

CONTENTS

7	BIODIVERSITY	7-3
7.1	Introduction.....	7-3
7.1.1	Purpose of this Chapter.....	7-3
7.1.2	Description of the Proposed Development.....	7-3
7.1.3	Legislation, Policy and Guidance	7-3
7.1.4	Statement of Authority.....	7-8
7.2	Consultations.....	7-12
7.3	Methodology.....	7-12
7.3.1	Determining the Zone of Influence	7-12
7.3.2	Determining the Ecological Baseline.....	7-13
7.3.3	Baseline Surveys and Data Gathering	7-27
7.3.4	Assessment Methodology	7-32
7.4	Biodiversity Baseline	7-38
7.4.1	Designated Sites	7-38
7.4.2	Terrestrial Habitats	7-48
7.4.3	Invertebrates.....	7-60
7.4.4	Amphibians & Reptiles	7-62
7.4.5	Terrestrial Mammals.....	7-65
7.4.6	Bats	7-75
7.4.7	Aquatic Ecology.....	7-91
7.5	Embedded Mitigation.....	7-99
7.5.1	Construction Methods	7-99
7.5.2	Operational Methods	7-101
7.5.3	Timing of Works.....	7-101
7.5.4	Ecological Clerk of Works	7-101
7.6	Assessment of Effects.....	7-102
7.6.1	Assessment Scope.....	7-102
7.6.2	Assessment of Effects on Designated Sites	7-102
7.6.3	Assessment of Effects on Key Ecological Features.....	7-109
7.6.4	Invasive Species Management Plan	7-151
7.6.5	Construction Phase	7-152
7.6.6	Habitat Reinstatement and Creation	7-152
7.6.7	Operational Phase.....	7-153
7.6.8	Decommissioning Phase.....	7-153
7.6.9	Enhancement Measures	7-154
7.8	Residual Effects.....	7-154
7.9	Monitoring.....	7-155
7.9.1	Habitat Monitoring	7-156
7.9.2	Bat Monitoring	7-156
7.9.3	Other Species Monitoring.....	7-157
7.10	References	7-157

TABLES

Table 7.1: Characterisation of Bat Activity Indices 7-19

Table 7.2: Terminology used to categorise bat activity levels 7-21

Table 7.3: Reference categories for EPA Q-ratings (Q1 to Q5) 7-26

Table 7.4: Sources of Baseline Information for Biodiversity 7-28

Table 7.5: NRA Evaluation Guidance (NRA 2009) 7-34

Table 7.6: Determining Magnitude of Impacts (Percival 2007)..... 7-35

Table 7.7: Quality of Effects (EPA, 2022) 7-36

Table 7.8: Duration of Effects (EPA, 2022)..... 7-36

Table 7.9: Significance of Effects (EPA, 2022) 7-36

Table 7.10: Proximity of relevant European sites to the Proposed Development, including Grid Connection and TDR..... 7-39

Table 7.11: Proximity of relevant nationally designated sites to the Proposed Development, including Grid Connection and TDR..... 7-41

Table 7.12: Proximity of relevant Important Bird Areas to the Proposed Development 7-45

Table 7.13: Baseline habitats within the Proposed Development, with a 500 m buffer..... 7-49

Table 7.14: Assessment of habitat importance and identification of Key Ecological Features 7-57

Table 7.15: Legal Protection and Conservation Status of the bat species found within OS grid squares R56 and R57 7-75

Table 7.16: Preliminary Roost Assessment results of trees with roosting potential of the Proposed Development 2023 7-76

Table 7.17: Roost Survey Results 2023 7-77

Table 7.18: Bat Activity Passive Survey Results 2023 7-83

Table 7.19: Transect Survey Results 2023..... 7-89

Table 7.20: Abundance & Typical Flight Behaviour of Bat Species Recorded at the Proposed Development 7-90

Table 7.21: Assessment of species importance and identification of Key Ecological Features 7-99

Table 7.22: Anticipated habitat loss during the construction of the Proposed Development in the absence of mitigation 7-110

Table 7.23: Construction effect characterisation for Key Ecological Features 7-126

Table 7.24: Estimated turbine collision risk for bat species 7-131

Table 7.25: Operational effect characterisation for Key Ecological Features..... 7-132

Table 7.26: Decommissioning effect characterisation for Key Ecological Features 7-134

Table 7.27: Wind farm developments considered for cumulative effects 7-136

Table 7.28: Non wind farm developments considered for cumulative effects 7-137

7 BIODIVERSITY

7.1 Introduction

7.1.1 Purpose of this Chapter

This chapter of the EIAR for the Proposed Development assesses potential effects on biodiversity features; specifically on habitats and species within and adjacent to the Proposed Development, and on relevant qualifying and supporting interests of nearby designated sites. Ornithological features are discussed separately in **Chapter 8**.

This chapter has been informed by available literature and best practice guidance, a desk-based review of relevant designated sites and up-to-date records of specially protected and notable species, and data collected during detailed field surveys of the Proposed Development and adjacent land undertaken in 2023.

The key objectives of the assessment presented in this EIAR chapter are:

- To assess the current ecological baseline of the Proposed Development site and the likely Zone of Influence, including determination of the importance of the ecological features present;
- To evaluate the potential significance of effects from the Proposed Development on ecological features, including from potential impacts during the construction, operational and decommissioning stages, and in isolation and in combination with other relevant development both existing and proposed; and
- To identify mitigation and enhancement measures to avoid, reduce or offset significant adverse effects from the Proposed Development on ecological features and, where possible, achieve a positive effect on biodiversity.

This chapter should be read with reference to the following documents:

- Part 4 of the Planning Application, **Appropriate Assessment Reporting**; and **Species and Habitat Management Plan (Appendix 7.1)**.

7.1.2 Description of the Proposed Development

A detailed description of the Proposed Development is outlined in section 5.1.1 of Chapter 5 of this EIAR.

7.1.3 Legislation, Policy and Guidance

7.1.3.1 Legislative Context

This EIAR chapter has been prepared in accordance with to the following legislation:

- The European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) (the “Habitats Regulations”) and Part XAB of the Planning and Development Act 2000 (as amended) which transposes Directive 92/43/EC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and

Flora (the “Habitats Directive”), and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the Conservation of Wild Birds (the “Birds Directive”);

- The EU Water Framework Directive 2000/60/EC (the “Water Framework Directive”), which is transposed into Irish Law by the European Communities (Water Policy) Regulations 2003 (the “European Communities (Water Policy) Regulations”);
- Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 (the “EIA Directive”);
- The Convention on the Conservation of Migratory Species of Wild Animals 1979 (the “Bonn Convention”);
- The Convention on the Conservation of European Wildlife and Natural Habitats 1979 (the “Bern Convention”);
- The Convention on Wetlands of International Importance Especially as Waterfowl Habitat 1971 (the “Ramsar Convention”); and
- The Wildlife Act 1976 (as amended) (the “Wildlife Act”).

Further information outlining the relevance of this legislation to this EIAR chapter is provided below.

7.1.3.2 The Habitats Regulations

These regulations provide for the implementation in Ireland of the Habitats Directive and the Birds Directive. The Habitats Directive requires EU Member States to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of community interest, which are listed under Annex I, II, IV and/or V. Species listed under Annex IV are known as ‘European Protected Species’ (EPS). Under the Habitats Directive, EU Member States are required to contribute to the Natura 2000 network through the designation of Special Areas of Conservation (SACs) for natural habitat types listed in Annex I and habitats of species listed in Annex II.

7.1.3.3 The European Communities (Water Policy) Regulations

The Water Framework Directive is transposed into Irish Law by the European Communities (Water Policy) Regulations, which commits European Union Member States to achieve good qualitative and quantitative status of all water bodies. Such water bodies are seen holistically as habitats and their water is not purely seen as a consumer good. The directive standardises the legal framework for the water policy of the EU and aims at shaping water utilisation in a sustainable and environmentally compatible way. The protection of waters plays a crucial role in this respect. The principal objective is for transnational and sustainable management of the water resource and the preservation of the ecological functionality of bodies of water as ecosystems.

7.1.3.4 The EIA Directive

The EIA Directive requires that public and private projects that are likely to have significant effects on the environment be made subject to an assessment prior to development consent being given. The directive includes a list of projects that are assessed to have significant effects on the environment and are thus required to undergo an impact assessment. Environmental Impact Assessment is a process to be undertaken in respect of applications for specified classes of development listed in the Directive before a decision in respect of development consent is made. This assessment includes, amongst other things, a description of the projects, including an estimate, by type and quantity, of expected effects, residues, and emissions resulting from the operation of the proposed project.

7.1.3.5 The Bonn Convention

The Bonn Convention was adopted in 1979 and came into force in 1985. Contracting parties work together to conserve migratory species and their habitats by providing strict protection for endangered migratory species (listed in Appendix I of the Convention), by concluding multilateral agreements for the conservation and management of migratory species which require or would benefit from international cooperation (listed in Appendix II), and by undertaking cooperative research activities.

7.1.3.6 The Bern Convention

The principal aims of the Bern Convention are to ensure the conservation and protection of wild plant and animal species and their natural habitats (listed in Appendices I and II of the Convention), to increase cooperation between contracting parties, and to regulate the exploitation of those species (including migratory species) listed in Appendix III. To this end, the Bern Convention imposes legal obligations on contracting parties, protecting over 500 wild plant species and more than 1,000 wild animal species.

7.1.3.7 The Ramsar Convention

The Ramsar Convention is an intergovernmental treaty focused on the conservation and sustainable use of wetland, primarily as habitat for waterbirds. Under the convention, each ratified country is required to identify and designate sites (Ramsar sites) that meet the criteria for identifying a wetland of international importance (i.e., containing representative, rare or unique wetland types). The convention also encourages international co-operation to promote appropriate use of wetlands and their resources.

7.1.3.8 The Wildlife Act

The Wildlife Act is the principal national legislation for the protection of wildlife and the control of activities that may adversely affect wildlife. This legislation also seeks to conserve a representative sample of important ecosystems and regulate game resources. It makes licences mandatory for certain activities which may interfere with ecosystems and regulates the possession, trade, and movement of wildlife. Areas of importance for wildlife may be protected under the Act, either as Nature Reserves for Fauna, or by way of management agreements.

7.1.3.9 Policy Framework

National and local planning policy relevant to this assessment include the following statutory policies:

- Project Ireland 2040: National Planning Framework;
- The Biodiversity Sectoral Climate Change Adaptation Plan;
- Clare County Development Plan 2023-2029;
- Tipperary County Development Plan 2022-2028;
- Climate Action Plan 2023 – Changing Ireland for the Better;
- National Biodiversity Plan 2017-2021; and
- Clare Biodiversity Action Plan 2017-2023.

Further information outlining the relevance of this policy to this EIAR chapter is provided below.

7.1.3.10 Project Ireland 2040: National Planning Framework

The National Planning Framework under Project Ireland 2040, produced by the Department of Housing, Planning and Local Government, provides an overarching framework for the social, economic, and cultural development of the country. It is a national document that guides at a high-level strategic planning and development for the country to the year 2040 so that population growth is economically, socially, and environmentally sustainable. This includes the provision of more renewable energy developments such as the Proposed Development. It ensures that any proposed developments consider biodiversity and the future sustainability of the environment.

7.1.3.11 The Biodiversity Sectoral Climate Change Adaptation Plan

This plan sets out a long-term goal for adaptation to climate change, including flood risk management, along with a set of objectives and adaptation actions aimed at achieving those objectives. Such objectives include the enhancement of knowledge and understanding of the impacts of climate change, adapting flood risk management practice, and aligning adaptation to the impact of climate change across sectors of Government policy.

7.1.3.12 Clare County Development Plan 2023-2029

The Clare County Development Plan 2023-2029 sets out an overall strategy for the proper planning and sustainable development of the functional area of Clare County Council over a six-year period. The Development Plan comprises a written statement indicating the development objectives (including mandatory objectives) for County Clare, supported by maps. Clare County Council is required to prepare and adopt a County Development Plan every six years, with review of the existing Development Plan and commencement of preparation of the new Development Plan required no later than four years after Development Plan adoption.

7.1.3.13 Tipperary County Development Plan 2022-2028

The Tipperary County Development Plan 2022-2028 guides sustainable physical, economic and social development across Tipperary whilst protecting the environment and guiding and supporting the move to a low-carbon society. It identifies the social, economic and environmental character of Tipperary, provides guidance on the growth of towns, villages and rural areas, and informs the nature of future investment. The Plan serves to inform decisions on public services, infrastructure and amenities, and influences many facets of daily economic and social life regarding the availability and locations of services and employment.

7.1.3.14 Climate Action Plan 2023 – Changing Ireland for the Better

The Climate Action Plan follows the Climate Act 2021, which commits Ireland to a legally binding target of net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030. Among the critical measures in the plan is to increase the proportion of renewable electricity to up to 80% by 2030, making wind farm projects imperative to achieving this aim.

7.1.3.15 National Biodiversity Plan 2017-2021

In 1996 the Irish Government ratified the convention on Biological Diversity and launched a series of National Biodiversity Plans; most recently the 3rd National Biodiversity Plan 2017-2021. This plan contains the following seven objectives:

- Mainstream biodiversity into the decision-making process across all sectors;
- Strengthen the knowledge basis for conservation management and sustainable use of biodiversity;
- Increase awareness and appreciation of biodiversity and ecosystem services;
- Conserve and restore biodiversity and ecosystem services in the wider countryside;
- Conserve and restore biodiversity and ecosystem services in the marine environment;
- Expand and improve on the management of protected areas and species; and
- Strengthen international governance for biodiversity and ecosystem services.

This plan operates across statutory and non-statutory policy realms.

7.1.3.16 Clare Biodiversity Action Plan 2017-2023

The Clare County Biodiversity Action Plan 2017-2023 identifies and translates those actions of the National Biodiversity Plan 2017-2021 relevant to County Clare, such that they can be implemented at a county level. The Biodiversity Action Plan will run in parallel with the Clare County Development Plan and build upon its biodiversity goals and objectives across County Clare.

7.1.3.17 Guidance

This EIAR chapter has been prepared in accordance with current key industry standard best practice guidance including the following (see **Table 7.3** for additional supporting guidance):

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater Coastal and Marine version 1.2 (CIEEM, 2018);
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022);
- Best Practice Guidelines for the Irish Wind Energy Industry (Irish Wind Energy Association, 2012);
- Wind energy development and Natura 2000 (European Commission, 2011); and
- Bats and onshore wind turbines: survey, assessment, and mitigation (Scottish Natural Heritage, 2021).

7.1.4 Statement of Authority

This EIAR chapter has been prepared by experienced RSK Biocensus and Inis Environmental Consultants Ltd (INIS) ecologists, based on field data collected by skilled INIS ecologists who are experienced in undertaking field surveys in relevant habitats and for relevant species. The contributors to this chapter are listed below:

Andrew Whitfield MA BA CEnv CEcol (Associate Consultant): Andrew has over 30 years of experience in undertaking and co-ordinating ecological and environmental impact assessments across a wide variety of infrastructure projects. These include projects of varying type and scale, ranging from new nuclear power generation facilities and housing developments to major road and rail construction schemes. Andrew has undertaken Habitat Regulations Assessments (HRA) of various plans and projects including transport improvement options for the Scottish Government, water supply options for Greater London, and the Heads of the Valleys road improvements in South Wales, where Marsh Fritillary and Lesser Horseshoe Bat were a key concern. Andrew has extensive experience of undertaking Phase 1 habitat surveys, surveys for Otter, Water Vole, Badger and Red Squirrel, amphibian surveys, and butterfly and dragonfly surveys. He has given evidence at approximately 20 planning inquiries/hearings in the UK, Ireland and Africa. Andrew led the technical review of this EIAR chapter.

Howard Williams BSc CEnv CBiol MRSB MIFM (Principal Ecologist and CEO, INIS): Chartered Environmentalist and Chartered Biologist who has authored and managed Ecological Impact Assessments (EclA), Construction Environmental Management Plans and Article 6 Appropriate Assessments (AA) for over 50 wind farm projects. Howard is an expert in the field of avian ecology and has extensive knowledge and experience of prescribing management for a range of terrestrial and aquatic protected species. Howard provided technical support during the production of this EIAR chapter.

Dr Alex Copland BSc PhD (Principal Ecologist, INIS): experienced conservation scientist specialising in the conservation of wild birds and biodiversity in the wider countryside, particularly in agricultural, upland and peatland landscapes. Alex is

proficient in data analysis and has studied bird populations in Ireland for over 18 years. He has managed several large-scale, multi-disciplinary conservation projects including research and conservation work for species of conservation concern. Alex has also worked with NGOs at EU-level and EU institutions (European Commission and European Parliament). Alex provided technical support during the production of this EIAR chapter.

Peter O Connor BA MSc (Lead GIS Specialist, INIS): lead GIS Specialist experienced in overseeing the completion of mapping for multiple windfarm projects. Peter has experience in conducting Viewshed Analysis in support of selected Vantage Points for ornithological surveys, involving the use of Digital Terrain Models and Digital Elevation Models in addition to bespoke Viewshed Analysis plugins for QGIS. Peter also has experience with field data capture and integration into project mapping (e.g., for habitats and species), including for figures supporting EIAR chapters and associated reports. Peter led the production of figures, calculations and all other GIS inputs to this EIAR chapter.

Esther McMorrow Donnellan MSc BA (Ecologist, INIS): ecological consultant with extensive ecological survey experience, notably for habitats and bats. Esther has authored numerous ecological reports including survey reports, EclA, Natura Impact Statements (NIS) and Environmental Impact Assessment (EIA) Reports. Esther co-authored this EIAR chapter.

Megan Doyle MSc BSc (Ecologist, INIS): ecologist awarded a distinction MSc in Biodiversity and Conservation from Trinity College Dublin and an honours BSc in Zoology from University College Dublin. Megan has extensive report writing experience, including Screening for Appropriate Assessment Reports, NIS, Environmental Impact Assessment Reports and survey reports for a range of protected species. Megan has also undertaken surveys of habitats, bats and terrestrial mammals. Megan co-authored this EIAR chapter.

Cillian Burke BSc (Assistant Ecologist, INIS): ecologist with a BSc (Hons) in Environmental Science from the University of Galway. Cillian has experience in undertaking multi-disciplinary surveys including habitat and bat surveys, as well as supporting as an Ecological Clerk of Works. Cillian has authored ecological reports including AA Screening Reports, NIS, EclA and Biodiversity Net Gain (BNG) Reports. Cillian co-authored this EIAR chapter.

Conor Daly MSc BSc (Hons.) (assistant Ecologist, INIS): ecologist that contributed to the writing of this EIAR. Conor was awarded an MSc in Biodiversity and Conservation and an Honours BSc in Zoology. Conor has been conducting ornithological surveys for projects since 2021 for a variety of projects including industrial estates and Windfarms (Small-Large). Conor has conducted habitat surveys to inform this EIAR. Conor has experience in Raptor conservation with ample experience with bird of prey of pressures and threats to protected species and has provided reports for EIAR and NIS reports while working with Inis Environmental Ltd. Conor has been a Qualifying member of CIEEM since 2022.

