any roosting bats however the 2023 survey identified two soprano pipistrelle emerging from a crevice. The proposed Project will not impact on the roost as a structural assessment of the bridge concluded it "*is currently in a relatively good structural condition. Our assessment indicates that the bridge is capable of carrying the loads exerted on it by standard roadworthy vehicles.*"

Bat Conservation Trust (BCT) states the Core sustenance zone for this species is 3 km thus the proposed windfarm lies within this area. The Maigue River provides connectivity between the roost and the proposed windfarm. In the Bat Mitigation Guidelines for Ireland,

Marnell (2022) describes a roost status for the different types of roosts found in Ireland. Individual bat roost for a common species lies at the lowest end of roost status found in Ireland. Soprano pipistrelle is a common bat species.

Bruree Church roost located 2.6 km north-east of T09

Soprano pipistrelle, common pipistrelle and likely brown long-eared bats were noted roosting in the church to the north of the site during a survey in September 2023. Two turbines (T07 & T09) lie within the CSZ of this roost for soprano pipistrelle while the Maigue River provides connectivity between the sites.

The removal of landscape features leading to the turbines should be sufficient mitigation (see **section 6.5.6.1** below) to direct these species away from the wind turbines, while the compensatory planting will ensure no net loss of feeding or commuting features.

Potential roost located 750 m from T01

A survey conducted on 9th August 2022 noted a significant amount of pipistrelle activity close to a derelict house and trees to the north-east of T01 indicating a roost may be nearby, although no emerging bats were recorded. An additional re-entry survey conducted in September 2022 however did not find any evidence of a roost here. Treelines and hedges do provide connectivity between the proposed windfarm and this building. All turbines lie within the CSZ of this potential roost (2 km for common pipistrelle and 3 km for soprano pipistrelle).

The removal of landscape features leading to the turbines should be sufficient mitigation (see **section 6.5.6.1** below) to direct these species away from the wind turbines, while the compensatory planting will ensure no net loss of feeding or commuting features.

Historical roost located by bridge west of T01

While this record is dated from 2019, the record has only been uploaded to the BCI database after March 2024. As noted in section 6.3.15, the recorder considers the bridge is not used as a maternity roost. This bridge is not located along the TDR or grid route and thus will not be impacted by the construction of the wind farm. Daubenton's bats are a low flying species; when over water this species flies at approx. 5-25 cm above the water (Russ, 2021). This species can also hunt in woodlands. Very low levels of Daubenton's bat activity were recorded from static detectors within the subject site with 13 recordings over the two years. SNH (2021) states this species as having a low collision risk. No impacts are expected on this roost by the proposed Project.

The presence of various confirmed roosts surrounding the site increased the habitat suitability from medium to high.

6.4.7 Decommissioning Phase Impacts

A Decommissioning Plan accompanies the EIAR (see **CEMP Management Plan 6: Decommissioning Plan**). There follows an overview of the decommissioning process.

The Developer is applying for a consent for an operational period of 35 years for the Wind Farm. It is intended that all above ground components and underground cabling (ducting left in-situ) will be removed from the Wind Farm Site as part of the decommissioning of the Garrane Green Energy Project. The following elements are included in the decommissioning phase:

- Removal of 9 no. wind turbines and concrete plinths
- Removal of 1 no. permanent meteorological mast
- Removal of all associated underground electrical and communications cabling connecting the wind turbines to the wind farm substation. Ducting is to remain in-situ

All other elements of the proposed Project will remain in-situ. The Site Access Tracks and associated drainage systems will serve agriculture activity in the area. All other hard surfaced areas will be allowed to revegetate naturally. Based on the experience of the project team monitoring operational wind farm sites throughout the country, the approach of allowing these areas to revegetate naturally has proven to be very successful.

Prior to wind turbine removal, due consideration will be given to any potential impacts arising from these operations. Potential impacts are likely to be similar to that of the construction phase, to an equal or lesser extent. Some of the potential issues could include:

- Potential disturbance by the presence of cranes, HGVs, and personnel on-site
- Time of year and timescale (to be outside sensitive periods).

Prior to the decommissioning work, a comprehensive plan will be drawn up and submitted to An Coimisiún Pleanála (or equivalent planning agency at the time) for written agreement. The plan will take account of the findings of the EIAR for the present project and the contemporary best practice at that time, to manage and control the component removal and ground reinstatement.

From the perspective of terrestrial ecology, the anticipated potential impacts would be:

- Disturbance to protected mammal species which may be on-site at the time,
- Potential pollution of local waterways and ultimately various designated sites,
- Creation of new habitats on-site.

6.4.7.1 Decommissioning phase: Disturbance of fauna species

Particular care will be taken to ensure that the Decommissioning works do not cause disturbance to animal species occurring on the Wind Farm Site at the time. Pre-construction confirmatory surveys will be carried out for species identified of conservation importance during the 2022-24 baseline surveys, as well as for further species of importance which may be present at the time of the works. Relevant legislation relating to flora and fauna in force at the time will be strictly adhered to.