Katie Sullivan BA (Mod.) MSc is an Assistant Ecologist at INIS with a BA (Hons) in Natural Sciences (Zoology) from Trinity College Dublin and an MSc (Hons) in Wildlife Conservation and Management from University College Dublin, where her research

focused on modelling the impacts of result-based agri-environmental schemes on pollinator communities in semi-natural grasslands. Katie has experience in bat, mammal, herpetological, ornithological and entomological surveying. As part of her role with INIS, Katie has small mammal trapping and several bird and bat surveys in line with Best Practice Standards. Katie has undertaken bat surveys as to inform this project. Katie is also a Qualifying member of the Chartered Institute of Ecology and Environmental Management (CIEEM).

Molly O'Hare BSc MSc carried out bat surveys on this project. She is a Bat Ecologist with Inis Environmental Consultants Ltd, has a BSc in Ecology and Environmental Biology and an MSc in Marine Biology from University College Cork. Molly has extensive Bat Surveying and Handling experience ranging from Radio Tracking, Mist Netting, Harp Trapping and Hand Netting. She also has experience with carrying out Roost Assessments, Emergence/Re-entry Surveys and various exclusion practices. She was the lead surveyor for bat surveys for this project. Molly also has experience in the preparation and writing of reports, including Ecology Reports and screening for Appropriate Assessment.

James O'Connell BSc (Hons) (Ecologist, INIS):-

James was awarded a BSc (Hons) in Wildlife Biology from IT Tralee. James regularly conducts ornithological surveys for various projects across Ireland. He has a broad range of ecological survey experience including Vantage Point surveys, transect surveys, habitat classification and bat surveys. James led a wide a range of ornithological field surveys to inform this EIAR Report.

Chris McKiernan BSc (Hons) (Ecologist, INIS):

Chris has over three years of experience of carrying out professional ornithology surveys in Ireland on a variety of projects. They received a BSc in Ecology and Environmental Biology from UCC in 2020 and is a Qualifying member of CIEEM. Chris was heavily involved in carrying out and coordinating ornithological field surveys to inform this EIAR Report, including Vantage Point surveys, transect surveys, breeding and wintering raptor surveys, and surveys for wintering waterbirds-

Emily Marsh BSc (Hons) PGDip MSc (Ecologist, INIS): Emily has an MSc in Sustainable Resource Management awarded jointly from the University of Galway and University of Limerick, a Postgraduate Diploma in Climate Change Science & Policy from University of Bristol, and a BSc (Hons) in Environmental & Earth System Science from University College Cork. Emily's expertise is primarily in ornithological surveys, terrestrial mammal surveys and habitat assessment. She is experienced in delivering ecological fieldwork and reporting for renewable energy projects in accordance with industry best practice standards. Emily completed ornithological survey work informing this EIAR Report including; Vantage Point surveys and surveys for breeding and wintering raptors.

Darren McCartney BSc (Ecologist and GIS Specialist, INIS):

Darren has worked in both the field ecology and GIS teams at INIS and is a Qualifying member of CIEEM. He has experience of undertaking ornithological field surveys in relevant habitats, and completed various surveys to inform this EIAR Report including Vantage Point surveys, transect surveys, surveys for breeding waders, surveys for

breeding and wintering raptors, and surveys for wintering waterbirds. As a member of the INIS GIS team, Darren also contributed to figure production and habitat calculations for this EIAR Report.

Michael Whelan (Consultant Ornithologist):

Micheal is a field ecologist based in Co. Offaly, and has been working for INIS since 2018. Michael has substantial experience of many relevant ornithological surveys types, and led varied surveys to inform this EIAR Report including Vantage Point surveys, transect surveys, surveys for breeding waders, surveys for breeding and wintering raptors, and surveys for wintering waterbirds.

Peig Healy MSc BSc (Assistant Ecologist, INIS): ecologist awarded a distinction MSc in Environmental Leadership and an Honours BSc in International Development and Food Policy. Graduate Member of the Institute of Environmental Management and Assessment (IEMA). Peig has authored reports on sustainability and environmental research, involving policy analysis, case study review, and reporting in relation to Fisheries Policy and EIA. Peig has also produced ecological reports including AA Screening Reports, NIS and EIA Screening. Peig co-authored this EIAR chapter and was involved in bat surveys to inform this EIAR Chapter.

Ross Macklin B.Sc. (Hons), MIFM, HDip GIS, PDip IPM is an ecologist with over 16 years' professional experience in Ireland. He specialises in freshwater fisheries ecology, biology and water quality. He has considerable experience in a wide range of ecological and environmental projects including EIAR, EcIA, AA/NIS, CEMP reporting, as well as biodiversity, water quality monitoring, invasive species and fisheries management. Ross was involved in all aquatic surveys undertaken for the Proposed Development used to inform this EIAR Chapter. He also has expert identification skills in macrophytes, freshwater invertebrates, protected aquatic habitats and protected aquatic species including freshwater pearl mussel. His diverse project list includes work on renewable energy developments, flood relief schemes, road schemes, blueways/greenways, biodiversity projects, fisheries management projects and catchment wide water quality management. He is currently completing his Ph.D. on the ecology and impact of Common Carp (*Cyprinus carpio*) in Irish waters.

Bill Brazier B.Sc. (Hons) MIFM is an aquatic ecologist with over 10 years' professional experience in Ireland. He specialises in freshwater fisheries ecology, biology and water quality. He has considerable experience in a wide range of ecological and environmental projects including EIAR, EcIA and AA/NIS reporting, as well as biodiversity, invasive species and fisheries management. Bill was involved in all aquatic surveys undertaken for the Proposed Development used to inform this EIAR Chapter. His diverse project list includes work on renewal energy developments, flood relief schemes, road schemes, blueways/greenways and biodiversity projects. He is currently completing his Ph.D. on the genetics, reproductive biology and invasive potential impact of Common Carp (*Cyprinus carpio*) in Irish waters. Additionally, Bill runs the highly respected *Off the Scale* magazine, Ireland's most-read recreational angling publication and is the national coordinator for the novel Anglers National Line Recycling Scheme (ANLRS).

Nick Henson MSc CEnv (Associate Director, RSK Biocensus): Nick has a wealth of experience from over 18 years as an ecological consultant. His expertise includes

ecological impact assessment for a range of projects including wind farms, for which he has extensive experience of providing technical advice and leadership in the UK and Ireland. Nick provided technical support during the production of this EIAR chapter.

George Wilkinson BSc MSc (Senior Ornithologist, RSK Biocensus): George has over five years of consultancy experience and over 15 years of experience of studying and watching wildlife in the UK and overseas. George works primarily in the UK where he frequently leads ecological assessments and surveys for a variety of species and development types including wind farms and solar developments. This has included work on wind farms and other development types in Ireland. George co-authored this EIAR chapter.

7.2 Consultations

Consultees and their responses are listed in full in EIAR **Chapter 3: Scoping, Consultations, Community Engagement and Key Issues**. Regarding potential impacts on ecological features, the following bodies were consulted in relation to the Proposed Development:

- An Bord Pleanála pre-application consultation;
- National Parks and Wildlife Service (NPWS): sensitive data request issued 24/02/2023, response received 06/03/2023 (areas searched: R56 and R57);
- NPWS Development Applications Unit (DAU): request for recommendations and observations issued 21/02/2023, response received 30/03/2023. The DAU made no comment on this referral (areas searched: Proposed Development (see **Figure 7. 1**);
- Inland Fisheries Ireland: contacted 24/02/2023, response received 13/04/2023 (areas searched: see Proposed Development (see **Figure 7.1**); and

Whilst Bat Conservation Ireland was contacted, no response was received yet on the Proposed Development (15/09/2023).

7.3 Methodology

7.3.1 Determining the Zone of Influence

Following consideration of the Proposed Development and its potential source-pathway-receptor model (i.e., based on its geographical location and potential scope for impacts), European sites designated within the Natura 2000 network and nationally designated sites occurring within 15km of the Proposed Development were subject to detailed consideration. As such, a preliminary Zone of Influence (Zol) of 15km was adopted within this assessment. Sites that were further away from the proposed development were also considered and no complete source-pathway-receptor chain for significant effect was identified for any European Site that was further than 15 km from the site.

The proximity of the Proposed Development to European sites and nationally designated sites is of importance when identifying potential likely significant effects. A conservative 15km Zol was adopted to ensure comprehensive assessment of potential

impact pathways. When identifying potential impact pathways, the complete list of all Qualifying Interests (QIs) and Special Conservation Interests (SCIs) are considered in **Chapter 8 Ornithology** of this EIAR of European sites, and nationally designated sites in Ireland (i.e., potential receptors) was considered, in accordance with Irish departmental guidance on AA:

“For projects, the distance could be much less than 15 km, and in some cases less than 100_m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects” (DoEHLG, 2010, p. 32).

Following the guidance set out by the National Roads Authority (NRA) (2009) and the Office of the Planning Regulator (2021), the Proposed Development has been evaluated based on an identified Zol with regards to the potential source-impact-receptor model for the development. The likely Zol for mobile species (e.g., otter) and static species and habitats is considered differently. Mobile species have a ‘range’ outside of the designated sites for which they are QIs and SCIs. The ranges of mobile QI and SCI species vary considerably, from several metres, to hundreds of kilometres (e.g., in the case of migratory wetland birds). Whilst static species and habitats are generally considered to have Zols in close proximity to the development, they can be significantly affected at considerable distances from an effect source; for example, where an aquatic QI habitat or species is located many kilometres downstream from a pollution source.

Hydrological linkages between developments and statutory designated sites (and their QIs/SCIs) can occur over significant distances; however, any effect will be site-specific depending on the receiving aquatic environment and the nature of the potential impact. A reasonable worst-case Zol for water pollution from a development is considered to be the hydrological pathway from the development until it reaches the first lentic water body (e.g., lake) or transitional water body (e.g., estuary), as the depositional nature of these waterbodies would limit the transport capacity of any potential influences from the development to downstream designated sites.

7.3.2 Determining the Ecological Baseline

7.3.2.1 Desktop Study

A search of the following websites has been undertaken:

- National Parks and Wildlife Service (NPWS) website;
- National Biodiversity Data Centre website (NBDC);
- Environmental Protection Agency website (EPA);
- Inland Fisheries Ireland (IFI);
- Birdwatch Ireland website (BWI);
- Bat Conservation Ireland (BCI); and
- Butterfly Ireland website.

In addition, consultation responses have been requested and received from NPWS, DAU and IFI. A request and no response was yet received from BCI.

7.3.2.2 Designated Sites

A desktop review was conducted to inform scoping and identify features of ecological importance. The desktop review also included an appraisal of all sites designated for nature conservation under national and international legislation within a 15km radius of the Proposed Development. Potential sites of conservation interest were identified by an examination of Ordnance Survey (OSI) mapping (1:50,000 scale), NPWS maps browser and detailed aerial photography (Bing maps).

Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Important Bird Areas (IBAs), Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs) within 15 km of the Proposed Development, and records of protected species in the vicinity of the Proposed Development were identified. This information was obtained by accessing the website (last accessed on 13/11/2023) of the NPWS of the Department of the Environment, Heritage and Local Government.

A data request was also sent to NPWS GIS division on 24 February 2023 for a full inventory of all protected and rare species recorded within the OS 10 km grid square overlapping the Proposed Development site. This data is presented in **Appendix 7.2**.

The database of the NBDC was also consulted and accessed on 02/10/2023 to assess the presence of rare plant and faunal species and records of protected species reported within the primary OS 10 km squares in which the Proposed Development is located (R56 and R57). This data is presented in **Appendix 7.2**.

Due to the conditions of the data request with regard to the presentation of sensitive data as defined (<https://www.npws.ie/sites/default/files/general/npws-sensitive-species.pdf>), not all records are presented in this EIAR. In addition, the spatial resolution of each record is presented at 10 km scale in line with the condition that “data are provided on the understanding that users will not use the information to the detriment of individual species or habitats, biodiversity or the environment in general”.

7.3.2.3 Habitat Ecology – Desktop Review

Satellite maps, available at <https://www.google.com/maps/>, were reviewed (last accessed on 07/10/2023) in addition to Fossitt's *A Guide to Habitats in Ireland* (Fossitt, 2000) to identify the size of the survey area and the habitats present within and adjacent to the Proposed Development. Information on plant species present within the Proposed Development site., was obtained from the NPWS data request sent in February 2023. A list of protected plant species recorded within the 10 km grid squares in which the Proposed Development is located was procured from the NBDC maps.

7.3.2.4 Terrestrial Invertebrate Ecology – Desktop Review

Utilising satellite maps available at <https://www.google.com/maps/> (last accessed on 07/10/2023), a desktop review was undertaken to identify suitable habitat for rare and protected invertebrates within the Proposed Development and receiving environment. A data request was also sent to NPWS GIS division in February 2023 for a full inventory of all protected and rare species recorded within the R56 and R57 10 km square overlapping the Proposed Development site. The database of the National Biodiversity Data Centre was also consulted to assess the presence of rare invertebrate species and records of protected species reported within the 10 km grid squares accessed on

02/10/2023, areas searched include R56 and R57 within which the Proposed Development is located.

7.3.2.5 *Marsh Fritillary*

Marsh Fritillary surveys were undertaken in September 2023 by Chris McKiernan BSc (Hons), following relevant guidance, specifically, the Marsh Fritillary Monitoring Scheme (NBDC, 2015). Habitats were assessed for their suitability for Marsh Fritillary, specifically the presence of abundant Devils-bit Scabious. Suitable habitat was searched for occupied larval webs and the number was recorded in addition to the location.

Ten Marsh Fritillary were recorded within the 10 km grid squares (NBDC, 2023) R56 and R57.

7.3.2.6 *Detailed Survey Results*

For Marsh Fritillary Survey Results see **Appendix 7.3**.

7.3.2.7 *Terrestrial Mammal Ecology- Desktop Review*

Utilising satellite maps available at <https://www.google.com/maps/>, accessed on 07/10/2023). A desktop review was undertaken to identify suitable habitat for rare and protected mammals within the Proposed Development and receiving environment. A data request was also sent to NPWS GIS division in February 2023 for a full inventory of all protected and rare species recorded within the R56 and R57 10 km square overlapping the Proposed Development site. The database of the National Biodiversity Data Centre was also consulted accessed on 02/10/2023 to assess the presence of rare mammal species and records of protected species reported within the 10 km grid squares overlapping the Proposed Development.

7.3.2.8 *Amphibian and Reptile Ecology – Desktop Review*

A comprehensive desktop review was carried out to identify waterbodies located within or adjacent to the Proposed Development. The database of the National Biodiversity Data Centre was consulted accessed on 02/10/2023 to assess the presence of amphibian and reptile species reported within the grid squares overlapping the Proposed Development. Satellite mapping was also consulted to assess suitable habitat for reptiles and amphibians within or adjacent to the Proposed Development.

7.3.2.9 *Bats – Desktop review*

National landscape suitability maps for Irish bat species and species-specific roosting characteristics (Lundy et al., 2011) were reviewed using the Map Viewer of the National Biodiversity Data Centre, accessed on 02/10/2023. Records of known bat species within OS 10 km grid squares (R56 and R57) of the Proposed Development were obtained from the NBDC maps at the outset of the Proposed Development (see **Appendix 7.2**).

7.3.2.10 Aquatic Ecology - Desktop Review

The aquatic ecology desktop methodology is outlined in , a separate report as part of this EIAR.

7.3.2.11 Field Surveys

The following surveys were carried out within the Proposed Development.

7.3.2.12 Habitats – Fieldwork

All habitat surveys undertaken followed best practice guidance (Smith et al., 2011) and utilised the habitat classification presented in Fossitt (2000). All habitats within a 50 m buffer of the Proposed Development site boundary were surveyed and classified to level 3 in accordance with best practice guidelines (Fossitt, 2000).

Habitat surveys were undertaken in July and August 2023 by Conor Daly (MSc, BSc) (Hons.) and Emily Marsh (MSc, BSc) (Hons.) Nomenclature for vascular plants follows Parnell and Curtis (2012), except where small changes were made to the Proposed Development design, namely alterations to the gird connection route and loop in area (see Chapter 5 of this EIAR for detailed description of the Proposed Development), where the use of aerial imagery and a familiarity of the habitats within the area were utilised for habitat classification.

7.3.2.13 Detailed Survey Results

For habitats (non-linear and linear respectively) surveyed within 50 m of the Proposed Development works locations, see **Section 7.3.2** and **Appendix 7.4**.

7.3.2.14 Invertebrates, Reptiles & Amphibians

'Ecological Surveying Techniques for Protected Flora and Fauna During the Planning of National Road Schemes (2008)' were followed when carrying out surveys. Walkover surveys were conducted on August and September 2023 to determine the presence and suitability of habitats for insects, invertebrates, amphibians, and reptiles.

7.3.2.15 Terrestrial Mammals - Fieldwork

Walkover surveys were undertaken in August, October and November 2023 for the presence of Badgers, Otters and other mammals. Surveys were undertaken within a 50 m buffer of the Proposed Development site boundary, with the exception of Otter (listed separately below). Camera traps were deployed in August 2023 in locations that were expected to be of high-mammal use (see **Appendix 7.5**).

7.3.2.16 Otters

Otter surveys, conducted by James O'Connell BSc (Hons.) and Chris McKiernan BSc (Hons), followed the NRA *Guidelines for Treatment of Otters During Construction of National Road Schemes* (NRA, 2008), which state that, although there are no seasonal constraints for Otter surveys, any dense vegetation (especially in summer) can reduce success in the identification of Otter holts or couches. Hence, the confirmatory surveys were undertaken in August 2023 in order to optimise detection of otters.

Guidance on the extent of the study area for Otters was taken from the *British Highways Agency's Nature Conservation Advice in Relation to Otters HA8199* (Highways Agency, 1999) which dictates that a linear search of 300 m upstream and downstream of each watercourse crossing is undertaken (see **Appendix 7.5**).

7.3.2.17 Badgers

According to the NRA Guidelines for the Treatment of Badgers Prior to Construction of National Road Schemes (NRA, 2005), survey of setts within 50m of the proposed works location is required. Badger surveys are significantly constrained by vegetative cover and season and are best conducted from November to April (NRA, 2005). In accordance with NRA guidance, all areas were systematically searched for setts and all hedgerows and boundaries were checked comprehensively by James O'Connell BSc (Hons.) and Emily Marsh (MSc, BSc) (Hons.). Badger territorial activity is high from mid-January to March and surveying during this period is most efficient for the identification of badger paths, latrines and feeding signs. Surveys for evidence of the presence of Badgers within 50 m of the proposed works were completed in August and September 2023 (see **Appendix 7.5**).

7.3.2.18 Other Mammals

The following field signs of all mammals were recorded during terrestrial mammal surveys within the study area:

- Well-used pathways;
- Prints/tracks;
- Scat/spraints/droppings;
- Signs of feeding (foraged pinecones, badger snuffle holes); and
- Places of shelter and features or areas likely to be of particular value as foraging resources (NRA 2004).