Mitigation measures described in the present report to avoid or minimise disturbance to protected fauna species will be implemented as necessary.

With the above approach followed, it is not likely that the Decommissioning works will cause significance disturbance to fauna species, including otter and bats, associated with the Wind Farm Site.

6.4.7.2 Decommissioning phase: Maintenance of water quality

The issue of potential impacts on hydrology is reviewed in **Chapter 10: Hydrology and Hydrogeology (Section 10.5.3)**. The assessment notes the following:

> *Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures.*
>
> *No significant effects on the hydrological and hydrogeological environment are envisaged during the decommissioning phase of the Project.*

On this basis, it is likely that the Decommissioning works will not result in adverse effects on local watercourses or on designated sites downstream of the wind farm site.

6.4.7.3 Decommissioning phase: Creation of new habitat

The Decommissioning Plan specifies that the turbine hard stands will be allowed to naturally revegetate. At the time of Decommissioning, parts of the hardcore surface will likely already

support a sparse flora of annual and perennial species (this is normal to see at operational wind farms after a few years and indeed often attracts sheep and even the Irish hare to graze the tender shoots). The amount of vegetation that will eventually colonise will depend on the chemical character of the gravel surface, *e.g.* a calcareous substrate would support a higher diversity of plants than an acidic substrate. Such recolonising surfaces, which retain warmth in sunshine compared to surrounding areas of bog, tend to attract insects (butterflies *etc.*) as well as passerine bird species such as skylark and various finches, with the birds feeding on seeds from plants. The habitat that would be expected to develop is likely to fall into a mosaic of semi-natural grassland (GS) and artificial stone surfaces (BL3).

The natural re-vegetation of the above-mentioned surfaces is rated as a Positive effect of Slight significance.

6.5 MITIGATION MEASURES

6.5.1 Designated sites

The present report has identified a likely pathway between the area of the proposed Project and two European sites, namely:

- Lower River Shannon SAC (code 002165)
- River Shannon and River Fergus Estuaries SPA (code 004077)

In the absence of mitigation, there is a risk that contaminants generated by the proposed Project during the construction, operation and decommissioning phases could enter local watercourses associated with the Maigue River and ultimately flow to the designated site where there could be resultant adverse effects on water quality and aquatic life and relevant qualifying interests within the sites. Mitigation is therefore required to minimise this risk.

The mitigation proposed to maintain water quality in the watercourses which drain the area of the proposed Project are detailed in **Chapter 7: Aquatic Ecology,** in **Chapter 10: Hydrology and Hydrogeology**, and in the **CEMP**. The mitigation measures which are required to ensure that there are no adverse effects on the integrity of the European Sites are also contained within the accompanying NIS. The implementation of mitigation through avoidance principles, pollution control measures, surface water drainage measures and other preventative measures have been incorporated into the project design in order to minimise potential significant adverse impacts on water quality at the Wind Farm Site.

Within the Wind Farm Site all turbine locations and associated infrastructure have a buffer zone of at least 50 m from watercourses, with a 10 m buffer to drainage channels (see **Chapter 10: section 10.6.1**). No works will take place within these buffer zones except for the watercourse crossings on the access track network. Implementation of such buffer zones will result in the avoidance of sensitive hydrological features. Direct discharges to surface waters of dewatered loads will not be permitted under any circumstances. This in turn will avoid or reduce the potential for adverse impacts on downstream designated sites. All of the mitigation measures described in the above-mentioned chapters are contained in the Construction and Environmental Management Plan (CEMP) (appended to the EIAR in **Appendix 2.1**). The CEMP provides a contractual commitment to mitigation and monitoring, and reduces the risk of pollution whilst improving the sustainable management of resources. The environmental commitments of the proposed Project will be managed through the CEMP and will be secured in contract documentation and arrangements for construction and later phases, such that there will be a robust mechanism in place for their implementation. The CEMP addresses the construction phase, and will be continued through to the commissioning, operation and final decommissioning phases.

It is noted that an Ecological Clerk of Works (ECoW) with experience in overseeing wind farm construction projects will be appointed by the Contractor for the duration of the construction phase to ensure that the CEMP is effectively implemented and that all planning conditions relating to biodiversity are complied with. An Environmental Manager will be appointed by the Developer to oversee the environmental management of the project, advise on the environmental issues and ensure compliance by the Contractor.

With such mitigation in place and rigorously enforced, it can be concluded that there would not be any significant effects on the qualifying interests of the identified designated sites as a result of the proposed Project.

6.5.2 Mitigation for Habitats

6.5.2.1 Habitat loss

The principal significant impact on habitats as a result of the proposed Project is the loss of 1,649 m of hedgerows, which includes 641 m for provision of bat buffers where required.

This loss will be mitigated by the planting of 1,620 m of new hedging within the Redline Boundary of the site. Details of the planting programme, along with hedgerow enhancement measures and the planting of native woodland, are given in the Biodiversity Enhancement and Management Plan (BEMP) (see **Section 6.8** & **Appendix 6.2**).

The described hedgerow replacement within the site is in line with Objective EH O10 "Trees and Hedgerows" of the Limerick Development Plan 2022-2028.

Full details of the new planting programme are given in the BEMP (**Appendix 6.2**). The following key points are noted:

- The planting will follow best practice, including guidance from the Department of Agriculture, Food and the Marine ACRES scheme.
- The programmes within the BEMP will be overseen by an ecologist.
- New plantings will consist of native Irish species from Irish genetic stock (certified Irish).
- The species will reflect the existing species diversity in the immediate and wider areas, and will include hawthorn, blackthorn, willows, poplar, hazel, holly, rowan, alder, guelder rose and spindle. Formerly ash would be used as a principal tree standard but is not being planted due to ash dieback disease. Instead, sessile oak (*Quercus petraea*) is a suitable species. See **Appendix 6.2** for full list of species.
- The new plantings will connect in with existing hedging on site so as provide corridors for wildlife.
- The plantings will be fenced off from livestock at least until they are fully established.
- Monitoring will occur and any plants that fail will be replaced on an annual basis.

6.5.2.2 Protection of hedgerows and trees

The implementation of buffer zones of 50 m from watercourses and 10 m from drains will protect associated hedgerows and trees from potential disturbance during the construction phase.

Elsewhere on site, hedgerows will be protected from potential disturbance, including storage of materials, by the implementation of a 5 m buffer zone parallel to the base of the hedge. Individual mature specimen trees will be protected from possible root damage by the implementation of an exclusion zone to the outer edge of the canopy (often termed the drip-point). This will be marked by a suitable temporary fence erected prior to the commencement of works.

The Ecological Clerk of Works will ensure the implementation of the above protective measures, which will be maintained throughout the construction phase.

6.5.2.3 Habitat disturbance

At the end of construction, disturbed surfaces adjoining the wind farm infrastructure (hard stands, tracks etc) will be re-profiled and landscaped according to the Spoil Management Plan (see **Chapter 2**: section 2.5.16 & Appendix 2.1, Management Plan 4). The objective is to re-vegetate the areas of bare soil surfaces as quickly as possible so as to minimise the risk of soil run-off.

Top soil originally excavated from the work locations and stored in the dedicated spoil storage areas will be used, as such will still contain a seed source as well as underground parts (rhizomes etc.) of species such as yellow iris. In the wetter areas, it is likely that rushes, especially soft rush, will dominate any bare surface within 1-2 seasons.

6.5.3 Otter

While there was no evidence of otter breeding sites within the site area, otter forages within the various watercourses associated with the site, as well as downstream of the site. Such populations could be effected adversely by pollutants entering the watercourses as a result of activities associated with the proposed Project and especially during the construction phase.

The mitigation proposed to maintain water quality in the aquatic zones (as detailed in the **Chapter 7: Aquatic Ecology** & **Chapter 10: Hydrology and Hydrogeology**, and summarised in the **CEMP**) will ensure that the food supplies for otters within local watercourses are not affected by contaminants generated by the proposed Project.

As already noted in **section 6.4.5.3**, a confirmatory survey for otter breeding sites will take place at the crossing locations (upstream and downstream on both banks) prior to the commencement of works on site to ensure that otter holts have not been established since the baseline survey (see **section 6.9.3**).

6.5.4 Badger

Whilst no signs of badger presence were found within the proposed Project Site during the baseline surveys, badger does occur in the wider area and distribution of local populations can change over time.

Should more than 36 months have elapsed since the baseline surveys in 2023 and the projected date for commencement of construction, a pre-construction confirmatory survey will be undertaken in accordance with NRA Guidance (NRA 2006; NRA 2009b). This will

focus on the areas of the site where works will take place (to a distance of approximately 100 m).

Should an active sett be located within a 50 m distance of the works area, mitigation will require the closure of the sett (in consultation with NPWS) or the enforcement of a restrictive zone to prevent disturbance to underground tunnels. The ecologist would advise on the appropriate mitigation taking into account the type of sett (i.e. main, secondary, outlier) and the proximity of any works. This procedure would be carried out in strict accordance with relevant legislation and guidance.

6.5.5 Common frog

The common frog is widespread within the Wind Farm Site occurring in drains and wet fields. Areas where construction works are due to commence during the period February to August will be checked by the ECoW for the presence of frog spawn, tadpoles and adult frogs. If present, these will be removed under licence from NPWS and transferred to suitable ponds, drains or wetlands in the vicinity and away from the construction footprint.