Photographs and detailed notes were also recorded for each feature and mapped using QGIS.

Records of incidental sightings of individuals or other evidence from other surveys were also considered to inform the baseline data.

For Terrestrial Mammals Survey Results see **Appendix 7.5**.

7.3.2.19 Bats – Fieldwork

The landscape surrounding the Proposed Development is predominantly improved agricultural landscapes and forestry, with hedgerows / treelines along roadsides, in addition to low-density houses and farm buildings. The aims of the bat surveys carried out on site were to assess the bat roost suitability of bridges, buildings and mature trees that could be directly affected, and to identify potential indirect effects on bats, e.g., from disruption of commuting routes, or lighting. Field surveys undertaken and overseen by Molly O'Hare (BSc, MSc) and Katie Sullivan (BA, Mod., MSc) to inform this report were as follows:

- Preliminary roost assessments for buildings in the Proposed Development in addition to suitable trees and watercourse crossing structures such as bridges and culverts;

- Bat Activity Surveys at the site of the Proposed Development were undertaken using automated Anabat Express bat detectors;
- Spring, Summer and Autumn Transect surveys were conducted on the Proposed Development site in 2023;
- An ecological appraisal was carried out for all buildings within 500 m of the current layout of the Proposed Turbines in April 2023 (Collins, 2023);
- Ground-level roost assessments were carried out for all trees with moderate or low bat suitability within 250m of the proposed turbines, using binoculars (model: Steiner SkyHawk 3.0 10x42);
- Roost surveys; and
- Emergence/Re-entry surveys were conducted on the Proposed Development site in 2023.

7.3.2.20 Survey of potential bat roosts

As no buildings were identified within 500 m of the Proposed Development, no ecological appraisals for buildings were required.

Ground-level roost assessments were carried out for all trees with moderate or low bat suitability within 250m of the proposed turbines, using binoculars (model: Steiner SkyHawk 3.0 10x42). The aim of the ground-level inspection was to identify any Potential Roost Features (PRFs) (i.e., cavities or crevices on trunks or limbs) and evidence of bats (e.g., droppings, fur-oil stains at access points). Coniferous trees within plantations were not inspected, because they are rarely large enough to have any features suitable for bats, and because it is standard forestry practice to remove any trees that have obvious signs of damage and disease; as a result, trees within plantations typically have negligible suitability for bats.

The Proposed Development will be developed over/under nine watercourse crossing structures (i.e. bridges and culverts). One watercourse crossing does not currently have a crossing structure in place, a clear-span bridge has been proposed in the description of the Proposed Development (see Chapter 5 of this EIAR). Drains and watercourses with crossing structures in place (No. eight) were inspected in 2023. Eight watercourse and drain crossing structures were surveyed using a high-powered torch and an endoscope, allowing detailed inspections of all crevices.

Roost surveys consist of presence/absence surveys and include dusk and/or dawn visits (emergence/re-entry) to watch, listen for and record bats exiting or entering bat roosts. If the presence of bats has been confirmed, then roost characterisation surveys may be required.

According to Collins (2023), presence/absence surveys are needed if:

- The Preliminary Roost Assessment (PRA, i.e. for structures and trees) has not ruled out the reasonable likelihood of a roost being present (because there are locations with potential for bats to roost undetected in concealed cracks, crevices or voids), but no definitive evidence of the presence of bat roosts has been recorded; the PRA inspection survey (trees) has identified moderate and high suitability PRFs for bats but no definitive evidence of the presence of bat roosts has been recorded;
- A comprehensive inspection survey is not possible because of restricted access, but there are features with a reasonable likelihood of supporting bats; and/or

- There is a risk that evidence of bat use may have been removed by weather or human activities. The aim of this survey is to determine the presence or absence of bats at the time of the survey and the need for further survey and/or mitigation.
- Emergence/Re-entry surveys were conducted in the Proposed Development on 14 different structures with roosting potential (bridges and trees) from July to September 2023 following PRAs.
- Spring, Summer and Autumn Transect surveys were conducted of the Proposed Development in 2023 to establish the overall suitability surrounding habitats.

7.3.2.21 Proposed Development Wind Farm Bat Activity surveys

Bat Activity Surveys at the Proposed Development Site were undertaken in the Spring, Summer and Autumn of 2023 using automated Anabat Express bat detectors (Titley Scientific). External microphones were mounted on poles at a height of 1 m in order to obtain 'clean' recordings that were not affected by surrounding vegetation. Twelve locations were chosen for 2023 passive surveys, covering the 11 turbine locations and the habitats in the surrounding areas. Twelve static detectors were deployed in spring, summer and autumn (Spring 14, Summer 19, Autumn 12).

Based on professional judgement, and with reference to relevant guidance (Collins, 2023), this survey effort was sufficient to provide a good representation of bat activity during their most active periods and was proportionate to the potential effects (as discussed in Section 2.2.5 of Collins (2023)). Surveys were carried out during suitable weather conditions, i.e., minimum temperatures above 10°C, average winds of less than 17mph and little or no rainfall. There was wet weather or high winds on some survey nights, so the survey was extended until a suitable number of nights of suitable conditions were obtained. Results of this survey are still considered viable for the revised appraisal given that little or no change to baseline habitat structure has occurred in the interim.

7.3.2.22 Calculation and comparison of bat activity indices

In order to standardise bat activity between the mid-summer and autumn survey periods, results are displayed as a 'Bat Activity Index', which is the total number of bat passes divided by the number of hours per night (Hundt, 2012). This was calculated from sunset to sunrise, using publicly available data from www.timeanddate.com.

At present there is not a standard system to categorise bat activity as low, moderate or high, because the results vary depending on the species involved and the location of the site. For the purposes of this report, a bespoke system is used to discuss and compare levels of bat activity at the Proposed Development site, as outlined in **Table 7.1**. This approach uses standardised terms (e.g., occasional, frequent) to categorise bat activity indices within certain ranges; the average time interval between passes is also provided to give a more-intuitive interpretation of the terms.

Table 7.1: Characterisation of Bat Activity Indices

Bat Activity Index	Average interval between calls	Terms of characterisation
<2	> 30 minutes	Negligible

2 - 12	5 – 30 minutes	Occasional
12 – 60	1 – 5 minutes	Frequent
>60	< 1 minute	Near-constant

7.3.2.23 Species identification and interpretation of data

Sonograms from Anabat Express detectors were obtained in the ‘zero-crossing’ format and viewed using AnalookW software (Corben 2014). Species were identified with reference to *British Bat Calls: A Guide to Species Identification* (Russ 2012) based primarily on frequency and call shape, but also with reference to call slope for *Myotis* spp. Social calls were classified as unidentified bats unless they closely matched the examples provided in Russ (2012).

It is acknowledged that *Myotis* spp. can have very similar calls, and that the classification of sonograms can be imprecise, so all *Myotis* records in this document should be considered as conferred records, i.e., *Myotis c.f. daubentonii*. There can also be overlaps in call frequency between *Pipistrellus* spp. - calls with a constant frequency (CF) component at 50kHz may be either soprano pipistrelle or common pipistrelle, while calls at 40kHz may be either common pipistrelle or Nathusius’ pipistrelles – but in most cases, it is possible to determine the species based on call characteristics and other calls immediately before or after the recording. If a bat pass could not be confidently identified to species level it was recorded as an unidentified bat or identified only to genus level (e.g., *Myotis* spp.).

7.3.2.24 Valuation of ecological features and assessment of impacts

Impacts were assessed using the *Guidelines for Ecological Impact Assessment in the UK and Ireland* (CIEEM 2018) and *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2022). Reference was also made to Wray *et al.*, (2010) with regards to the evaluation of roosts and commuting routes/foraging areas.

7.3.2.25 Use of a Frequency Scale for comparing bat activity

For the purposes of this assessment the 2022-2023 data set is the most up to date and comprehensive data set and is the primary data source in this assessment. Detailed results of bat activity for each type of bat survey (e.g., transect surveys, passive surveys) are provided in **Appendix 7.6**. For the purposes of this report, we use a bespoke system to discuss and compare levels of bat activity at the Proposed Development site, as outlined in **Table 7.2**. This system is based on the professional judgement of the surveyor, and the results of peer reviewed research (Mathews *et al.* 2016). For ease of comparison, bat activity levels are classified into four categories based on a simple count of bat passes in any night, and cells are coloured using shades of blue. For the purposes of this assessment, any species that regularly has more than 50 bat passes per night (i.e., moderate to high activity) is considered to have a significant level of activity, furthermore, given that designated sites within the Zol of the Proposed Development are designated solely for Lesser Horseshoe Bat, the presence of Lesser Horseshoe Bat within the Proposed Development site is also

considered, which would warrant further consideration in an impact assessment. This corresponds with the threshold of 50 passes per night that was used in the Mathews *et al.* 2016 report.

Table 7.2: Terminology used to categorise bat activity levels

Category	Number of bat passes per night
Negligible	≤9
Low	10 – 49
Moderate	50 – 99
High	≥100

7.3.2.26 Detailed Survey Results

For Bat Roost Survey Results and Bat Activity Survey Results see **Appendix 7.6**.

7.3.2.27 Aquatic Ecology – Desktop Review

All freshwater watercourses which could be affected directly or indirectly by the Proposed Development grid connection, were considered as part of the current assessment. A range of sites were selected based on the proximity to proposed infrastructure and also in the downstream connecting catchments. This approach helped to provide a more robust baseline on the ecological importance of watercourses longitudinally. This included both sites in vicinity of the boundary of the Proposed Development site, including watercourse crossing along the IPP connection route and grid connection route. It should be noted that all grid connection route options were considered for aquatic surveys as the project layout was not finalised at this time. Thus, a total of 56 riverine sites were selected for detailed aquatic assessment (see **Appendix 7.7**).

7.3.2.28 Sensitive Species Data Request

A sensitive species data request was submitted (24/02/2023) to the National Parks and Wildlife Service for the 10 km grid squares containing and adjoining the Proposed Development (i.e., R56 and R57) and was received on the 13th of April 2023. Records for a number of rare or protected aquatic species were available although they did not overlap directly with the survey area (i.e., R56 and R57).

7.3.2.29 Selection of Watercourses for Assessment

All freshwater watercourses which could be affected directly or indirectly by the Proposed Development, of which three were assessed as the final layout was not decided at this time, as part of the assessment. A total of 56 sites were selected for detailed aquatic assessment (see **Appendix 7.7**). The nomenclature for the

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

Surveys at each of these sites included a fisheries assessment (electro-fishing and fisheries habitat appraisal), white-clawed crayfish survey, macrophyte and aquatic bryophyte survey and biological water quality sampling (Q-sampling) and macro-invertebrate sweep sampling.

7.3.2.30 Aquatic Site Surveys

Aquatic surveys of the watercourses within the of the Proposed Development were conducted on the 21st, 22nd, 23rd, and 29th August and 1st September 2023. Survey effort focused on both instream and riparian habitats at each aquatic sampling location. In addition to the ecological characteristics of the Proposed Development site, the physical and riparian habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003) and the Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000). This broad characterisation helped define the watercourses' conformity or departure from naturalness. All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e., width, depth, channel form) including associated evidence of historical drainage;
- Substrate type and relative condition, listing substrate fractions in order of dominance (i.e., bedrock, boulder, cobble, gravel, sand, silt etc.);
- Flow type by proportion of riffle, glide and pool in the sampling area;
- An appraisal of the macrophyte and aquatic bryophyte community at each site; and
- Riparian vegetation composition and bordering land use practices.

7.3.2.31 Fisheries assessment of survey area

The survey sites were located within the Owenogarney_SC_010, Owenogarney_SC_020, Shannon[Lower]_SC_100 and Ballygirreen_SC_010 river sub-catchments. The Proposed Development is not located within a European site. Fisheries survey sites were present on the following streams (www.epa.ie);

- Rocks Stream (EPA code: 27R07),
- Gortacullin Stream (27G05),
- Gortagonnella River (27G04),
- Broadford River (27B02),
- Snaty Stream (27S13),
- Clashduff Stream (27C44),
- Gortadroma Stream (27G12),
- Belvoir Stream (27B45),
- Ballyvorgal North Stream (27B47),
- Owenogarney River (27O01),
- Oatfield River (25O07),
- Snaty River (25S34) West Cloontra Stream (25W36),
- O'Neill's Stream (25O02), Knockshanvo Stream (25K82),
- Mountrice River (25M03),

- East Cloontra Stream (25E29),
- Mountrice Stream (27M38),
- River (Clare) Blackwater (2606),
- North Ballycannan Stream (27N17),
- South Ballycar River (25S75),
- West Roo Stream (25W38),
- Coolycasey Stream (27C57),
- Corlea Stream (27C63),
- Gourná River (27G02),
- Fortwilliam River (27F07),
- Reaskcamoge Stream (27R19),
- Island River (27I07),
- Gortnanool Stream (27G22),
- Carrownerríbul Stream (27C86),
- Ballintlea South Stream (27B77),
- Rossmanagher Stream (27R23),
- Clovemill Stream (27C10),
- Ballycasey Beg Stream (27B70) and several unnamed streams.

7.3.2.32 Fish Stock Assessment (Electro-Fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on watercourses in the vicinity of the Proposed Development in August and September 2023 following notification to Inland Fisheries Ireland, under the conditions of a Department of the Environment, Climate and Communications (DECC) licence (see **Appendix 7.7**). The survey was undertaken in accordance with best practice (CEN, 2003; CFB, 2008) and Section 14 licencing requirements.

Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank. Salmonids, Eel and other captured fish species were transferred to a holding container with oxygenated fresh river water following capture. To reduce fish stress levels, anaesthesia was not applied to captured fish. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

As three primary species groups were targeted during the survey, i.e., salmonids, lamprey, and eel, the electro-fishing settings were tailored for each species. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling location could be determined as a larger representation of the watercourse surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g., CFB, 2008).

The catchment-wide electro-fishing (CWEF) survey was undertaken across 56 sites (see **Appendix 7.7**).

7.3.2.33 *Salmonids and Eel*

For salmonid species and Eel, as well as all other incidental species, electro-fishing was carried out in an upstream direction for a 10-minute catch-per-unit-effort (CPUE), an increasingly common standard approach for wadable streams (Matson et al., 2018). A total of 40-100 m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages. At certain, minor watercourse sites or sites with limited access, it was more feasible to undertake electro-fishing for a 5-minute CPUE. Discrepancies in fishing effort (CPUE) between sites are provided in the results section (see **Appendix 7.7**).

Relative conductivity of the water at each site was checked in-situ with a conductivity meter and the electro-fishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract salmonids and Eel to the anode without harm. For the moderate conductivity waters of the sites (mixed geologies) a voltage of 240-300V, frequency of 35-45Hz and pulse duration of 3.5-4ms was utilised to draw fish to the anode without causing physical damage.

7.3.2.34 *Lamprey*

Electro-fishing for lamprey ammocoetes was conducted within the Proposed Development site using targeted quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (30Hz) burst DC pulse setting which also allowed detection of Eel in sediment, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx (2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under the water's surface, approximately 10-15cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine-mesh hand net as they emerged.

Lamprey species were identified to species level, where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

7.3.2.35 *Fisheries Habitat*

A fisheries habitat appraisal of all aquatic survey sites within the Proposed Development was undertaken to establish their fisheries value. The surveys focused on evaluating the spawning, nursery and/or holding habitat for salmonids and lamprey species but also considered Eel and other fish species. The appraisals of salmonids and lamprey were cognisant of species-specific habitat requirements and preferences as outlined in O'Grady (2006), Hendry et al. (2003), Armstrong et al. (2003), Harvey &

Cowx (2003), Maitland (2003) and Hendry & Cragg-Hine (1997). River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (Environment Agency, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the riverine sites (i.e., channel profiles, substrata etc.).

7.3.2.36 *Biosecurity*

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and personal protective equipment (PPE) used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Particular cognisance was given towards preventing the spread or introduction of crayfish plague (*Aphanomyces astaci*). Furthermore, Ross Macklin B.Sc. (Hons) and Bill Brazier B.Sc. (Hons) who undertook all aquatic surveys for the Proposed Development, did not undertake any work in a known crayfish plague catchment for a period of <72hrs in advance of the survey. Where feasible, equipment was also thoroughly dried (through UV exposure) between aquatic survey sites. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. Ross Macklin B.Sc. (Hons) and Bill Brazier B.Sc. (Hons) (are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

7.3.2.37 *White Clawed Crayfish Survey*

White-clawed crayfish (*Austropotamobius pallipes*) surveys were undertaken at the aquatic survey sites in August 2023 under a National Parks and Wildlife (NPWS) open national licence (no. C24/2023), as prescribed by Sections 9, 23 and 34 of the Wildlife Act, to capture and release crayfish to their site of capture. As per Inland Fisheries Ireland aquatic biosecurity recommendations, the crayfish sampling started at the uppermost site(s) of the Proposed Development catchment/sub-catchments in the survey area to minimise the risk of transfer of invasive propagules (including crayfish plague) in an upstream direction.

Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). An appraisal of white-clawed crayfish habitat at each site was conducted based on physical channel attributes, water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider survey area (OS grid squares R56 and R57) was completed.

7.3.2.38 *Freshwater Pearl Mussel survey (eDNA only)*

There are no known freshwater pearl mussel (*Margaritifera margaritifera*) records in the Owenogarney_SC_010, Owenogarney_SC_020, Shannon[Lower]_SC_100 and Ballygirreen_SC_010 river sub-catchments. This was based on an extensive literature review and also examination of NPWS sensitive species data. However, following the precautionary principle and to account for any lacunae in data for the species, environmental DNA (eDNA) samples were collected from the Broadford River, Owenogarney River, Gourna River and River Blackwater in August 2023 and analysed

for freshwater pearl mussel eDNA to confirm the species' absence within the vicinity of the Proposed Development site.

7.3.2.39 eDNA analysis

To validate site surveys and to detect potentially cryptically low populations of freshwater pearl mussel within the study area, $n=4$ composite water samples were collected from the Broadford River (site A4), Owenogarney River (A11), Gourná River (D6) and River Blackwater (B16) in August 2023 and analysed for freshwater pearl mussel, white-clawed crayfish and crayfish plague (*Aphanomyces astaci*) environmental DNA (eDNA) (see **Appendix 7.7**). The water samples were collected in August 2023, with the sites strategically chosen to maximise longitudinal (instream) coverage within the catchment (i.e., facilitating a greater likelihood of species detection).

In accordance with laboratory guidance, a composite (500ml) water sample was collected from the sampling point, maximising the geographic spread at the site (20 x 25ml samples at each site), thus increasing the chance of detecting the target species' DNA. The composite sample was filtered and fixed on site using a sterile proprietary eDNA sampling kit. The sample was stored at room temperature and sent to the laboratory for analysis with 48 hours of collection. A total of $n=12$ qPCR replicates were analysed for the site. Given the high sensitivity of eDNA analysis, a single positive qPCR replicate is considered as proof of the species' presence (termed qPCR No Threshold, or qPCR NT). Whilst an eDNA approach is not currently quantitative, the detection of the target species' DNA indicates the presence of the species at and or upstream of the sampling point. Please refer to **Appendix 7.7** for full eDNA laboratory analysis methodology.

7.3.2.40 Biological Water Quality (Q-Sampling)

The 56 no. riverine survey sites were assessed for biological water quality through Q-sampling in August 2023. All samples were taken with a standard kick sampling hand net (250mm width, 500 μ m mesh size) from areas of riffle/glide utilising a 2-minute kick sample, as per Environmental Protection Authority (EPA) methodology (Feeley et al., 2020). Large cobble was also washed at each site for 1-minute (where present) to collect attached macro-invertebrates (as per Feeley et al., 2020). Samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification to species level. Samples were converted to Q-ratings as per Toner et al. (2005) and assigned to WFD status classes (**Table 7.3**). Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012), stoneflies (Feeley et al., 2020) and other relevant taxa (i.e., Byrne et al., 2009; Nelson et al., 2011).

Table 7.3: Reference categories for EPA Q-ratings (Q1 to Q5)

Q Value	WFD Status	Pollution status	Condition
Q5 or Q4-5	High status	Unpolluted	Satisfactory

Q4	Good status	Unpolluted	Satisfactory
Q3-4	Moderate status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor status	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad status	Seriously polluted	Unsatisfactory

7.3.2.41 *Macrophytes and aquatic bryophytes*

Surveys of the macrophyte and aquatic bryophyte community were conducted by instream wading at each of the aquatic survey sites, with specimens collected (by hand and via grapnel) for on-site identification. An assessment of the aquatic vegetation community helped to identify any rare macrophyte species listed under the Flora (Protection) Order, 2022 and Irish Red list for vascular plants (Wyse-Jackson et al., 2016) or habitats corresponding to the Annex I habitats, e.g., 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitriche-Batrachion* (low water level during summer) or aquatic mosses [3260]' (more commonly referred to as 'floating river vegetation').

7.3.2.42 *Otter signs*

The presence of Otter (*Lutra lutra*) was determined through the recording of otter signs within 150m radius of each aquatic survey site. Notes on the age and location of signs (ITM coordinates) were made, in addition to the quantity and visible constituents of spraint (i.e., remains of fish, crustaceans, molluscs etc.).

7.3.2.43 *Aquatic ecological evaluation*

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

7.3.2.44 *Detailed Survey Results*

For Aquatic Survey Results see **Appendix 7.7**.

7.3.3 **Baseline Surveys and Data Gathering**

The biodiversity baseline information for all elements of the Proposed Development was collated from site investigations and field surveys, along with publicly available online resources including Biodiversity Data Centre (NBDC), National Parks & Wildlife Service (NPWS), Environmental Protection Agency (EPA), and Inland Fisheries Ireland (IFI), which are regularly updated. In all cases the most recent publications available are relied on. All documentation used is referenced at the end of the chapter. All field survey work was carried out by qualified and experienced ecologists (see Section 7.1.5).

The evaluation of the baseline environment and potential for impacts has been informed by and carried out using best practice guidance, namely *Guidelines for Ecological*

Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (Chartered Institute of Ecology and Environmental Management, 2016 and 2018). The professional judgement of the ecologist has been used in the scoping of surveys, interpretation of data, and assessment of impacts; this approach is consistent with the CIEEM guidelines. Sensitivity and magnitude were evaluated using a combined approach based on the NRA (NRA, 2009) and Percival (Percival, 2007) methodologies. The significance of identified impacts has been evaluated using EPA guidance (EPA, 2022).

As updated designs for the grid connection was received post habitat surveys, aerial photography of surrounding habitats was used to estimate habitats within the footprint of the amended changes. No other material limitations or difficulties were encountered during the course of the studies carried out to inform the assessment of impacts for the Proposed Development.

The information sources outlined in **Table 7.4** were reviewed during desktop studies and confirmed during fieldwork in order to gather information on the baseline environment. The recommendations in the guidelines listed in **Table 7.4** have been considered during the preparation of this chapter.

Table 7.4: Sources of Baseline Information for Biodiversity

Type	Information source
Policy & Legislation	<ul style="list-style-type: none"> ● National Biodiversity Action Plan (2017 – 2021). ● Clare County Development Plan 2023-2029, adopted April 2023. ● EU Habitats Directive (1992) Council Directive 92/43/EEC. ● EC (Birds and Natural Habitats) Regulations 2011 (as amended). ● Water Framework Directive (2000) Directive 2000/60/EC. ● Irish Wildlife Acts 1976 to 2018. ● The International Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971. ● The All-Ireland Pollinator Plan 2021-2025.
Guidelines	<p><u>Ecological Evaluation</u></p> <ul style="list-style-type: none"> ● Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2016 and 2018). ● Environment Agency, (2014) UK Pollution Prevention Guidelines (PPG). ● Environmental Protection Agency Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EIAR) 2022 ● NRA (2006). Guidelines For The Treatment Of Otters Prior To The Construction Of National Road Schemes. National Roads Authority. ● NRA, (2008) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. ● NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes. National Roads Authority.

Type	Information source
	<ul style="list-style-type: none"> • NPWS (2019) <i>The Status of EU Protected Habitats and Species in Ireland</i>. Volume 2: Habitat Assessments. Unpublished NPWS report. • Sundseth, K., & Roth, P. (2014) Article 6 of the Habitats Directive - Rulings of the European Court of Justice. European Commission. <p><u>Terrestrial Habitats</u></p> <ul style="list-style-type: none"> • Fossitt, J (2000) <i>A Guide to the Habitats of Ireland</i>. • Smith <i>et al.</i> (2011) <i>Best Practice Guidance for Habitat Survey and Mapping</i>, Heritage Council Ireland. • Irish Statute Book (Various) European Communities (Natural Habitats) Regulations 1997 (S.I. 94/97) as amended. • NPWS (2013) <i>Status of Protected EU Habitats and Species in Ireland</i>. Overview Vol.1. • Parnell, J., Curtis, T (2012). <i>Webb's An Irish Flora (8th edition)</i>. Cork: Cork University Press, 2012. • Stace, C (2010) <i>New Flora of the British Isles</i>. 3rd edn. Cambridge University Press, Cambridge, UK. <p><u>Bats</u></p> <ul style="list-style-type: none"> • Bat Conservation Ireland (2012). <i>Wind Turbine/Wind Farm Development Bat Survey Guidelines</i>. Version 2.8, December 2012. Bat Conservation Ireland, www.batconservationireland.org. • Billington <i>et al.</i> (1997). <i>The Conservation of Bats in Bridges Proposed Development</i>. Natural England. • Collins (2023) <i>Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Ed.)</i>. • National Road Authority (2006) <i>Guidelines for the treatment of bats during the construction of National Road scheme</i>. • Lundy <i>et al.</i> (2011) <i>Landscape conservation for Irish bats & species-specific roosting characteristics</i>, Bat Conservation Ireland. • Hundt (2012) 'Bat Activity Index'. • Russ (2012) <i>British Bat Calls: A Guide to Species Identification</i>. • NatureScot 2021 <i>Bats and onshore wind turbines - survey, assessment and mitigation</i>. • Kelleher C., Marnell F. and Mullen E, (2022). <i>Bat Mitigation Guidelines for Ireland V2</i>. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland • Bat Conservation Ireland (2013) <i>Irish Bats in Flight</i>, Department of Environment, Heritage and Local Government. <p><u>Terrestrial Mammals</u></p> <ul style="list-style-type: none"> • NPWS 'Ireland Red List No. 12: Terrestrial Mammals' (Marnell <i>et al.</i>, 2019). • 'Atlas of Mammals in Ireland 2010-2015' (Lysaght and Marnell, 2016). • 'Irish Wildlife Manual 121, All-Ireland Squirrel and Pine Marten Survey 2010' (Lawton <i>et al.</i>, 2020). • NRA (2005) <i>Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes</i>.

Type	Information source
	<ul style="list-style-type: none"> • Sleeman <i>et al.</i> (2009) How many Badgers are there in Ireland? European Journal of Wildlife Research. • National Roads Authority (2006) Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes. • Highways Agency (1999) The Good Roads Guide: Nature Conservation Advice in Relation to Otters <i>Design Manual for roads and Bridges</i> (DMRB Vol 10 S. 4 Part 4 HA 81/99). • 'Irish Wildlife Manuals No. 76, National Otter Survey of Ireland 2010/12 (Reid et al., 2013). <p><u>Reptiles & Amphibians</u></p> <ul style="list-style-type: none"> • Beebee, T.J.C. & Griffiths, R.A. (2000) <i>Amphibians and reptiles</i>. The New Naturalist. HarperCollins Publishers, London. • Farren, A. Prodohl, P.A., Laming, P. & Reid N. (2010) <i>Distribution of the common lizard (Zootoca vivipara) and landscape favourability for the species in Northern Ireland</i>. Amphibia-Reptilia 31: 387-394. • King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011) <i>Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish</i>. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland. • National Roads Authority (2008). 'Ecological Surveying Techniques for Protected Flora and Fauna During the Planning of National Road Schemes'. • O'Neill, K, Jennings, S., Forsyth, L., Carey. C., Portig, A., Preston, J., Langton, T. & McDonald, R. (2004). The Distribution and Status of Smooth Newts in Northern Ireland. Report Prepared for Environment and Heritage Service <p><u>Aquatic Habitats & Species</u></p> <ul style="list-style-type: none"> • National Roads Authority (2005) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes. • Inland Fisheries Ireland, (2016) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters. • Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites (Eastern Regional Fisheries Board, not dated). • CIRIA (Construction Industry Research and Information Association) 2006: Guidance on 'Control of Water Pollution from Linear Construction Proposed Development s'. • CIRIA (2006): Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors). • Fowles & Smith, (2006) Mapping the habitat quality of patch networks for the marsh fritillary. • Meehan, (2013) National Smooth Newt Survey 2013 Report, Irish Wildlife Trust. • Moorkens, E.A. (2006) <i>Irish non-marine molluscs – an evaluation of species threat status</i>. Bulletin of the Irish Biogeographical Society 30: 348-371. • National Biodiversity Data Centre (2021) Data for records of Common Frog held by NDBC. • NRA (2008) 'Ecological Surveying Techniques for Protected Flora and Fauna During

Type	Information source
	<p>the Planning of National Road Schemes' were followed when carrying out surveys.</p> <p><u>Invasive Species</u></p> <ul style="list-style-type: none"> • Kelly <i>et al.</i> (2013a) The economic cost of invasive and non-native species in Ireland and Northern Ireland, A report prepared for the N.I. Environment Agency and NPWS. • Kelly, <i>et al.</i> (2013b) Risk analysis and prioritisation for invasive and non-native species in Ireland and Northern Ireland, A report prepared for the N.I. Environment Agency and NPWS. • O'Flynn <i>et al.</i> (2014) Ireland's invasive and non-native species – trends in introductions, NBDC Series No. 2. <p><u>Terrestrial Invertebrates</u></p> <ul style="list-style-type: none"> • Asher, J., Warren, M., Fox, R., Harding, P., Jeffcoate, G. & Jeffcoate S. (2001) <i>The millennium atlas of butterflies in Britain and Ireland</i>. Oxford University Press, Oxford. • Marsh Fritillary Monitoring Scheme (NBDC, 2015).
Desktop	<ul style="list-style-type: none"> • NPWS website www.npws.ie • National Biodiversity Data Centre website (NBDC) www.biodiversityireland.ie • Clare County Council https://www.clarecoco.ie/ • Transport Infrastructure Ireland (formerly NRA) www.tii.ie • European Union www.europa.eu • Water Framework Directive www.wfireland.ie • Scottish National Heritage www.nature.scot • The Heritage Council www.heritagecouncil.ie • Construction Industry Research and Information Association www.ciria.org • Irish Wildlife Trust www.iwt.ie • Environmental Protection Agency website (EPA) www.epa.ie • Inland Fisheries Ireland (IFI) www.fisheriesireland.ie • Birdwatch Ireland (BWI) www.birdwatchireland.ie • Bat Conservation Ireland (BCI) www.batconservationireland.org • Butterfly Ireland www.butterflyconservation.ie • Satellite imagery was reviewed to identify areas of potentially suitable breeding habitat.
Fieldwork	<p><u>Terrestrial Habitats</u></p> <ul style="list-style-type: none"> • General site walkover • Habitat classification surveys within a 50m buffer of work locations of <u>boundary of the Proposed Development (including haul route works locations)</u>(includes identification of invasive species). • Smith <i>et al.</i> (2011) <i>Best Practice Guidance for Habitat Survey and Mapping</i>, Heritage Council Ireland. <p><u>Terrestrial Invertebrates</u></p> <ul style="list-style-type: none"> • General site walkover • Pollinator surveys in the style of Butterfly transects (using the 'Pollard Walk' method) • Regan, E.C., Nelson, B., Aldwell, B., Bertrand, C., Bond, K., Harding, J., Nash, D.,

Type	Information source
	<p>Nixon, D., & Wilson, C.J. (2010) <i>Ireland Red List No. 4 – Butterflies</i>. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Ireland.</p> <ul style="list-style-type: none"> • Van Swaay, C., Cuttelod, A., Collins, S., Maes, D., Lopez Munguira, M., ŠAŠIĆ, M., Settele, J., Verovnik, R., Verstrael, T., Warren, M., Wiemers, M. & Wynhof, I. (2010) <i>European Red List of Butterflies</i>. Luxembourg: Publications Office of the European Union <p><u>Amphibians and Reptiles</u></p> <ul style="list-style-type: none"> • General site walkover • Ross, E. (2017). <i>A freshwater pearl mussel survey of the Ratty-Owenogarney River and Blackwater (Clare) River channels draining the Knockanuarha-Seefin uplands in County Clare</i> <p><u>Terrestrial Mammals:</u></p> <ul style="list-style-type: none"> • Mammal surveys (general mammal walkover surveys, in addition to specific otter and badger surveys) • Camera trap deployment <p><u>Bats:</u></p> <ul style="list-style-type: none"> • Habitat assessment surveys, transect surveys, static detector deployments, preliminary roost assessments and emergence/re-entry (roost) surveys. . • Collins (2023) <i>Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Ed.)</i>. <p><u>Aquatic Ecology Surveys</u></p> <ul style="list-style-type: none"> • Catchment Wide Electro-Fishing surveys • Aquatic site survey • Broad aquatic & fisheries habitat assessment • Catchment Wide Electro-fishing • White-clawed crayfish (sweep netting & hand searching) surveys • Biological water quality sampling and macrophyte and aquatic bryophyte surveys (Q-sampling)

7.3.4 Assessment Methodology

A combination of NRA guidance (NRA, 2009) and methodology developed by Percival (2007) was used to evaluate the sensitivity of ecological receptors, the magnitude of impacts and the resultant significance of likely or potential effects to relevant aspects of Biodiversity as a result of the development of the Proposed Development.

Potential impacts on receptors were assessed using the *Guidelines for Ecological Impact Assessment in the UK and Ireland* (CIEEM 2018) and *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2022). Reference was also made to Wray et al., (2010) with regards to the evaluation of bat roosts and commuting routes/foraging areas.

7.3.4.1 *Determining the Importance of the Biodiversity resources (NRA 2009)*

The importance of biodiversity resources within the study areas for the Proposed Development has been derived from NRA Guidance (2009), as outlined in the **Table 7.5** below.

Table 7.5: NRA Evaluation Guidance (NRA 2009)

Resource Evaluation	NRA Criteria
International Importance	<ul style="list-style-type: none"> ● 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) and Important Bird Areas (IBA). ● Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. ● Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or Species of animal and plants listed in Annex II and/or IV of the Habitats Directive. ● Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). ● Biosphere Reserve (UNESCO Man & The Biosphere Programme). Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). ● Site hosting significant populations under the Bern Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). ● Biogenetic Reserve under the Council of Europe. European Diploma Site under the Council of Europe. ● Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).
National Importance	<ul style="list-style-type: none"> ● Site designated or proposed as a Natural Heritage Area (pNHA). ● Statutory Nature Reserve. ● Refuge for Fauna and Flora protected under the Wildlife Acts. ● National Park. ● Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA). ● Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive.
County Importance	<ul style="list-style-type: none"> ● Area of Special Amenity. ● Area subject to a Tree Preservation Order. ● Area of High Amenity, or equivalent, designated under the County Development Plan. ● Resident or regularly occurring populations (assessed to be important at the County level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. ● Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. ● County important populations of species, viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared. ● Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. ● Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Resource Evaluation	NRA Criteria
Local Importance (Higher Value)	<ul style="list-style-type: none"> Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared. Resident or regularly occurring populations (assessed to be important at the Local level) of the following: Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. Sites containing semi natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality; Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
Local Importance (Lower Value)	<ul style="list-style-type: none"> Sites containing small areas of semi natural habitat that are of some local importance for wildlife. Sites or features containing non-native species that is of some importance in maintaining habitat links.

7.3.4.2 Determining the Sensitivity of Biodiversity Receptors

Guidance from Percival 2007 and NRA 2009 has been used to evaluate the sensitivity of bird species to the proposed development (refer to **Chapter 8**). This rating system has also been used as a general guide for other biodiversity receptors throughout this report.

7.3.4.3 Determining Magnitude of Impacts to Biodiversity Receptors (Percival 2007)

A definition of terms used in respect of magnitude of impacts for bird species evaluations is outlined in **Table 7.6**. This rating system has also been used as a general guide for magnitude quantification of impacts for other biodiversity receptors throughout this report.

Table 7.6: Determining Magnitude of Impacts (Percival 2007)

Magnitude	Description
Very High	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether. Guide: < 20% of population / habitat remains.
High	Major loss or major alteration to key elements/ features of the baseline (pre-development) conditions such that post development character/ composition/ attributes will be fundamentally changed. Guide: 20-80% of population/ habitat lost.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed. Guide: 5-20% of population/ habitat lost.

Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns. Guide: 1-5% of population/ habitat lost.
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the “no change” situation. Guide: < 1% population/ habitat lost.

7.3.4.4 EPA EIAR Guidance Definitions of Effects

Table 7.7, Table 7.8 and **Table 7.9** outline the EPA evaluation criteria utilised in this appraisal of the Environmental Factor, Biodiversity. These criteria are included in the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

Table 7.7: Quality of Effects (EPA, 2022)

Quality of Effect	Description
Positive Effect	A change which improves the quality of the environment (for example, by increasing species diversity; or improving the reproductive capacity of an ecosystem, or removing nuisances or improving amenities).
Neutral Effect	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.
Negative/Adverse Effect	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 7.8: Duration of Effects (EPA, 2022)

Duration of Effect	Description
Momentary Effects	Effects lasting from seconds to minutes.
Brief Effects	Effects lasting less than a day.
Temporary Effects	Effects lasting less than a year.
Short-term Effects	Effects lasting one to seven years.
Medium-term Effects	Effects lasting seven to fifteen years.
Long-term Effects	Effects lasting fifteen to sixty years.
Permanent Effects	Effects lasting over sixty years.

Table 7.9: Significance of Effects (EPA, 2022)

Significance of Effect	Description
------------------------	-------------

Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics.