6.5.6 Bats

6.5.6.1 Construction phase mitigation for bats

6.5.6.1.1 Buffer zone

Bats typically use hedgerows/treelines and woodland edge habitats for commuting and feeding purposes. Various publications provide guidelines on buffer zones surrounding turbines to reduce the favourability of the site for bat activity. Eurobats 'Guidelines for consideration of bats in wind farm projects' (Rodrigues, et al., 2015) recommend buffer zones of 200 m from turbine base to high potential features, whilst Natural England Bats (England, 2014) recommend 50 m buffers from blade tip to tree. NIEA (2021) recommends a minimum buffer of 100 m between the turbines at the edge of commercial forestry where wind farms are proposed to be key-holed.

The proposed Garrane Green Energy Project is situated within habitats dominated primarily by grassland with accompanying treelines and hedgerows. The proposed wind turbines; Vestas V-150, have a hub height of 95 m and has a blade length of 75 m. Should the typical 50 m buffer be put in place it would require a buffer of 103 m from the turbine base where treelines are affected and 96 m buffer when hedgerows are impacted.

The following formula is used to calculate the distance required from the turbine base.
√((50+BL)^2-(HH-FH)^2)

Buffer for treelines	√((50+75)^2-(95 – 25)^2)
	103m buffer zone for treelines
Buffer for hedgerows	√((50+75)^2-(95 – 15)^2)
	96m buffer zone for hedgerows

Where: bl = blade length, hh = hub height, fh = feature height (all in metres).

Based on a review of aerial photographs, a review of the habitat map and ground truthing, Turbines 1, 2, 5 and 9 should have a clearing of **103 m** given these are surrounded by treelines, while all others require a **96 m** buffer. Not all treelines and hedgerows within the buffers will be removed as the loss is deemed too high given the ecological value these hedgerows and treelines have in a local context. As such alternative mitigation measures have been proposed to reduce bat fatalities while retaining portions of these features (see **Appendix 6.1: Table 7-2 & Figure 7-1**).

6.5.6.1.2 Habitat loss replacement

To offset the loss of hedgerows and trees which are used for foraging by bats, as well as offsetting the loss of connectivity along commuting routes, a hedgerow replanting scheme will be undertaken within the site (see section 6.5.2.1 above). This will involve the planting of 1,620 m of hedging to replace the loss of approximately 1,649 m. The enhancement of existing hedgerows and treelines and the planting of a native woodland plot will also be undertaken as part of a Biodiversity Enhancement Management Plan (BEMP) (Appendix 6.2).

6.5.6.1.3 Lighting restrictions

In general, artificial light creates a barrier to bats so lighting should be 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. However, some works may occur during hours of darkness but the Environmental Manager/ECoW shall limit night-time works to sections of the site which avoid sensitive features (*e.g.* mature treelines). 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.

6.5.6.2 Operation Phase Mitigation for Bats

This section refers to ongoing mitigation for bats once turbines are operational. Two methods are proven to reduce bat fatalities; feathering (reduced rotation speed when turbines are idling) and curtailment (keeping turbines turned off when conditions are suitable for bat activity).

6.5.6.2.1 Feathering of blades

Turbines should 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. This is usually 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 feathering of turbine blades combined with increased cut-in speeds have been shown to reduce bat fatalities from 30% to 90% (NIEA 2021, SNH 2021).

As such, the feathering of blades to prevent 'idling' during low wind speeds will be implemented for all nine turbines during the bat activity season (April to October) when temperatures are optimal for bat activity.

6.5.6.2.2 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 1.5m/s.

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).

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.

At Garrane, a two-step smart curtailment strategy is proposed that will protect bats whilst minimising the curtailment periods and will be informed by post-construction monitoring.

Step 1: Operational curtailment, Year 1

Smart curtailment will commence prior to the final close out of construction, as long as the turbine (s) are erected and turning, i.e. posing a collision risk. Year 1 monitoring will be in line with the start of the bat active season (April) and will continue until the end of October. Results from the 2022 and 2023 static survey show activity continues into October. As such, smart curtailment will continue into October. Cut-in speeds will be increased during the bat activity season (April-October inclusive) 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 speed restrictions will be operated according to specific weather conditions:

<u>For turbines 1, 2, 5, 6, 7 and 9</u>

When the air temperature is above a 9.5°C at nacelle height.

Wind speeds below 5.5 m/s (at nacelle height).

<u>For turbines 3, 4 and 8</u>

When the air temperature is above a 10.0°C at nacelle height.

Wind speeds below 5.0 m/s (at nacelle height).

Step 2: Operational curtailment - Year 2 onwards

Smart curtailment must be guided by a coherent and comprehensive post-construction monitoring methodology, which will clarify the bat usage of the site at turbine locations post construction.

Year 1 fatality monitoring together with information from static deployment at height and at feature level on temporal usage of the site at specific turbine locations post-construction (including usage over each season and over night-time periods within specific seasons) will be utilised to provide a highly effective mitigation approach by implementing smart curtailment during the periods and environmental parameters that are known to be preferred by at-risk species.

A risk assessment will be produced based on the Year 1 data which will be used to inform a curtailment strategy from Year 2 onwards, where required. Static deployment data will be compared with weather stations based at nacelle height to inform cut-in speeds restrictions

according to specific weather conditions. The post construction surveys (static deployment, transects, fatality monitoring) will be used to refine the Year 1 curtailment regime designed around the values for the key weather parameters and other factors that are known to influence collision risk. This will include all the following:

- Wind speed in m/s (measured at nacelle height)
- Time after sunset
- Month of the year
- Temperature (ºC)
- Precipitation (mm/hr)

Should it be found that the results of the bat activity surveys and fatality searches confirm that the level of bat activity at turbine locations post construction is low, the cessation in the requirement for curtailment measures, or a reduction on the timing restrictions for these measures, will be implemented. This will subsequently be monitored in Years 5, 7, 10, 15, 20, 25 and 30, with further review after each monitoring period.

If bat activity increases above the baseline and/or remains consistently high and fatality monitoring indicates fatalities are occurring, increased cut-in speeds will be considered Acoustic monitoring will be supplemented with thermal imaging cameras to provide more detailed information on bat activity in the vicinity of turbines.

An assessment of static data gathered during operational surveillance will be completed using Ecobat type analysis as recommended by SNH (2021) as a minimum, or other equivalent guidance as dictated by up-to date standards and practices.

6.5.6.2.3 Buffer zones

The vegetation-free buffer zones (refer to section 6.5.6.1.1 above) around the identified turbines will be managed and maintained during the operational life of the development. The immediate surroundings of individual turbines will be managed and maintained so that the areas have minimal potential to attract insects. This will be achieved through physical management of habitats without the use of toxic substances.

With the above mitigation implemented in full, the risk of bat fatalities on site will be minimised.

6.5.7 Invasive Species

While the baseline surveys did not record the presence of any Third Schedule invasive species within the site, best practice measures will be taken throughout the construction phase to prevent the introduction or spread of invasive alien species. The commencement of works will be preceded by a confirmatory survey for invasive species, especially Japanese knotweed, giant hogweed and Gunnera species.

During construction, the following best practice measures will be implemented:

- Good construction site hygiene will be employed to prevent introduction of invasive plant species by thoroughly washing vehicles prior to entering site
- Any soil or topsoil required on the site will be sourced only from a stock that has been screened for the presence of invasive species
- Should the presence of an invasive species be detected, the treatment and control of same will follow guidelines issued by the National Roads Authority - The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads (NRA 2010).

Implementation of the above measures will ensure that there will be no significant effect with regard to Third Schedule invasive species as a result of the proposed development.

6.6 CUMULATIVE IMPACTS

Consideration is given in the following for potential cumulative impacts between the Garrane Green Energy Project and other projects and landuse activities within the study area.

Other Wind Farm Projects

Chapter 2, Section 2.3.2 of the EIAR identified a total of 10 no. operational, consented and proposed wind farms within a 20 km radius of the site of the proposed Wind Farm Development (see **Table 2.1** & **Figure 2.3** in **Vol III**). The nearest is the operational Rathnacally Wind Farm (2 no. turbines) at a distance of c. 5.9 km to the south. The largest developments are the proposed Ballinlee Wind Farm (17 no. turbines) at a distance of c.7.7 km to the northeast and the operational Castlepook Wind Farm (14 no. turbines) in the Ballyhoura Mountains (c.14 km from Garrane site).

Apart from the operational Slievaragh Wind Farm (2 no. turbines at c.19.3 km distance from Garrane project), all the other wind farms are located in separate hydrological catchments and have no potential for in-combination effects on the Maigue River system when

considered with the Proposed Garrane Development (see details in **Chapter 10: section 10.7.4.4**). The Slievaragh Wind Farm drains to the Loobagh River and is located at the eastern boundary of the hydrological cumulative study area. There is limited potential for cumulative effects as the Slievaragh Wind Farm is already operational. Nevertheless, the mitigation measures which will be implemented will ensure that the proposed Project does not have the potential to result in significant effects on the hydrological/hydrogeological environment.

Based on geographical separation and the location of all other wind projects (other than Slievaragh) in separate hydrological catchments, and thus not having connectivity with the River Maigue system and River Shannon Estuary, it is concluded that the proposed Project will not contribute to a significant effect on terrestrial ecological interests when considered in-combination with other wind energy projects.