7.3.4.5 Constraints and Limitations

Whilst Desk Study data are useful in providing supplementary ecological information for a site, it should be acknowledged that these data are dependent on the submission of records to the relevant organisation. As such, a lack of records for a particular species does not necessarily mean that the species is absent from the site and/or wider search area. Similarly, records of a particular species do not necessarily mean that the species is still present within the site and/or wider search area.

It should be noted that ecological features are transient, and that the distributions of habitats and species may be subject to change. As such, in line with CIEEM guidance, the ecological survey data presented in this report are considered valid for at least two years (CIEEM, 2019), after which it may be necessary for further field surveys to be undertaken.

The information provided in this EIAR chapter accurately and comprehensively describes the ecological baseline of the Proposed Development and provides a prediction of the likely ecological effects of the Proposed Development, along with prescriptions for mitigation and enhancement as necessary. It should be noted, however, that due to late design changes, small areas of the Proposed Development were subject to habitat survey outside of optimal survey window (access road into Eastern DA) or in the instance of the two Loop-in options through review of aerial photographs and knowledge of adjacent habitats. The specialist studies, analysis, reporting, and assessment methodologies have all been undertaken in accordance with the appropriate guidelines. No significant limitations in relation to the scope, scale, or context of the impact assessment have been identified.

7.4 Biodiversity Baseline

The baseline Biodiversity environment in relation to designated sites, terrestrial habitats, invertebrates, amphibians & reptiles, terrestrial mammals, bats, birds, aquatic habitats & species is described below.

7.4.1 Designated Sites

7.4.1.1 European Sites

Relevant European sites of nature conservation importance, including SPAs, SACs and Ramsar sites, are summarised in **Table 7.10** below. These European sites and their hydrological catchments are detailed in the **Appropriate Assessment Reporting**.

A precautionary approach was adopted when identifying relevant European sites, assessing all European sites within a 15 km radius of the Proposed Development as well as more distant sites where potential hydrological linkage exists (OPR, 2021).

As presented in **Table 7.10** below, 23 European sites were identified for assessment in relation to the Proposed Development: specifically four SPAs and 19 SACs. The distance from the nearest element of the Proposed Development and (where this distance differs significantly) the Proposed Development turbines is stated below.

Table 7.10: Proximity of relevant European sites to the Proposed Development, including Grid Connection and TDR

No.	European site	Distance from Proposed Development	Distance from Proposed Development turbines	Hydrological connectivity (yes/no)
1	Lower River Shannon SAC (002165)	0 m (from closest point of TDR)	7.2 km	TDR spans the SAC via the Killaloe Bypass
2	River Shannon and River Fergus Estuaries SPA (004168)	380 m (from closest point of TDR)	9.1 km	Yes, SPA is located 17.3 km downstream from grid connection
3	Glenomra Wood SAC (001013)	1.3 km	4.5 km	No
4	Danes Hole, Poulnalecka SAC (000030)	2.0 km	2.1 km	No
5	Lough Derg (Shannon) SPA (004165)	2.1 km	12.6 km	No
6	Slieve Bernagh Bog SAC (002312)	3.5 km	4.1 km	No
7	Slievefelim to Silvermines Mountains SPA (004058)	3.8 km	>15 km	No
8	Ratty River Cave SAC (002316)	4.3 km	4.4 km	No
9	Kilkishen House SAC (002319)	5.1 km	5.1 km	No
10	Clare Glen SAC (000930)	5.7 km	>15 km	No
11	Silvermines Mountains West SAC (002258)	6.9 km	>15 km	No
12	Glenstal Wood SAC (001432)	7.8 km	>15 km	No
13	Keeper Hill SAC (001197)	8.5 km	>15 km	No
14	Tory Hill SAC (000439)	10.8 km	>15 km	No
15	Poulnagordon Cave (Quin) SAC (000064)	11.3 km	11.4 km	No
16	Askeaton Fen Complex SAC (002279)	11.7 km	>15 km	No
17	Slieve Aughty Mountains SPA (004077)	11.8 km	11.9 km	No
18	Lough Gash Turlough SAC (000051)	12.1 km	13 km	No

No.	European site	Distance from Proposed Development	Distance from Proposed Development turbines	Hydrological connectivity (yes/no)
19	Silvermine Mountains SAC (000939)	12.2 km	>15 km	No
20	Newgrove House SAC (002157)	13.3 km	13.4 km	No
21	Curraghchase Woods SAC (000174)	13.6 km	>15 km	No
22	Bolingbrook Hill SAC (002124)	13.7 km	>15 km	No
23	Old Domestic Building (Keevagh) SAC (002010)	14.1 km	14.2 km	No

The Proposed Development does not overlap with any European sites, with the exception of Lower River Shannon SAC, for which the TDR spans over the SAC via the Killaloe Bypass. No TDR works will be required at this section of the TDR, and Lower River Shannon SAC is approximately 3.4 km from the Proposed Development turbines. The nearest SPA, River Shannon and River Fergus Estuaries SPA, is located approximately 380 m from the TDR, and approximately 6.4 km from the Proposed Development turbines.

There are no Ramsar sites within 15 km of the Proposed Development, with the nearest Ramsar site (Ballyallia Lough, site number: 845) located approximately 18.9km from the Proposed Development. Considering this distance, and the scope for impacts from the Proposed Development, no Ramsar sites were carried forward for further assessment.

7.4.1.2 Nationally Designated Sites

NHAs are nationally designated sites of nature conservation importance protected under the Wildlife (Amendment) Act 2000. Whilst pNHAs do not have the legal protection afforded to NHAs until designation is confirmed, these should still be taken into consideration when establishing the potential for impacts from a plan or project on a precautionary basis.

As presented in **Table 7.11** below, nine NHAs and 33 pNHAs were identified for assessment in relation to the Proposed Development. No other relevant nationally designated sites were identified.

The Proposed Development turbines and Grid Connection do not overlap with any NHA or pNHA boundaries. One NHA, Inner Shannon Estuary – South Shore is located approximately 5.2 m from the TDR, no works are proposed at this section. The Gortacullin Bog NHA, is located approximately 60 m west of the nearest element of the Proposed Development (Hardstand of T11). The next nearest NHA or pNHA, Lough Derg pNHA, is located approximately 867 m north and upstream of the Turbine Delivery Route. The remaining nearby nationally designated sites are all more than 1 km from the nearest element of the Proposed Development.

Table 7.11: Proximity of relevant nationally designated sites to the Proposed Development, including Grid Connection and TDR

No.	Name	Distance from nearest element of Proposed Development	Distance from Proposed Development turbines	Hydrological connectivity (yes/no)
1	Inner Shannon Estuary – South Shore pNHA (004 077)	5.2 m (from closest point of TDR)	10.3 km	Yes (18.2 km downstream via Grid Connection)
2	Gortacullin Bog NHA (002401)	8.7 m	108.2 m	Yes (west of Proposed Development boundary)
3	Lough Derg pNHA (000011)	867.4 m	12.6 km	No
4	Fergus Estuary and Inner Shannon, North Shore pNHA (002165)	1.1 km (from closest point of TDR)	9.1 km	Yes (18.6 km downstream via Grid Connection)
5	Glenomra Wood pNHA (SAC code: 001013)	1.3 km	4.5 km	No
6	Doon Lough NHA (000337)	1.6 km	1.6 km	No
7	Loughmore Common Turlough pNHA (000438)	1.9 km	15 km	No
8	Cloonlara House pNHA (000028)	2.2 km	9.3 km	No

No.	Name	Distance from nearest element of Proposed Development	Distance from Proposed Development turbines	Hydrological connectivity (yes/no)
9	Woodcock Hill Bog NHA (002402)	2.3km	4 km	No
10	Danes Hole, Poulnaleck a pNHA (000030)	2.3 km	2.4 km	No
11	Castle Lake pNHA (000239)	2.3 km	2.4 km	No
12	Castleconnell (Domestic Dwelling, Occupied) pNHA	2.6 km	11.6 km	No
13	Knockalishreen Marsh pNHA (002001)	3.3 km	7.2 km	No
14	Lough Cullaunyhedda pNHA (001017)	5.5 km	5.6 km	No
15	Cloonlough More Bog NHA (002307)	5.7 km	5.8 km	No
16	Clare Glen pNHA (SAC code: 000930)	5.7 km	>15 km	No
17	Garrannon Wood pNHA (001012)	6.8 km	8.2 km	No
18	Derrygaree n Heath	6.9 km	2 km	No

No.	Name	Distance from nearest element of Proposed Development	Distance from Proposed Development turbines	Hydrological connectivity (yes/no)
	pNHA (000931)			
19	Bleanbeg Bog NHA (002450)	7.0 km	>15 km	No
20	Rosroe Lough pNHA (000324)	7.1 km	7.2 km	No
21	Glenstal Wood pNHA (001432)	7.7 km	>15 km	No
22	Fin Lough (Clare) pNHA (001010)	8.4 km	8.5 km	No
23	Keeper Hill pNHA (001197)	8.6 km	>15 km	No
24	Dromore & Bleach Loughs pNHA (001030)	9.1 km	>15 km	No
25	Ballyvorheen Bog pNHA (001849)	9.3 km	>15 km	No
26	Skoolhill pNHA (001996)	9.4 km	>15 km	No
27	Loughanilloon Bog NHA (001020)	10.2 km	10.3 km	No
28	Ballycar Lough pNHA (000015)	10.5 km	10.6 km	No

No.	Name	Distance from nearest element of Proposed Development	Distance from Proposed Development turbines	Hydrological connectivity (yes/no)
29	Tory Hill pNHA (000439)	10.8 km	> 15 km	No
30	Adare Woodlands pNHA (000429)	10.8 km	>15 km	No
31	Dromsallagh Bog pNHA (001850)	10.9 km	>15 km	No
32	Poulnagordon Cave (Quin) pNHA (000064)	11.3 km	11.4 km	No
33	Ayle Lower Bog NHA (000993)	11.5 km	11.6 km	No
34	Grageen Fen And Bog NHA (002186)	11.6 km	>15 km	No
35	Silvermine Mountains pNHA (000939)	12.2 km	>15 km	No
36	Lough O'Grady pNHA	12.3 km	12.4 km	No
37	Lough Gash Turlough pNHA (000051)	12.9 km	13 km	No
38	Lough Gur pNHA (000437)	13.5 km	>15 km	No
39	Dromoland Lough	13.6 km	13.7 km	No

No.	Name	Distance from nearest element of Proposed Development	Distance from Proposed Development turbines	Hydrological connectivity (yes/no)
	pNHA (001008)			
40	Curraghchase Woods pNHA (000174)	13.6 km	>15 km	No
41	Old Domestic Building (Keevagh) pNHA (002010)	14.1 km	14.2 km	No
42	Mauherslieve Bog NHA (002385)	14.9 km	>15 km	No

7.4.1.3 Important Bird Areas

Important Bird Areas (IBAs) are internationally recognised sites of significant importance to bird species. These sites are monitored and designated by organisations (e.g., BirdWatch Ireland) in partnership with BirdLife International. They include International, Regional and Sub-Regional categories.

As indicated in **Table 7.12** below, three IBAs were identified within the potential ZoI of the Proposed Development. These overlap with other European sites. No other relevant IBAs were identified.

The Proposed Development turbines and Grid Connection do not overlap with any IBA boundaries. The nearest IBA, Shannon and Fergus Estuaries IBA, is located approximately 2.1km from the Proposed Development. Based on their proximity and the scope for impacts from the Proposed Development, IBAs were carried forward for consideration as Key Ornithological Features on a precautionary basis.

Table 7.12: Proximity of relevant Important Bird Areas to the Proposed Development

No.	Name	Distance from the Proposed Development	Distance from Proposed Development turbines	Hydrological connectivity (yes/no)
1	Shannon and Fergus Estuaries	7.9 km	11.6 km	Yes (downstream of Proposed Development)

No.	Name	Distance from the Proposed Development	Distance from Proposed Development turbines	Hydrological connectivity (yes/no)
2	Slieve Aughty Mountains	11.9 km	12 km	No
3	Lough Derg (Shannon)	12.1 km	13.1 km	No

7.4.1.4 Examination of Connectivity

The European Sites within the Zol of the Proposed Development were initially screened for connectivity with the Proposed Development. Connectivity with a European site was evaluated using a conceptual site model which identifies potential impact source-pathways between the Proposed Development and the European Sites. The conceptual model (based on source-pathway-receptor connectivity) is a standard tool used in environmental assessment. In order for an effect to be likely, all three elements (source, pathway, and receptor) of this mechanism must be in place. All phases of the Proposed Development were considered - i.e., construction, operational and decommissioning phases.

Following the examination of potential connectivity to European Sites using Conceptual Site Modelling described above, 16 European Sites were shown to have no connectivity to the Proposed Development and were considered to be outside the Zone of Influence and therefore there is no potential for significant impacts to these European Sites. The remaining four European Sites were the subject of a screening exercise, as there is potential connectivity between the Proposed Development and these European Sites. Each of the Qualifying Interests (QIs) / Special Conservation Interests (SCIs) of these European Sites was then screened in order to consider whether or not it could be objectively concluded that effects (if any) will not be significant in relation to European sites.

European Sites screened out from further evaluation: The findings of the screening exercise undertaken at Stage 1 conclude that **it can be excluded, on the basis of best scientific knowledge and objective evidence, that the Proposed Development, individually or in combination with any other plan or project, will have a significant effect** to the following 16 no. European Sites (see **Appropriate Assessment Reporting for reasoning for excluding these sites**) within the Zol:

- Glenomra Wood SAC [001013];
- Slieve Bernagh Bog SAC [002312];
- Kilkishen House SAC [002319];
- Clare Glen SAC [000930];
- Silvermines Mountains West SAC [002258];
- Glenstal Wood SAC [001432];
- Keeper Hill SAC [001197];
- Tory Hill SAC [000439];
- Poulmagordon Cave (Quin) SAC [000064];

- Askeaton Fen Complex SAC [002279];
- Lough Gash Turlough SAC [000051];
- Silvermine Mountains SAC [000939];
- Newgrove House SAC [002157];
- Curraghchase Woods SAC [000174];
- Bolingbrook Hill SAC [002124]; and
- Old Domestic Building (Keevagh) SAC [002010].

Therefore, these EU sites have been 'Screened Out' at Stage One of the Appropriate Assessment process as it can be objectively concluded that effects (if any) will not be significant in relation to these 16 European Sites.

European Sites Screened In for detailed examination at Stage 2 of the AA process: The results of the screening are also that **it cannot be excluded, on the basis of best scientific knowledge and objective evidence, that the Proposed Development, individually or in combination with any other plan or project, will have a significant effect on any of the following four European Sites (three SACs, one SPA):**

- Lower River Shannon SAC [002165];
- Danes Hole, Poulnalecka SAC [000030];
- Ratty River Cave SAC [002316]; and
- River Shannon and River Fergus Estuaries SPA [004077].

These sites and affiliated QI or SCI with their conservation objectives were examined in detail in relation to each of the identified impacts that have been screened in for the Stage 2 Appropriate Assessment, and a Natura Impact Statement has been prepared – see AA Report 2023, which accompanies the application.

7.4.1.5 Ramsar Sites

Ramsar sites are classified under the Convention on Wetlands of International Importance. There are no Ramsar sites within 15km of the Proposed Development. The nearest Ramsar Site is Ballyallia Lough (Site number: 845) which is 18.9km away from the Proposed Development. Due to separation distance, and the inexistence of hydrological and hydrogeological pathways between the Proposed Development and this, or any other, Ramsar site, it is considered that the potential for significant effects arising as a result of the Proposed Development can be excluded. Therefore, Ramsar sites are not considered further herein.

7.4.1.6 National Sites – Natural Heritage Areas

Natural Heritage Areas (NHA) are fully protected under the Wildlife (Amendment) Act 2000, although proposed NHAs (pNHA) will not have legal protection until the consultative process with the relevant landowners and authorities has been completed;

a lengthy process taking many years and is ongoing for all pNHAs, these pNHAs are given the same sensitivity as a receptor on a precautionary basis

The Proposed Development does not overlap an NHA or pNHA boundary. The Gortacullin Bog NHA is located adjacent to the western boundary of the Proposed Development. The grid connection and IPP connection route, of which both elements are included within the Proposed Development, does not overlap an NHA or pNHA boundary.

As outlined in **Table 7.11**, there are nine NHAs and 33 pNHAs within 15 km ZoI of the Proposed Development (see **Appendix 7.4, Figure 7.15**).

Of the three NHAs and pNHAs with connectivity to the Proposed Development, two are significantly downstream and share conservation objectives with the previously screened-in European sites.

Both the Inner Shannon Estuary - South Shore pNHA & the Fergus Estuary and Inner Shannon, North Shore pNHA are greater than 16 km downstream making any significant effects from the grid connection element of the Proposed Development unlikely to occur.

However, one NHA has direct connectivity and ecological connectivity with potential for significant effects to its conservation objectives.

National Sites Screened-in for Environmental Impact Assessment: The results of the screening are that the Proposed Development has potential, via impact pathways, to cause effects to the following National Site (NHA):

- Gortacullin Bog NHA [002401]

Gortacullin Bog NHA is of national importance for its peatland raised bog habitat. This site hosts Blanket Bog that is confined to the lower slopes of the centre and eastern part of the site with wet heath occupying the drier areas on slightly higher ground. There is a large flush in the north part of the site and regenerating cutover bog with scrub woodland occurs in the south-centre. Given the proximity of Gortacullin Bog NHA to the Proposed Development, further assessment of potential effects is required regarding this nationally designated site. There is no published Conservation Objective for its singular Qualifying Interest, Peatland [4].

7.4.2 Terrestrial Habitats

7.4.2.1 Habitats within the Proposed Development Area

The planning boundary for the Proposed Development primarily comprises two areas covering 292 ha: the Western DA (covering 153 ha), and the Eastern DA (covering approximately 139ha). The habitats on-site in 2023, as per Fossitt (2000), predominantly comprise conifer plantation, transitional woodland scrub, mixed forest, pasture, agricultural lands and peatlands. The Proposed Development site also includes land allocated for associated elements including the IPP connection route and the turbine delivery route (see **Appendix 7.2**). Habitats identified on-site and their Fossitt codes (Fossitt, 2000) are outlined in **Table 7.13** below, and shown in **Figure 7.2 - Figure 7.8**.