Other Developments

An inventory of other major developments or proposed developments (bigger than a one-off house) within a 10 km distance of the proposed Project Site has been compiled (see **Chapter 2, Table 2.2)**. There projects are relevant to the time period between 2019 and 2025. The projects include telecommunication masts (planning refs. 21986 & 2360822), solar farm (3.8 km to north, planning ref. 19455), residential development (3.9 km to south, planning ref. 224578), amenity facility (planning ref. 23403), and an industrial production unit (2.5 km to south-west, planning ref. 224226).

All of these projects have been subject to rigorous evaluation of effects on the environment and especially potential for effects on designated sites. Taking into account the distances of these projects from the proposed Garrane Green Energy Project, and the predicted effects (with mitigation in place) from the proposed Project, it is considered that the proposed Project will not contribute to any significant cumulative effect when considered in combination with other developments within the study area.

Agriculture

Agriculture is the largest landuse activity within the study area. Agricultural operations have the potential for the release of sediment and nutrients to the aquatic environment, which can ultimately have negative effect on the interests of aquatic habitats and associated species, such as otter, which receive the inflowing waters.

With the strict mitigation measures, as discussed within **Chapter 10** of the EIAR, which will be implemented during the construction, operational and decommissioning phases of the proposed Project to ensure the protection of local watercourses and associated aquatic fauna (fish, otter, etc), the proposed Project will not contribute to any significant cumulative effect on European sites when considered in combination with agricultural activities within the catchment.

6.7 RESIDUAL EFFECTS OF THE PROPOSED DEVELOPMENT

The strict mitigation measures which will be enforced to maintain water quality in local drains and watercourses during the Construction, Operational and Decommissioning phases of the proposed Project (as described in detail in **Chapter 10: Hydrology and Hydrogeology**) will ensure that there will be no significant residual effects on water quality or aquatic habitats or species, including otter and salmonid fish species.

Similarly, with mitigation implemented to protect water quality in local watercourses, there will be no likely significant effects on identified designated sites with hydrological connectivity with the proposed Project.

With mitigation measures implemented to minimise disturbance to habitats on site, and with the implementation of an extensive planting programme (approximately 1,620 m) to offset hedgerow loss (approximately 1,649 m), this loss will be reduced to the level of Not Significant in the medium-term (7 -15 years). As the BEMP (see section 6.8) includes for additional hedgerow enhancement (1,359 m) and re-vitalisation of existing unmanaged hedgerows (4,074 m), as well as the planting of 0.67 ha of native woodland (a habitat that is presently absent from the site), a Positive effect for biodiversity within the site will accrue over time.

The loss of neutral and wet grassland as a result of the proposed Project will result in a residual Slight adverse effect at a Local level.

With mitigation measures as presented implemented in full, it is considered that the significance of the predicted impact on terrestrial mammal species and amphibians (common frog) as a result of the proposed Project will be Not Significant.

Following extensive surveys within and surrounding the site for the Wind Farm, it is considered that the landscape in which the proposed wind farm is situated is of high suitability for soprano pipistrelle, common pipistrelle, Leisler's bat and brown long-eared

bat, moderate suitability for Daubenton's bat, and low suitability for Nathusius pipistrelle. With the implementation of the mitigation as outlined in this report the potential risk of fatality from collision and/or barotrauma events to foraging and/or commuting high risk species have been significantly reduced. The development will not have a long-term negative impact on the local bat populations as a result. Impacts on other bat species, particularly Natterer's bat, have also been assessed. While this species is not at high risk from collision, it can be impacted by loss of connectivity features and loss of roosting sites. Through the BEMP, the proposed Project will result in a net gain of hedgerow/treeline within the site, as well as the creation of 0.67 ha of new native woodland. These are proposed in locations that will aid connectivity along existing rivers, outside collision risk zones and thus the overall effect on bats should be positive.

6.8 BIODIVERSITY ENHANCEMENT

The Biodiversity and Enhancement Management Plan (BEMP) is presented in **Appendix 6.2**. The primary objective of the Plan is to offset the loss of hedgerows and trees as a result of the civil works required for the proposed Project, as well as the need to provide mitigation for bats through buffers.

The BEMP will offset the loss of the estimated 1,649 m of hedging to facilitate the construction works and provision of bat buffers through new hedge plantings and will also include a hedgerow enhancement scheme, as well as a programme to re-vitalise existing unmanaged hedgerows in the eastern sector of the site. The following is a summary of the proposals:

- New hedge planting: 1,620 m
- Enhancement of existing hedging: 1,359 m
- Re-vitalisation of existing hedging: 4,074 m
- **Total** **7,053 m**

The BEMP also includes for the planting of a plot (c.0.67 ha) of native woodland in proximity to the substation location which will offset adverse effects on bats. This will be of particular biodiversity value as native woodland habitat is presently absent from the site.

The BEMP will benefit all wildlife, including small mammal species, birds and invertebrates.