Table 7.13: Baseline habitats within the Proposed Development, with a 500 m buffer

Fossitt Code	Area_(ha)
BL3 Buildings and artificial surfaces	16.697
BL3/ ED2 Buildings and artificial surfaces/ Spoil and bare ground	0.113
BL3/ ED3 Buildings and artificial surfaces/ Recolonising bare ground	0.095
BL3/ GA1 Buildings and artificial surfaces/ Improved agricultural grassland	0.917
BL3/ GA2 Buildings and artificial surfaces/ Amenity Grassland	11.62
BL3/GA2/WD5 Buildings and artificial surfaces/ Amenity Grassland/ Scattered trees and parkland	0.632
BL3/ GS4 Buildings and artificial surfaces/ Wet grassland	0.251
BL3 /WS1 Buildings and artificial surfaces/ Scrub	0.188
BL3 /WS2 Buildings and artificial surfaces/ Immature Woodland	0.891
ED2 Spoil and bare ground	0.38
ED2/GM1 Spoil and bare ground/ Marsh	0.703
ED3 Recolonising bare ground	0.364
GA1 Improved agricultural grassland	51.406
GA1/GS4 Improved agricultural grassland/ Wet Grassland	0.266
GA1/WS1 Improved agricultural grassland/ Scrub	2.637
GM1 Marsh	0.34
GS1/GS3 Dry calcareous and neutral grassland/ Dry-humid acid grassland	0.035
GS2 Dry meadows and grassy verges	0.786
GS3/HH1	0.590
GS2/HD1 Dry meadows and grassy verges/ Dense bracken	0.066
GS3 Dry-humid acid grassland	5.764
GS3/GS4 Dry-humid acid grassland/ Wet grassland	1.039
GS3/GS4/HH1 Dry-humid acid grassland/ Wet grassland/ Dry siliceous heath	0.033
GS3/HH1 Dry-humid acid grassland/ Dry siliceous heath	0.59
GS3/WS1 Dry-humid acid grassland/ Scrub	5.302
GS4 Wet grassland	30.02
GS4/HH2 Wet grassland/ Dry calcareous heath	0.199
GS4/HH3 Wet grassland/ Wet heath	0.154
GS4/HH3/PB2 Wet grassland/ Wet heath/ Lowland blanket bog	0.075
GS4/PB2 Wet grassland/ Lowland blanket bog	0.299
GS4/WS1 Wet grassland/ Scrub	3.064
HD1 Dense bracken	0.122
HD1/WS1 Dense bracken/ Scrub	0.593
HH3 Wet heath	14.058

HH3/WD4 Wet heath/Conifer plantation	3.044
HH3/WS1 Wet heath/Scrub	1.11
WD1 (Mixed) broadleaved woodland	2.156
WD2 Mixed broadleaved woodland/ conifer plantation	1.984
WN6 Wet willow-alder-ash woodland	1.374
WD3 (Mixed) conifer woodland	1.168
WD4 Conifer plantation	62.186
WD4/WS1 Conifer plantation/Scrub	2.74
WS1 Scrub	13.234
WS1/WD2 Scrub/ Mixed broadleaved woodland/ conifer plantation	0.023
WS1/WS2 Scrub/ Immature woodland	1.436
WS2 Immature woodland	0.584
WS3 Ornamental/non-native shrub	0.431
WS5 Recently-felled woodland	10.46
Fossitt Code	Length (m)
BL1 Stone walls and other stonework	1029.05
BL2 Earth banks	4935.04
BL2/WL1 Earth banks/ Hedgerows	791.96
BL2/WL1/WL2 Earth banks/ Hedgerows/ Treelines	251.86
BL2/WL2 Earth banks/ Treelines	329.27
FW1 Eroding/upland rivers	97.63
FW4 Drainage ditches	3553.18
WL1 Hedgerows	7836.29
WL1/WL2 Hedgerows/ Treelines	7094.51
WL2 Treelines	5461.43

7.4.2.2 Buildings and artificial surfaces (BL3)

This broad category incorporates areas of built land that do not fit elsewhere in the classification. It includes all buildings (domestic, agricultural, industrial and community) other than derelict stone buildings and ruins (see stone walls and other stonework - BL1). It also includes areas of land that are covered with artificial surfaces of tarmac, cement, paving stones, bricks, blocks or astroturf (e.g., roads, car parks, pavements, runways, yards, and some tracks, paths, driveways and sports grounds). This habitat consists of existing roads within the Proposed Development, IPP connection route and grid connection route, the area is 16.453 ha.

This habitat forms mosaics with habitats including amenity grassland (11.62ha), improved agricultural grassland (0.93 ha), scattered trees and parkland (0.63ha), wet grassland (0.25 ha) and immature woodland (0.87 ha). These mosaic habitats collectively occur along the grid connection route, IPP connection route and TDR.

7.4.2.3 Spoil and bare ground (ED2)

This category includes heaps of spoil and rubble, and other areas of bare ground that are either very transient in nature or persist for longer periods of time because of ongoing disturbance or maintenance. Spoil is generally associated with the excavation

or construction of roads and buildings, or with drainage and dredging activities. Once the disturbance ends, spoil is readily colonised by plants. This habitat occurs within the Proposed Development site, adjacent to T1, 86 m north of T7 and adjacent to the grid connection route, this land cover has an area of 0.38 ha.

7.4.2.4 *Recolonising bare ground (ED3)*

This category is used for any areas where bare or disturbed ground, derelict sites or artificial surfaces of tarmac, concrete or hard core have been invaded by herbaceous plants. Vegetation cover should be greater than 50% for inclusion in this category. Most of the typical colonisers are ruderals or opportunistic plants. Common species identified include perennial ryegrass (*Lolium perenne*) and nettle (*Urtica dioica*). This habitat occurs within proposed site roads, adjacent to T7 and adjacent to the IPP connection route and TDR, the area of this habitat is 0.36ha.

7.4.2.5 *Improved agricultural grassland (GA1)*

This category is used for intensively managed or highly modified agricultural grassland that has been reseeded and/or regularly fertilised and is now heavily grazed and/or used for silage making. It includes regularly reseeded monoculture grasslands and ryegrass leys that are planted as part of an arable rotation. Species identified include perennial ryegrass, creeping buttercup (*Ranunculus repens*), broad leaved dock (*Rumex obtusifolius*), white clover (*Trifolium repens*), thistle (*Cirsium spp.*) and nettle. This habitat occurs predominantly along the IPP connection route/TDR and 93m south of T7. This habitat has a total area of 51.64 ha.

This habitat forms mosaics with other habitats including wet grassland (0.26 ha) and scrub (2.64 ha).

7.4.2.6 *Dry meadows and grassy verges (GS2)*

Dry meadows that are rarely fertilised or grazed and are mown only once or twice a year for hay are now rare in Ireland. Most have been improved for agriculture and this type of grassland is now best represented on grassy roadside verges, on the margins of tilled fields, on railway embankments, in churchyards and cemeteries, and in some neglected fields or gardens. These areas are occasionally mown (or treated with herbicides in the case of some railway embankments), and there is little or no grazing or fertiliser application. This pattern of management produces grasslands with a high proportion of tall, coarse and tussocky grasses such as False Oat-grass (*Arrhenatherum elatius*) and Cock's-foot (*Dactylis glomerata*). This habitat occurs along the margins of existing roads adjacent to the IPP connection route/TDR, 0.79ha in total.

This habitat forms mosaic habitats with dense bracken (*Pteridium spp.*), occurring along the IPP connection route and TDR (0.78ha).

7.4.2.7 *Conifer Plantation (WD4)*

Conifer plantation within the Proposed Development includes areas that support dense stands of planted conifers, with a broadleaved component of less than 25%. The overriding management interest for these areas is commercial timber production. This

habitat is characterised by even-aged stands of trees planted in regular rows, often forming angular blocks. Species diversity is low and single species stands are common. Blocks of conifer plantation are present throughout the receiving environment including within the Proposed Development. The most dominant species of conifer identified was Sitka spruce (*Picea sitchensis*). Occurrences of this habitat include the footprints of all turbines and the grid connection route. This habitat covers a combined area of 62.03 ha.

7.4.2.8 Scrub (WS1)

This broad category includes areas that are dominated by at least 50% cover of shrubs, stunted trees or brambles. The canopy height is generally less than 5m, or 4m in the case of wetland areas. Scrub frequently develops as a precursor to woodland and is often found in inaccessible locations, or on abandoned or marginal farmland. In the absence of grazing and mowing, scrub can expand to replace grassland or heath vegetation. Trees are included as components of scrub if their growth is stunted as a result of exposure, poor soils or waterlogging. Species identified within the habitat include bramble (*Rubus fruticosus agg.*), nettle, gorse (*Ulex europaeus*), willow (*Salix spp.*), common hazel (*Corylus avellana*) and thistle (*Cirsium spp.*). Scrub habitat is prominent within the Western DA, other areas of where this habitat occurs include adjacent to the IPP connection route, TDR and grid connection route, this habitat has a total area of 12.80 ha.

This habitat forms mosaic habitats which include wet heath, which is present within the Western DA: specifically, between T5 and T6, 163 m east of the proposed on-site substation, and in the vicinity of T10. This habitat covers a combined area of 1.11 ha.

Scrub forms a mosaic habitat with wet grassland, which occurs adjacent to the proposed site roads located within the Proposed Development, 250 m north of T4, adjacent to the eastern boundary of the Western DA and adjacent to the IPP connection route, TDR and the grid connection route. It also forms a mosaic habitat with dense bracken (HD1) adjacent to the grid connection route (0.25 ha). This habitat covers a combined area of 3.2 ha.

7.4.2.9 Immature woodland (WS2)

Immature woodland includes areas that are dominated by young or sapling trees that have not yet reached the threshold heights (5m, or 4m in the case of wetland areas) for inclusion in the woodland categories previously described. Recently planted areas and young plantations are also included here, with the exception of conifer plantations - WD4. This habitat occurs adjacent to the grid connection route, the area of this habitat is 0.58 ha.

7.4.2.10 Ornamental/non-native shrub (WS3)

This category is used for areas that are dominated by ornamental and non-native shrubs. Most of these originate from planting and can be found in formal beds and borders in gardens, parks and other landscaped areas. It also includes areas where non-native shrubs have escaped and become naturalised in urban and rural situations.

This habitat occurs adjacent to the footprint of the IPP connection route and TDR. The area of the habitat is 0.05ha.

7.4.2.11 Stone walls and other stonework (BL1)

This category incorporates stone walls and most other built stone structures in rural and urban situations, apart from intact buildings (see buildings and artificial surfaces - BL3) and coastal constructions made of stone. This habitat is located 265 m south of the proposed on-site substation. The total length of this habitat is 1021.48 m.

7.4.2.12 Earth banks (BL2)

Earth banks are a common type of field boundary in many parts of Ireland. Constructed from local materials such as peat, earth, gravel or stone, these narrow linear ridges are often bordered by drainage ditches. Most are completely vegetated when intact and feature elements of a range of habitats, including grassland, heath, hedgerow and scrub. This habitat occurs along the IPP connection route/TDR, grid connection route and adjacent to existing roads at the entrance of the Proposed Development. The total length of the habitat is 4886.24 m.

Earth banks form mosaics with other habitats including hedgerows and treelines (1373.80 m), occurring along the IPP connection route/TDR and grid connection route. These habitats have significant overlap with aforementioned non-mosaic Earth banks habitat.

7.4.2.13 Eroding/upland rivers (FW1)

This category includes natural watercourses, or sections of these, that are actively eroding, unstable and where there is little or no deposition of fine sediment. Eroding conditions are typically associated with the upland parts of river systems where gradients are often steep, and water flow is fast and turbulent. Rivers in spate are included. For some rivers on the seaward side of coastal mountains, particularly in the west of Ireland, eroding conditions persist to sea level because of comparatively steep gradients over short distances, and high rainfall. Small sections of other lowland rivers may also be eroding where there are waterfalls, rapids or weirs. The beds of eroding/upland rivers are characterised by exposed bedrock and loose rock. Pebbles, gravel and coarse sand may accumulate in places, but finer sediments are rarely deposited. An unnamed river is located on the Western DA 72.5 m east of T7. The total length of the habitat is 84.10 m.

The Oatfield River (EPA Code: 25O07) (1040.85 m) and Snaty River (EP Code: 25S34) (918.21 m) are both located within the Proposed Development site (Western DA), running through it.

7.4.2.14 Drainage ditches (FW4)

This category includes linear water bodies or wet channels that are entirely artificial in origin, and some sections of natural watercourses that have been excavated or modified to enhance drainage and control the flow of water. This habitat occurs within the Western DA, adjacent to T4 and T7, the on-site substation and intersecting with the grid connection route. The total length of the habitat is 2431. m.

7.4.2.15 Hedgerows (WL1)

Linear strips of shrubs and occasionally low scrub, often with occasional trees, typically forming field boundaries. Common species identified within this habitat include willow, ash (*Fraxinus excelsior*), hawthorn (*Crataegus monogyna*), gorse and bracken.

This habitat is present throughout the Proposed Development, including the IPP grid connection route, TDR and grid connection route. Hedgerows extend for a total length of 7782.18 m.

7.4.2.16 Treelines (WL2)

Narrow rows or single lines of trees greater than 5m in height and typically occurring along field boundaries. Common species identified include ash, sycamore (*Acer pseudoplatanus*), ivy (*Hedera helix*) and downy birch (*Betula pubescens*).

This habitat occurs throughout the Proposed Development, including areas adjacent to proposed site roads and crossing the footprint of T4. Treelines delineate other elements of the Proposed Development including the grid connection route and proposed IPP connection route/TDR. The total length of this habitat is 6516.29 m.

7.4.2.17 Hedgerows/Treelines (WL1/WL2)

A mosaic of these two aforementioned linear habitats is present along the footprint of the grid connection route and the IPP connection route/TDR. The total length of this habitat is 5769.13 m.

7.4.2.18 Wet Willow-alder-ash Woodland (WN6)

Includes woodlands of permanently waterlogged sites that are dominated by Willows (*Salix* spp.), Alder (*Alnus glutinosa*) and/or Ash. This habitat is present within the footprint of T8 and 166 m southeast of T4, and is also present along the grid connection route. This habitat covers a combined area of 0.52 ha.

7.4.2.19 Wet Heath (HH3)

Vegetation with at least 25% cover of dwarf shrubs on peaty soils and shallow wet peats with an average depth of 15-50cm. Species identified include cross-leaved heath (*Erica tetralix*) (>5%), common heather (*Calluna vulgaris*) (>5%), bell heather (*Erica cinerea*) (15%), gorse (10%), purple moor grass (*Molinia caerulea*) (80%), bog asphodel (*Narthecium ossifragum*) (>5%) and *Sphagnum* spp. (40%). This habitat corresponds to Appendix I habitat, 'northern Atlantic wet heaths with *Erica tetralix* (4010)'.

This habitat occurs within the footprints of T2-T3 and T5-T11, and adjacent to proposed site roads and the IPP connection route and TDR. This habitat covers a combined area of 14.06 ha.

7.4.2.20 Dry siliceous heath (HH1)

Dry siliceous heath can be found on flat to steeply sloping ground in upland and lowland areas. This habitat was identified on the eastern boundary of the Western DA, the area

of the habitat is 0.23 ha. It forms a mosaic habitat with dry-humid acid grassland along the IPP connection route, the area of this habitat is 0.59 ha.

7.4.2.21 Upland Blanket Bog (PB2)

Upland blanket bog occurs on flat or gently sloping ground above 150 m. The 150 m limit serves to distinguish upland from lowland blanket bog but is loosely applied. Peat depths vary and normally fall in the range of 1-2 m. This habitat occurs along the western boundary of the Eastern DA, 77 m west of T11 and is located within the Gortacullin Bog NHA. This habitat forms a mosaic with wet grassland and wet heath. The total area of these habitats is 1.04 ha.

7.4.2.22 Wet Grassland (GS4)

Occurs on wet or waterlogged mineral or organic soils that are poorly drained or subject to periodic flooding. Species identified include perennial ryegrass, soft rush (*Juncus effusus*), thistle (*Cirsium spp.*), nettle, common St. Johnswort (*Hypericum spp.*), creeping buttercup, tormentil (*Potentilla erecta*), white clover, devil's bit-scabious (*Succisa pratensis*) and yarrow (*Achillea millefolium*). Wet grassland is present within the footprints of T3-T5, T7 and T10, and within the footprint of the proposed on-site substation and site roads. Significant areas are present adjacent to the IPP connection route/TDR, the northern boundary of the Eastern DA and the southern boundary of the Western DA. Wet grassland is also present along the grid connection route. This habitat covers a combined area of 29.13 ha.

7.4.2.23 (Mixed) Broadleaved Woodland (WD1)

Areas of woodland with 75-100% cover of broadleaved trees and 0-25% cover of conifers which cannot be classified as semi-natural, with a minimum canopy height of 4m. This habitat is located adjacent to the IPP connection route/TDR, the grid connection route and the footprint of T10, covering a total area of 2.16 ha.

7.4.2.24 Mixed Broadleaved/conifer Woodland (WD2)

Includes woodland areas with mixed stands of broadleaved trees and conifers, where both types have a minimum cover of 25% and a maximum cover of 75%, and canopy height is at least 4m. Species identified include sycamore, beech (*Fagus salivation*), hawthorn, yew (*Taxus baccata*), ivy (*Hedera hibernica*) and cherry laurel (*Prunus laurocerasus*).

This habitat was recorded adjacent to the IPP connection route/TDR and within the Proposed Development site adjacent to site roads south of T5. This habitat covers a combined area of 1.96 ha.

7.4.2.25 (Mixed) Conifer Woodland (WD3)

Includes woodland areas with 75-100% cover of conifers that are not conifer plantations (WD4), typically dominated by non-native tree species. This habitat is present along the grid connection route, IPP connection route/TDR and Western DA, 269m south of the proposed on-site substation. This habitat covers a combined area of 1.18 ha.

7.4.2.26 *Dry-humid Acid Grassland (GS3)*

Unimproved or semi-improved grassland occurring on free-draining acid soils that are dry to humid (but not waterlogged). This habitat frequently grades into, or forms mosaics with, dry siliceous heath.

This habitat is present within the footprint of T7, on the northern boundary of the Eastern DA, with an area of 11.47 ha.

This habitat forms mosaics with other habitats including scrub, which occurs within the footprint of proposed site roads south of T7 and west of T3. This habitat is also present within the IPP connection route and TDR. This habitat covers a combined area of 5.29 ha.

A mosaic of dry-humid acid grassland with dry siliceous heath is present along the IPP connection route/TDR, covering a total area of 0.59 ha.

Dry-humid acid grassland recorded within the Proposed Development forms mosaic habitats with wet grassland. This habitat mosaic is present within the footprint of site roads located at the entrance to the Eastern DA. A small section is also located 530 m east of T9. This habitat covers a combined area of 0.84 ha.

Refer to EIAR **Figure 7.2 to Figure 7.8: (see Appendix 7.4)**

7.4.2.27 *Occurrence of Flora Protection Order Species*

No Flora Protection Order species were recorded during habitat walkover surveys.

7.4.2.28 *Occurrence of Invasive Species*

Seven invasive species plants are recorded in the NBDC records for OS Grid reference R56 and R57, within which the Proposed Development site is located. These species are “High Impact Invasive Species” (the Habitats Regulations) and locations of such species are recorded in 2023 are shown on **Appendix 7.4; Figure 7.13**.

Butterfly bush (*Buddleia davidii*) was recorded adjacent to the IPP cable, the closest stand is located 1.5 km southwest of T4. Himalayan Knotweed (*Persicaria wallichii*) was recorded 664 m south of T4.

Japanese Knotweed (*Fallopia japonica*) was recorded within the proposed site roads within the Proposed Development site between T1 and T3 and potentially within other areas of the proposed works as a precautionary assumption.

Common Rhododendron (*Rhododendron ponticum*) was recorded along the IPP connection route.

7.4.2.29 *Importance of Terrestrial Habitats & Sensitivity to Change*

Terrestrial habitats in general, are sensitive to direct land take, pollution, and environmental changes resulting from modification such as increased drainage. Groundwater dependant habitats such as bog and peatland habitats may be sensitive to changes in groundwater regimes or changes in ground water quality. The diversity of habitats is particularly sensitive to encroachment from invasive species which may out-compete local native species. Habitats are also sensitive to human activities such as burning and recreational use.

One habitat of international importance was observed during field surveys: wet heath habitat which corresponds to Appendix I habitat, 'northern Atlantic wet heaths with *Erica tetralix* (4010)'.

This habitat, listed in Annex I of the Habitats Directive, is very limited in extent in Ireland and may be described as having Special Conservation Importance (Fossitt, 2000).

No other habitats equalled County Importance as a result of habitat surveys. Habitats of Local Importance (Higher and Lower Value) are outlined in **Table 7.14**.

Table 7.14: Assessment of habitat importance and identification of Key Ecological Features

Habitat type (Fossitt, 2000)	Evaluation rationale	Importance	KEF (yes/no)
BL3 Buildings and artificial surfaces	Based on possible importance of certain roadside buildings to bats	Local importance (Higher Value)	No
BL3/GA2 Buildings and artificial surfaces / Amenity grassland	Importance to local diversity	Local importance (Lower Value)	
ED2 Spoil and bare ground			
ED3 Recolonising bare ground			
GA1 Improved agricultural grassland			
GS3/WS1 Dry-humid acid grassland / Scrub	Importance to local diversity	Local importance (Higher Value)	No
GS4 Wet grassland	Based on level of value to birds/mammals/amphibians	Local importance (Higher Value)	No
GS4/WS1 Wet grassland / Scrub			
HH3 Wet heath	Based on level of value to birds/mammals/reptiles/amphibians; links to Annex I habitat	County importance	Yes
HH3/WD4 Wet heath / Conifer plantation	Importance to local diversity	Local importance (Higher Value)	No
HH3/WS1 Wet heath / Scrub			
PB2 Upland blanket bog			
WD1 Mixed broadleaved			

Habitat type (Fossitt, 2000)	Evaluation rationale	Importance	KEF (yes/no)
woodland			
WD2 Mixed broadleaved/conifer woodland			
WD4 Conifer plantation	Based on importance to birds/mammals		
WN6 Wet willow-alder-ash woodland	Based on level of value to birds/mammals/reptiles/amphibians		
WS1 Scrub	Based on importance to birds/mammals		
BL1 Stone walls and other stonework	May support a diverse flora with abundant lichens, mosses and ferns and wildlife		
BL2 Earth banks	Importance to local diversity	Local importance (Lower Value)	No
FW1 Eroding/upland rivers	Importance to mammals/amphibians/Leisler's Bats	Local importance (Higher Value)	No
FW4 Drainage ditches			
WL1 Hedgerows	Level of maturity and value to birds and mammals		
WL1/WL2 Hedgerows / Treelines			
WL2 Treelines	Value to bats as commuting pathways and possible day roosts		
BL3/GA2/WD5 Buildings and artificial surfaces/Amenity Grassland/Scattered trees and parkland	Importance to local diversity	Local importance (Lower Value)	No
BL3/GS4 Buildings and artificial surfaces/ Wet grassland	Based on level of value to birds/mammals/reptiles/amphibians	Local importance (Lower Value)	No
BL3/WS2 Buildings and artificial surfaces/ Immature woodland	Importance to local diversity		
ED2/GM1 Spoil and bare ground/Marsh	Based on level of value to birds/mammals/reptiles/amphibians		
GA1/GS4 Improved agricultural grassland/ Wet	Importance to local diversity		

Habitat type (Fossitt, 2000)	Evaluation rationale	Importance	KEF (yes/no)
grassland			
GA1/WS1 Improved agricultural grassland/ Scrub			
GM1 Marsh	Based on level of value to birds/mammals/reptiles/amphibians	Local importance (Higher Value)	No
GS2 Dry meadows and grassy verges	Importance to local diversity	Local importance (Lower Value)	No
GS2/HD1 Dry meadows and grassy verges/ Dense bracken	Importance to local diversity		
GS3 Dry-humid acid grassland	Importance to local diversity		
GS3/GS4 Dry-humid acid grassland/ Wet grassland	Based on level of value to birds/mammals/reptiles/amphibians		
GS3/HH1 Dry-humid acid grassland/ Dry siliceous heath	Importance to local diversity	Local importance (Higher Value)	No
GS3/WS1 Dry-humid acid grassland/ Scrub	Importance to local diversity		
HD1 Dense bracken	Importance to local diversity	Local importance (Lower Value)	No
HD1/WS1 Dense bracken/ Scrub			
WD3 (Mixed) conifer woodland		Local importance (Higher Value)	No
WS2 Immature woodland	Importance to local diversity		
WS3 Ornamental/non-native shrub	Importance to local diversity	Local importance (Lower Value)	No
BL2/WL1 Earth banks/ Hedgerows	Level of maturity and value to birds and mammals	Local importance (Higher Value)	No
BL2/WL1/WL2 Earth banks/ Hedgerows/Treelines			
BL2/WL2 Earth banks/Treelines			

7.4.2.30 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

The present survey forms a baseline classification of habitats on or near the Proposed Development. No previous habitat information at a suitable scale is available from which trends can be identified or changes evaluated.

7.4.2.31 Receiving Environment (the Baseline + Trends)

It is assumed in this report that the baseline environment in relation to Terrestrial Habitats, as identified above, will be the receiving environment at the time of construction and during the operational and decommissioning phase .

7.4.3 Invertebrates

Although habitats were suitable for a narrow assemblage of other common and widespread invertebrate species, targeted invertebrate surveys were only undertaken for Marsh Fritillary butterfly (*Euphydryas aurinia*) comprising walkover surveys undertaken to identify the presence of Marsh Fritillary webs in September 2023.

7.4.3.1 Survey Results & Occurrence of Suitable Habitat

The Marsh Fritillary butterfly is the only Irish insect legally protected and listed on Annex II of the EU Habitats Directive. Marsh Fritillary has a wide distribution across Ireland, but the distribution is patchy and it is still considered overlooked in some parts of its range. Colonies can be found in a variety of habitats including calcareous grassland, degraded bogs, wet heath, transition mires and fens up to 300m. (Regan *et al.*, 2010). No Marsh Fritillary was recorded during the larval webs survey; however, suitable larval web habitat was recorded. Devil's Bit Scabious was recorded in patches within and adjacent to proposed site roads within the Western DA. A significant patch of Devil's Bit Scabious was recorded 366 m east of T9, and isolated patches were recorded within the footprint of proposed site roads and adjacent to the south boundary of the Eastern DA (see **Appendix 7.5; Appendix 7.4, Figure 7.10**). Marsh Fritillary was recorded 38 times within the OS grid squares, the latest of which was recorded on 30/06/2017 (see **Appendix 7.2**).

Suitable Marsh Fritillary habitat was recorded during the field surveys both within and in close proximity to the Proposed Development site (see **Appendix 7.4, Figure 7.10**) and recent desk study records in the local area results in Marsh Fritillary being included for further consideration as a Key Ecological Receptor on a precautionary basis.

7.4.3.2 Importance of Invertebrates

Under the Red List of Irish Butterflies, the Marsh Fritillary is categorised as 'Vulnerable' (IUCN Irish Status; Regan *et al.*, 2010), meaning it is considered at high risk of extinction. The Marsh Fritillary has a wide but patchy distribution across Ireland. It has experienced a population decline due to a decrease in the amount of suitable habitat. Marsh Fritillary is evaluated as being of International Importance, which is equivalent to a Very High sensitivity rating. No Marsh Fritillary was recorded during field surveys, however, suitable habitat was identified within and surrounding the Proposed Development, any occurrence of the species would be assessed as having County Importance.

The importance of Marsh Fritillary in relation to the Proposed Development is outlined in **Table 7.21**.

7.4.3.3 *Sensitivity to Change*

The Marsh Fritillary has a restricted diet in Ireland as the caterpillars are 'monophagous', meaning that they feed only on one plant, Devil's-bit Scabious. Marsh Fritillary only breed where Devil's-bit Scabious grows, however, healthy populations will only be found where suitable habitat quality is provided by good sward structure. Marsh Fritillary live in metapopulations. This is where one main population is supported by smaller subpopulations. These subpopulations will go through periods of local extinctions, contracting to the main population and then recolonising areas. These periodic colonisations can be due to weather, the abundance of Devils-bit Scabious and/or parasitism of the species by wasps. During periods of local extinctions, it is important that the habitat quality is maintained so the Marsh Fritillary can recolonise the area when populations increase again. If during the periodic extinctions the habitat quality becomes unsuitable, the Marsh Fritillary will not recolonise the area. The population dynamics of the Marsh Fritillary means that land management needs to be implemented at a landscape scale even if there are some areas that are not currently inhabited by the Marsh Fritillary.

Marsh Fritillary is sensitive to habitat loss, directly through land take or indirectly through compaction from vehicular movement. Individuals are considered to be sensitive to vibrations on a precautionary basis. At the webbing stage larvae are sensitive to habitat disturbance and direct mortality from contact with machinery. Marsh fritillary habitat is sensitive to land cover change from drainage regime modification, the application of nutrients, higher intensities of grazing, the introduction of invasive species and alteration of physical structure. At a landscape level habitat fragmentation may affect population function at a larger scale (Asher et al., 2001).

7.4.3.4 *Trends in the Baseline Environment (the 'Do-Nothing' scenario)*

The species is classified as vulnerable due to a population decline of ≥ 30 percent (A2c) in the Irish Red List for Butterflies (Reagan et al., 2010). Its conservation status is classified as least concern in a European context (Van Swaay et al., 2010).

According to Ireland's most recent Article 17 report (NPWS, 2019) as required under the EU Habitats Directive 92/43/EEC, the species was assessed as having an 'Inadequate' conservation status with an 'Improving' conservation trend. There has been genuine spread into areas where there have not been previous records.

Within the Article 17 report, the range was assessed as 'favourable', the population was assessed as 'favourable', habitat was assessed as 'favourable' and future prospects as 'inadequate' with a qualifier of improving.

Given the trends presented above, a scenario in which this Proposed Development does not take place would result in a continuation of current trends relating to Marsh Fritillary, within the study area, in line with the improvement cited above in respect of future prospects.

7.4.3.5 Receiving Environment (the Baseline + Trends)

It is assumed in this report that the baseline environment in relation to invertebrates, particularly Marsh Fritillary, as identified above, will be the receiving environment at the time of construction given the short time period likely to elapse in the interim.

7.4.4 Amphibians & Reptiles

Walkover surveys were conducted to determine the presence and suitability of habitats for amphibians and reptiles on site.

Taking into account the species distribution of amphibians and reptiles in Ireland, suitable habitat exists within the study area for Smooth Newt (*Lissotriton vulgaris*), Common Frog (*Rana temporaria*), and Common Lizard (*Zootoca vivipara*).

7.4.4.1 Survey Results & Occurrence of Suitable Habitat

The majority of the Proposed Development site consists of highly modified habitat of improved agricultural grassland and non-native conifer plantation, limiting its potential suitability for Smooth Newt (*Lissotriton vulgaris*), Common Frog (*Rana temporaria*) and Common Lizard (*Zootoca vivipara*). As a consequence, while suitable habitat does exist for Smooth Newt (long grass, woodland, scrubland, woodpiles, rotting logs), for Common Frog (wet grassland, scrub and drains), and for Common Lizard (wet heath, bogs, acid grassland), this habitat is not extensive and tends to occur in isolated patches within the much more extensive areas of less suitable habitat (i.e. improved agricultural grassland and commercial forestry plantation).

Surveys conducted during 2023 resulted in no sightings of amphibians and reptiles at the Proposed Development site. However, according to the NBDC records relating to OS grid R56 and R57; 30 sightings for Common Frog, six sightings of Smooth Newt and two sightings of Common Lizard have been recorded (see **Appendix 7.2**). While the Smooth Newt sighting was recorded in 22/01/2020, the most recent sighting of Common Frog was recorded on 26/03/2023. The latest sighting of Common Lizard was on 13/05/2020 (see **Appendix 7.2**).

Due to the presence of suitable habitat, though limited in its distribution, for both amphibians and reptile species recorded during field surveys within the Proposed Development, these species are included for further consideration as Key Ecological Receptors on a precautionary basis.

7.4.4.2 Importance of Amphibians & Reptiles

All amphibian and reptile species in Ireland are protected under the Wildlife Act. All amphibians and reptiles present are evaluated as of Local Importance (Higher Value).

Smooth Newt

Smooth Newt is the only species of tailed amphibian found in Ireland. Smooth newts are protected in Ireland under Schedule 5 of the Wildlife Act. In addition to protection under the Wildlife Act, the species is also afforded additional protection under Appendix III of the Bern Convention.

Common Frog

Common Frog is one of only three amphibians found in Ireland. In addition to protection under the Wildlife Act, the Common Frog is also listed on the Annex V of the Habitats Directive.

Common Lizard

Common Lizard is Ireland's only native species of reptile. It is protected under the Wildlife Act.

The importance of amphibians and reptile species in relation to the Proposed Development is outlined in **Table 7.21**.

7.4.4.3 Sensitivity to Change

Amphibians and reptiles are sensitive to direct mortality, including at the larval stage (frogs and newts), habitat loss (in particular wetland drainage and infilling; also excessive clearance of vegetation around breeding sites), habitat fragmentation and disturbance through visual intrusion, noise and vibration. Populations of amphibians and reptiles are evaluated as Low Sensitivity receptors.

Smooth Newt

Smooth Newt is a species of 'Least Concern' (IUCN Irish Status). Excluding habitat, the key factors affecting Newt presence appear to be the presence of fish, frogs and carnivorous birds. Increasing percentage cover of submerged vegetation is associated with the declining probability of newt presence (O'Neil et al., 2004). Fish predate on Smooth Newt eggs and larvae, so their presence is likely to be inversely correlated with newt presence. Carnivorous birds found in water may also predate newt larvae, and so may decrease the probability of Newts occurring at a site where they occur.

Common Frog

Common Frog is a species of 'Least Concern' (IUCN Irish Status). Common Frog is an extremely adaptable species. Given the widespread, abundant and adaptable nature of the species, no significant pressures or threats have been identified (Reid et al, 2014, NPWS, 2019b).

A total of 2% of the total land area of Ireland was estimated to be suitable as Frog breeding habitat during the 2010/11 survey (Reid et al. 2013). However, it should be noted that any area may be suitable for Frogs outside the breeding season as no habitats appear to be avoided. Reid et al. (2014) concluded that the Common Frog appears largely unaffected in Ireland by pollution and disturbance.

Common Lizard

Common Lizard is a species of 'Least Concern' (IUCN Irish Status). The species is sensitive to habitat loss and habitat fragmentation, they are also subject to predation by many predators including kestrels, stoats, foxes and cats (King *et al.*, 2011). Water pollution is also considered as another significant pressure.

7.4.4.4 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

No population estimate is available for the Smooth Newt but it is thought to be stable. The national Irish survey of smooth newts undertaken by the Irish Wildlife Trust in 2012

following a pilot study in 2010 found that the smooth newt remains relatively widespread throughout Ireland.

Although locally distributed, the species can be abundant where it occurs (King et al., 2011). The Smooth Newt has a conservation status of least concern in a European, Irish and Global context (King et al., 2011). There is no population estimate available for Ireland and therefore, there is no evidence to illustrate the current population status.

Common Frog

Common Frog is a widespread and very abundant species in Ireland. The number of adults (approximately) is derived from the national survey conducted in 2010/2011: population density was calculated as 15-44 adult frogs/ha, extrapolating to a national population estimate of c.165M (104-310M) (NPWS, 2019b). It is found throughout the country, has a broad habitat niche and is adaptable to changes in land practices. The species has colonised garden ponds in urban areas and drainage ditches in agricultural areas. The Common Frog was assessed as having a 'Favourable' conservation status and 'Stable' trend within the National Frog survey of Ireland 2010/11 (NPWS, 2019b). Despite the losses of ponds and natural wetland habitats, Common Frog throughout the country has adapted to other breeding sites, in particular artificial field margin ditches which are common across the landscape. On this basis, the availability of suitable habitat is considered to have remained stable over both the short term and the long term (NPWS, 2019b). Its conservation status is classified as least concern in a European, Irish and Global context (King *et al.*, 2011).

Smooth Newt

Smooth Newt are widely distributed across Europe. Newts are only found in still or slow moving water so the preservation of ponds, ditches and wetlands is essential to their survival. While smooth newts were scarce in agricultural landscapes the IWT survey revealed that man-made habitats, particularly garden ponds and quarries are now significant components of the newts natural habitat. This species has been recorded as common in most of Ireland (IWT, 2013). Although not technically in decline, it has particular habitat needs and its full distribution is not currently known.

Common Lizard

Common Lizard are widely distributed across Europe and Asia. It is found up to 70° North in Norway, making it the northernmost reptile in the world (Gasc *et al.*, 1997). They are widespread in Ireland, with recent records from all counties, bar Laois and Westmeath (Meehan, 2007). There are records from sea level to mountains (Farren et al., 2010; Marnell, 2002). While there is no population estimate available for Ireland, there is no evidence of a population decline.

7.4.4.5 Receiving Environment (the Baseline + Trends)

It is assumed in this report that the baseline environment in relation to amphibians and reptiles, as identified above, will be the receiving environment at the time of construction and on into the operational and decommissioning phase.

7.4.5 Terrestrial Mammals

The principal habitats within the context of Terrestrial Mammals include improved agricultural grassland which provides foraging habitat, coniferous and deciduous forestry, hedgerows and scrub which provide shelter and locations for breeding and resting.

Mammal surveys were undertaken in August, October and November 2023 (see **Section 7.3.2.15**) for the presence of badgers and other mammals; i.e., well-used pathways, prints/tracks, scat/spraints/droppings, signs of feeding (foraged pine cones, badger snuffle holes) and places of shelter and features or areas likely to be of particular value as foraging resources (NRA 2004). Surveys in November were carried out to study the full extent of the Turbine Delivery Route to identify any areas of high risk to mammals. No records or evidence were observed. Otter surveys were undertaken in August 2023 to assess for the presence of Otter while also recording secondary Otter evidence (e.g., holts) (NRA, 2004). Camera traps were also deployed throughout the site in September and October 2023.