The Plan is underwritten by a detailed monitoring programme, which will allow for modifications to ensure that the objectives are being achieved.

With the planting, enhancement and re-vitalisation of a total of 7,053 m of hedging/treeline within the site, as well as the planting of a native woodland plot of 0.67 ha, the permanent loss of 1,649 m of hedgerow as a result of the proposed Project is adequately off-set. Over time, a Positive biodiversity effect will accrue within the site as a result of the implementation of the BEMP.

6.9 PRE-CONSTRUCTION AND CONSTRUCTION PHASE MONITORING

6.9.1 Pre-construction bat surveys

A full suite of bat activity surveys will be completed in the season before construction works commence. Future survey work will be completed according to best practice guidelines available (NatureScot 2021, Collins 2023) and will include static detector, activity and roost inspection surveys.

6.9.2 Pre-felling survey of trees

A preliminary survey of trees within a 275 m zone of each turbine was undertaken in March and April 2023. Trees and hedges along TDR pinch points and the entrance route were also examined. These surveys have identified 20 trees and shrubs with a potential roost feature and an additional 13 which require further assessment should they be impacted (see **Appendix 6.1** for details on all 157 records).

All trees registered as PRF or FAR will require at-height surveys to be conducted by a suitably qualified ecologist with roost disturbance and inspection camera licences should they be required to be felled. Should PRF's be found above ladder height the use of tree climbing / cherry pickers, scaffolding will be required to gain access to PRFs for detailed examination with the use of recording inspection cameras.

Surveyors will carry out a detailed internal inspection using a torch, mirror and endoscope. Data such as internal dimensions particularly length of cavity would be gathered where relevant. Should the removal of the roost be required at a later stage these dimensions will be vital. Should a bat roost be found a derogation licence will be sought from the NPWS seeking permission for the translocation of the roost (if possible).

Evidence of bat usage sought during the surveys will include:

- Bat droppings;

- Live bats;
- Insect remains (under feeding perches);
- Oil (from fur) and urine stains;
- Scratch marks; and
- Bat corpses.

6.9.3 Pre-construction otter survey

If three years lapse from between the planning-stage surveys (carried out in 2023) and commencement of construction works at water crossings, it will be necessary to carry out a survey for otter in areas of potential suitable habitat which may be disturbed by the works as the local distribution of otter may have changed in that period.

It is noted that should the pre-construction survey indicate a requirement for protection of the relevant species (in this case otter), appropriate measures will be taken to comply with all relevant legislation and best practice guidance in force at the time.

6.9.4 Pre-construction badger survey

While badger was not recorded within the site during the baseline surveys, it is present in the wider area of the site and distribution can change over time. Should three years lapse from between the planning-stage surveys (carried out in 2023-24) and commencement of construction works, it will be necessary to carry out a survey for badger in areas of potential suitable habitat which will be disturbed by the works.

It is noted that should the pre-construction survey indicate a requirement for protection of the relevant species (in this case badger), appropriate measures will be taken to comply with all relevant legislation and best practice guidance in force at the time.

6.9.5 On-going monitoring during construction

An Ecological Clerk of Works (ECoW) will be employed by the Contractor for the duration of the construction phase and will ensure that all mitigation measures relating to ecology described in this report and contained within the planning permission are implemented.

6.10 POST-CONSTRUCTION MONITORING

6.10.1 Habitats

Post-construction habitat monitoring will focus on the newly planted hedgerows and the native woodland plot. Required monitoring is detailed in the Biodiversity and Enhancement Management Plan (**Appendix 6.2**).

Areas of disturbed ground from the construction works will be monitoring for vegetation recovery for a period up to three years (when full recovery can be expected) or longer if necessary. The purpose is to ensure that areas of bare soil are minimised so as to reduce the risk of run-off of suspended solids to local watercourses with species such as otter. Should recovery be slow in any area, further seeding may take place. For areas close to watercourses, vegetated grassland sods may be used to provide immediate coverage. Such sods would be dug out from a selected area of the site which is not in proximity to watercourses or subject to flooding.

6.10.2 Bat monitoring

Monitoring will take place for at least 3 years after construction, which will provide 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 bat activity will be measured at each turbine location, in combination with fatality 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.

6.10.2.1 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 low, the cessation in the requirement for

these cut-in speeds / curtailment measures, or a reduction on the timing restrictions for these measures can be implemented.

Acoustic monitoring will be supplemented with thermal imaging cameras to provide more detailed information on bat activity in the vicinity of turbines.

An assessment of static data gathered during operational surveillance will be completed using Ecobat type analysis as recommended by SNH (2021) as a minimum, or other equivalent guidance as dictated by up-to date standards and practices.

6.10.2.2 Monitoring of mitigation measures

The success of the implemented mitigation measures for bats on the project will be monitored for a period of three years after construction and appropriate measures taken to enhance these if and where required. Should bat fatalities be found within the first three years of surveys additional mitigation measures will be implemented in order to prevent this from reoccurring. Buffer zones surrounding the turbines will be increased from 50 m to 65 m and/or curtailment parameters will be tweaked to increase cut-off times.

A recommended schedule for monitoring is given in **Table 6.14** below.

Bat fatality monitoring

Although curtailment is a mitigation proven to lower bat fatalities it is recommended that the scheme 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 fatality monitoring programme is to be undertaken following published best practice (e.g. SNH 2021 or equivalent at the time of operation) (as below). All turbines will be included in the searches in Years 1, 2 and 3 and refined thereafter further to review of results.

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. At the time of writing, predation trials set using trail cameras following guidance set out in Smallwood (2010) provides the most accurate results.
b) Turbine searches for fatalities will be undertaken with the use of conservation dogs following best practice in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates as determined by carcass

removal trials in (a) above. At the time of writing (2024), the typical search area surrounding the turbine bases follow Edkins (2014) *Impacts Of Wind Energy Developments On Birds And Bats: Looking Into The Problem*, who recommends the "search width should be equal to the maximum rotor tip height'', *e.g.* turbines at Garrane have a max tip height of 170 m thus the spread of searched area, as a rectangle, square or circle, should be 85 m in either direction from the turbine base."

c) Search intervals will follow SNH (2021).
d) Recorded fatalities will be calibrated against known predator removal rates to provide an estimate of overall fatality rates.
e) Monitoring reports to be submitted at the end of each survey year to Limerick County Council and NPWS at agreed intervals

Bat activity monitoring

As per NatureScot 2019 "*In order to evaluate the success of the curtailment regime, a minimum of 3 years of monitoring should take place during which time casualty searches and acoustic monitoring should take place concurrently",* monitoring will take place for at least 3 years after construction. This will provide 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 outlined to inform any changes to curtailment.

During years one to three of operation, bat activity will be measured at each turbine location, in combination with fatality 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.

Table 6.14: Monitoring schedule for bat mitigation measures.

Mitigation measure	Monitoring required	Description	Duration
Bat boxes, tubes	Monitor bat use	Bat boxes, rocket boxes and tubes to be placed at locations removed from wind farm as determined by project ecologist/ECoW at least 1 season before start of construction. These shall be examined by a licenced bat specialist according to NPWS recommendations. Records should be submitted to Bat Conservation Ireland for inclusion in its bat distribution database.	From mounting to 3 years post construction

Mitigation measure	Monitoring required	Description	Duration
		If the boxes / tubes are not used within the first three years of deployment re-site if necessary. Annual clearing required if well used by bats or if used by birds. Replace if damaged/lost.	
Roost monitoring	Emergence surveys	Conduct emergence surveys of Natterer's bat roost throughout the bat active season of first 3 years of operational phase. Observed if mitigation measures are working and bats are travelling east. Use of thermal cameras are recommended for surveys to avoid disturbance. Should Natterer fatalities be found, provide further mitigation to prevent further losses.	From initial operation conducting during Years 1, 2 & 3.
Activity surveys	Static detectors	Static surveys conducted both at feature height (2-5 m) and at nacelle during spring, summer and autumn.	From initial operation conducting during Years 1, 2 & 3.
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 and 25 post construction.

6.11 SUMMARY OF SIGNIFICANT EFFECTS

With the implementation of mitigation through avoidance principles, pollution control measures, surface water drainage measures and other preventative measures which have been incorporated into the project design and into the construction, operational and decommissioning phases, in order to minimise potential significant adverse impacts on water quality within the zone of influence of the proposed Project, it can be concluded that the proposed Project will not adversely affect the integrity of any European designated site which has hydrological connectivity with the site.

From the perspective of terrestrial habitats, the loss of neutral and wet grassland as a result of the proposed Project will result in a residual Slight adverse effect at a Local level.

With the implementation of mitigation through planting of new hedging, the effect of the loss of 1,649 m of hedging to facilitate the proposed Project will over time be reduced to the level of Not Significant. With the proposed Biodiversity and Enhancement Management Plan (BEMP), which comprises hedgerow enhancement and revitalisation programmes, as well

as the planting of native woodland (a habitat that is presently absent from the site), a net biodiversity gain will be achieved within the site – this is rated as Positive effect.

With mitigation measures as presented implemented in full, it is considered that the significance of the predicted impact on terrestrial mammal species, including otter, and amphibians (common frog) as a result of the proposed Project will be Not Significant.

Following detailed surveys for bats within and surrounding the Wind Farm Site, it is considered that the proposed Project will not have a significant long term negative effect on the local bat populations in the area. The extensive hedge and woodland planting scheme and enhancement programme, will provide additional foraging habitat for bats and aid connectivity through the site.

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