Records from the National Biodiversity Database Centre show the presence of the following mammals recorded within the site of the Proposed Development in OS grid: R56 and R57. Otter (*Lutra lutra*) Pine Marten (*Martes martes*), Badger (*Meles meles*), Red Squirrel (*Sciurus vulgaris*), Irish Hare (*Lepus timidus subsp. hibernicus*), Red Fox (*Vulpes vulpes*), Irish Stoat (*Mustela erminea subsp. hibernica*), Wood Mouse (*Apodemus sylvaticus*), Hedgehog (*Erinaceus europaeus*) and Pygmy Shrew (*Sorex minutus*),

The following mammals classified as 'High Impact invasive Species' (EU Regulation No. 1143/2014 Regulation S.I. 477 (Ireland)) were also reported by the NBDC records in OS grid R56 and R57: American Mink (*Mustela vison*), Fallow Deer (*Dama dama*) and Wild Boar (*Sus scrofa*). 'Medium Impact Invasive Species' in the NBDC records of the study area include European Rabbit (*Oryctolagus cuniculus*) and Bank Vole (*Myodes glareolus*).

The Lower River Shannon SAC (site code: 002165), which is located downstream of the Proposed Development via the grid connection with a terrestrial separation distance of 3.4km and watercourse connection in excess of 13.9km, is designated for Otter.

7.4.5.1 Survey Results & Occurrence of Suitable Habitat for Individual Species

Otter

There are 15 records for Otter (*Lutra lutra*) sightings in the National Biodiversity Data Centre's 10 km square grid references (R56 and R57) within which the main construction works associated with the Proposed Development are located. The last recorded sighting from this record is from 13/01/2014 (see **Appendix 7.2**).

Areas of suitable habitat for Otter, i.e., watercourses with fisheries value, offer potential otter activity in the area of the Proposed Development. The results of mammal surveys and camera trap deployments in the Study Area returned no sightings of Otters.

Records of secondary evidence (e.g., mammal crossing/potential trail into stream/potential couch/rest spot/spraints) were recorded during Otter surveys.

Two mammal crossings were identified within or within close proximity to the Proposed Development site. One mammal crossing was located on the banks of the East Cloontra River (EPA Code: 25E28), 124 m west of the IPP connection route. The second mammal crossing was identified on the banks of the Blackwater (Clare) River (EPA Code: 25B06), 07 m west of the grid connection (see **Appendix 7.4, Figure 7.12; Appendix 7.5**).

Two Otter spraints were identified, one spraint is located on the banks of the Oatfield River (EPA Code: 25O07), 55 m west of the loop-in grid connection. An old spraint, with a very faint smell of otter was recorded within the site boundary, along the banks of the Snaty River (EPA Code: 25S34), 208 m east of T6 (see **Appendix 7.5**).

No Otter were observed during the general mammal walkover survey or designated site surveys throughout the survey period.

Due to secondary evidence of Otter confirmed within or within close proximity to the Proposed Development, it is considered for further consideration as a Key Ecological Feature.

Badger

Suitable habitat for Badger (*Meles meles*) is abundant in the study area, this includes conifer plantation (WD4) and areas of deciduous or mixed woodlands (e.g. WD3) which are near farmland or open habitats (e.g. GA1, GS3).

There are 129 records of Badger in the NBDC OS grids (R56, R57) within which the Proposed Development site is located. The last recorded sighting was 31/06/2016 (see **Appendix 7.2**).

The NBDC records were reinforced by evidence of the presence of Badger identified during the walkover survey. Badger runs, scat and setts were recorded during the mammal survey in conifer plantation habitat (WD4) and dry-humid acid grassland (GS3) within the Proposed Development site. One Badger was recorded foraging 56m southwest of T7. Secondary evidence of Badger was recorded during Badger surveys (mammal runs, foraging snuffle hole, scratching posts, prints) undertaken in August and September 2023 (see **Appendix 7.5**). No badger setts were recorded during the walkover surveys.

Camera traps were also deployed in three locations in August 2023. Trap Camera 19702 was located 99m east of T3, while 19062 was located 35m north of T8. Camera 19075 was located 130m south of T8. The final camera, 19065, was located 442m west of the IPP cable. Camera trap deployments did not return sightings of Badgers. Secondary evidence of Badger was recorded throughout the footprint of the Proposed Development, with high levels of activity detected within the footprint of the Western DA (see **Appendix 7.4, Figure 7.11; Appendix 7.5**).

Due to the confirmed presence of Badger within close proximity to the Proposed Development, and high levels of activity detected based on secondary evidence observed within the Proposed Development, it is considered for further consideration as a Key Ecological Feature.

Irish Hare

There are four sightings of Irish Hare (*Lepus timidus hibernicus*) recorded in the NBDC OS grids within which the Proposed Development is located. The most recent recorded sighting is from 11/02/2015 (see **Appendix 7.2**).

Irish Hares are usually found in peatland areas (e.g., PB2) and pastures (e.g., GA1). Pastures comprise a large area of the grid connection, however, there is very limited habitat available within the Proposed Development area, providing little habitat for the species.

Irish Hare individuals were not identified during the field surveys. Six Irish Hares were identified during camera traps deployed throughout the site (see **Appendix 7.4, Figure 7.12; Appendix 7.5**).

Due to the confirmed presence of Irish Hare within the Proposed Development area, it is considered for further consideration as a Key Ecological Feature.

Pine Marten

There are 28 sightings of Pine Marten (*Martes martes*) recorded in the NBDC OS grids within which the Proposed Development is located (R56, R57). The most recent recorded sighting is from 17/12/2021.

Suitable habitat exists on site for Pine Marten, i.e., forests of coniferous (WD4) or mixed tree species (e.g., WD3). Six Pine Martens were recorded by camera traps in September 2023 within the Proposed Development. One Pine Marten was recorded as an 'incidental sighting' during a re-entry bat survey in September 2023, 635 m south of T9 (see **Appendix 7.4, Figure 7.12; Appendix 7.5**).

Due to the confirmed presence of Pine Marten within the Proposed Development area, it is considered for further consideration as a Key Ecological Feature.

Irish Stoat

Stoat (*Mustela erminea hibernica*) was recorded twice in the NBDC OS grids within which the Proposed Development is located (R56, R57) (see **Appendix 7.2**). No activity or evidence of Irish Stoat was recorded by camera traps or field surveys in the Proposed Development.

Irish Stoats occur in most habitats with sufficient cover and occur most often in wooded areas. There is therefore suitable habitat available for use by the Irish Stoat within the Proposed Development site.

Due to a lack of sightings of Irish Stoat throughout the mammal surveying period, Irish Stoat is not considered for further consideration as a Key Ecological Feature.

Red Squirrel

There are 31 sightings of Red Squirrel (*Sciurus vulgaris*) recorded in the NBDC OS grids within which the Proposed Development is located (R56, R57). The most recent recorded sighting is from 26/01/2023. No activity or evidence of Red Squirrel was recorded by field surveys in the Proposed Development. One Red Squirrel was recorded as an 'incidental sighting' during a breeding wader survey in May 2023, 467 m west of T8 (see **Appendix 7.4; Figure 7.12; Appendix 7.5**). Five sightings of squirrel species were recorded during camera trap surveys undertaken in November 2023,

however, the exact species of squirrel could not be verified due to poor camera resolution.

Due to the confirmed presence of Red Squirrel within the Proposed Development area it is considered for further consideration as a Key Ecological Feature.

Red Fox

There are two sightings of Red Fox (*Vulpes vulpes*) recorded in the NBDC OS grid R56 within which the Proposed Development is located. The most recent recorded sighting is from 14/01/2018 (see **Appendix 7.2**). Foxes are highly adaptive mammals that can inhabit any type of land area, from woodland (e.g. ,WD4) to urban areas (e.g., BL3). Secondary evidence of Red Fox was identified during the field surveys such as footprints 95m north of T7 and 125m south of T7 during a mammal walkover survey. Camera traps deployed throughout the site captured nine sightings of Red Fox (see **Appendix 7.5**).

Due to the fact that Red Fox is a common species in Ireland, with no protection status and widely available habitat surrounding the Proposed Development to offset potential habitat loss, it is not considered for further consideration as a Key Ecological Feature.

Hedgehog

According to the NBDC records, 11 Hedgehog (*Erinaceus europaeus*) sightings have been recorded in the study area; the most recent being 01/08/2022 (see **Appendix 7.2**). Secondary evidence of Hedgehog (scats) was recorded during mammal surveys in January 2022. No evidence of Hedgehogs was captured as a result of camera trap deployment. However, potential habitat for hedgehogs exists in areas of scrub (WS1), open grasslands (e.g. GA1) and hedgerows (WL1).

Due to a lack of sightings of Hedgehog throughout the mammal surveying period, it is not considered for further consideration as a Key Ecological Feature.

Pygmy Shrew

Pygmy Shrew (*Sorex minutus*) were recorded six times within the NBDC 10 km Grid Square covering the Proposed Development site (R56, R57) (see **Appendix 7.2**). No evidence of Pygmy Shrew was observed on the site nor were any captured as a result of camera trap deployment. However, potential habitat for Pygmy Shrew exists at areas of deciduous woodlands (e.g., WD1) and open grasslands (e.g., GA1).

Due to a lack of sightings of Pygmy Shrews throughout the mammal surveying period, it is not considered for further consideration as a Key Ecological Feature.

Red Deer

Red Deer (*Cervus elaphus*) were not recorded within the NBDC 10 km Grid Square covering the Proposed Development site. No evidence of Red Deer was observed on the site nor were any captured as a result of camera trap deployment. A total of 14 Red Deer were observed as 'incidental sightings' during Breeding Waders, Breeding Hen Harrier and VP surveys in May, August and September 2023, respectively. Secondary evidence was recorded in the form of footprints located along the footprint of the proposed site roads and two mammal runs located 180 m and 200 m south of T10 (see

Appendix 7.5). Furthermore, potential habitat for Red Deer exists at woodlands (e.g., WD1, WD4) and open grasslands (e.g., GA1).

Due to high numbers of Red Deer recorded during field surveys, secondary evidence indicating utilisation of the Proposed Development footprint and availability of habitat, Red Deer is not considered for further consideration as a Key Ecological Feature.

7.4.5.2 *Importance of Terrestrial Mammals & Sensitivity to Change*

Badgers

Badgers are legally protected under the Wildlife Acts . Local populations of Badger are evaluated as Local Importance (Higher Value), which is equivalent to Low sensitivity.

Otters

Otters are protected under the Wildlife Acts and are listed on Annex II and IV of the EU Habitats Directive. Otter is also listed as a qualifying interest of the Lower River Shannon SAC and, hence, is evaluated as of International Importance, which is equivalent to a Very High sensitivity rating.

Red Squirrel

Red Squirrel are protected under the Wildlife Acts . Local populations of Red Squirrel are evaluated as Local Importance (Higher Value), which is equivalent to Low sensitivity, due to their protection under the Wildlife Act.

Pine Marten

Pine Marten are protected under the Wildlife Acts and Annex V of the EU Habitats Directive. Local populations of Pine Marten are evaluated as Local Importance (Higher Value), which is equivalent to Low sensitivity, due to their protection under the Wildlife Act.

Irish Stoat

Irish Stoat are protected under the Wildlife Acts . It is considered to be underrepresented in research to date (Marnell, 2019). Local populations of Irish Stoat are evaluated as Local Importance (Lower Value), which is equivalent to Low sensitivity, due to their protection under the Wildlife Act.

Irish Hare

The ecological and cultural value of the Irish hare in Ireland gives it intrinsic value. This led to the formation of the Irish Hare All-Ireland Species Action Plan in 2005 (National Parks and Wildlife Service and Environment & Heritage Service, 2005), aiming to maintain and increase the area and quality of suitable Hare habitat throughout the island (Reid *et al.*, 2007). Local populations of Irish Hare are evaluated as of Local Importance (Higher Value), which is equivalent to Low sensitivity.

Red Fox

Red Fox is not legally protected due its widespread distribution and abundance throughout the island, where it has been the subject of predator control for centuries.

As the Red Fox is not protected under the Wildlife Act it is therefore evaluated as Local Importance (lower Value) and does not require further evaluation.

Hedgehog

Hedgehog are protected under Appendix III of The Bern Convention and under the Wildlife Act (1976).. Local populations of Hedgehog are evaluated as Local Importance (Lower Value), which is equivalent to Low sensitivity, due to their protection under the Wildlife Act.

Pygmy Shrew

Pygmy Shrew are protected under the Wildlife Act but has been listed as of Least Concern in the recent Red List for terrestrial mammals in Ireland. Due to this status and as no Pygmy Shrews have been recorded as a result of surveys or on NBDC since 2012, it is therefore evaluated as Local Importance (Lower Value) and does not require further evaluation.

Red Deer

Red Deer is protected under the Wildlife Act (1976) but has been listed as of Least Concern in the recent Red List for terrestrial mammals in Ireland. Red Deer has been recorded as a result of surveys and local populations of Red Deer are evaluated as of Local Importance (Lower Value), which is equivalent to Low sensitivity.

The importance of mammal species in relation to the Proposed Development is outlined in **Table 7.21**.

7.4.5.3 Sensitivity

The conservation status of each of the protected species recorded or assumed to be present in the study area was obtained from the International Union for Conservation of Nature (IUCN) red list, the Habitats Directive Article 17 Reporting, and the NPWS 2009 Red List for Mammals. According to the IUCN Red List: all mammals recorded/assumed to be present are listed as 'Least Concern', with the exception of Otter which is listed as 'Near Threatened'.

According to Habitats Directive Article 17 Reporting: Otter, Pine Marten and Irish Hare are all listed as having 'Favourable' conservation status. According to the Irish (NPWS, 2019b) Red List: Otter, Badger, Red Squirrel, Red Fox, Pine Marten, Irish Hare and Hedgehog are classified as 'Least Concern' in Ireland (Marnell et al., 2019). Otter is classified as "Near Threatened" on a European and Global Scale.

All mammals are sensitive to the direct effects of disturbance/displacement from breeding and foraging ranges as a result of noise and visual intrusion. Some species show variable or flexible responses such as Otter where research from English Nature (Chanin, 2013) indicates that Otters will rest under roads, in industrial buildings, close to quarries, and at other sites close to high levels of human activity. Mammals are also sensitive to habitat loss and additive mortality from inadvertent contact with operating machinery or vehicles.

Badger

Badgers are susceptible to anthropogenic threats, such as illegal persecution (snaring, hunting with dogs, disturbance of setts) and road casualties (NPWS, 2019b). Bovine

tuberculosis is present in the Irish badger population. Roadkill analysis from specimens in the North suggests an infection rate of 15% (Courcier et al., 2018) however, a wide range of localised differences occur. Badger removal programmes in response to TB outbreaks in cattle have been operated by the Department of Agriculture in Republic of Ireland. A Badger vaccine programme is gradually being rolled out since 2019 but culling is still in practise in some areas and in extreme cases of TB (DAFM, 2020).

Badger setts are sensitive to land take/machinery operations within 50 m of sett location due to the potential for inadvertent disturbance and/or mortality with distances increasing to 150 m if activities such as piling or blasting are proposed (none in this instance). Habitat loss greater than 25% of any social group's territory size is deemed as significant (NRA). Disturbance to foraging individuals may occur from construction noise and visual intrusion especially during periods of night-time working. Habitat loss or the construction of significant barriers may also dissect territories. Badgers may also be killed or injured by road traffic as they attempt to access foraging areas.

Otter

Otters require aquatic prey and safe refuges where they can rest in order to survive. The main threats to the otter include pollution – particularly organic pollution resulting in fish kills; and accidental deaths (e.g. collision with road traffic). Disturbance to riverbank habitat also negatively impacts otters (Marnell *et al.*, 2019).

Red Squirrel

Due to their close association with forest habitat, red squirrels are severely impacted by deforestation; its abundance is directly related to woodland availability. Red squirrels invariably lose out to grey squirrel populations in broadleaf and mixed woodland habitat, due to competition and the impact of squirrel pox virus, which is carried by the grey squirrel (Marnell *et al.*, 2019).

Red Deer

Sensitivities include loss of woodland and open moorland habitat (Marnell *et al.*, 2019), other threats include hybridisation with sika deer, although this does not occur at the levels first feared (Marnell *et al.*, 2019).

Red Fox

Sensitivities include being hunted throughout Ireland for sporting or livestock protection purposes. However, it is unlikely to have a significant effect on the general population, although activities such as spotlight shooting with rifles may have significant local effects. Sarcoptic mange may exert a significant influence on urban populations. *Trichinella* has also confirmed as present in Irish Red Fox population but at very low levels (Zimmer et al., 2009). None of these pressures have sources from the Proposed Development site.

Pine Marten

The main threats to Pine Marten populations include land use change, forest management practices such as harvesting, habitat fragmentation, inbreeding, illegal persecution either through generic poisoning or deliberate killing and destruction of forest/scrub habitat for development. Pine Marten is susceptible to habitat loss and human persecution in Ireland (O'Mahoney et al., 2012).

Irish Stoat

The main threat to Irish Stoat populations is local persecution by gamekeepers due to the perceived threat to game birds. However, the Irish Stoat is considered to be underrepresented in research to date and population estimates for Ireland are not available (Marnell *et al.*, 2019).

Irish Hare

Agricultural intensification is leading to some reduction in habitat quality and a number of related threats have been identified, but the hare has a broad habitat niche, so the impacts of these changes on habitat extent and quality are unknown (NPWS, 2019b). Other threats include invasive species, roads and motorways, urbanised areas/human habitation, and hunting, along with habitat loss and fragmentation leading to isolation and inbreeding. Climate change is also identified as a threat, affecting competitive relationships between Irish Hare and Brown Hare species. Such competition is present on the Island of Ireland where Brown Hare has established presence in the North of the Island (NBDC, 2022).

Hedgehog

Hedgehogs are vulnerable to pesticides used in gardens, and many are killed by eating poisoned slugs. Severe winters may kill hibernating hedgehogs, and not reaching a sufficient weight before hibernating is also fatal. Many hedgehogs are recorded from roadkill deaths, although this is not thought to be impacting their populations. Recent reports of global loss of invertebrates could signify a major threat to their food supply (Eisenhauer *et al.*, 2019).

Otter

Otters was previously assessed as Near Threatened in Ireland (Marnell *et al.*, 2019) based on a 20-25% decline between 1980 and 2005 (Bailey & Rochford, 2006). However, more recent data showing population recovery and widespread distribution, justify the improved assessment of least concern (Reid *et al.*, 2013; NPWS, 2019). The most recent national survey indicated a full recovery and an adult population size in the order of 16-22,000 individuals (Reid *et al.*, 2013).

Ireland remains a stronghold for the Otter – the most recent distribution data show that the otter is widespread throughout Ireland in a wide variety of habitat types. The overall status of otter is considered to be favourable (NPWS, 2019b). A total of 44 SACs have been designated for otter comprising of river channels, coastline habitats, lakes and blanket bog systems (NPWS, 2019b).

Badger

Badgers were previously assessed as of least concern in Ireland and have remained at this classification (Marnell *et al.*, 2019). Despite localised removals for Tuberculosis management, badgers remain widespread, in a broad range of habitats. Irish badgers have stable population, estimated in Northern Ireland as 33,500 (Reid *et al.*, 2008) and in the Republic of Ireland as 84,000 (Sleeman *et al.*, 2009).

Pine marten

Pine marten was previously assessed as least concern (Marnell et al., 2019). Expert opinion and survey data from 2005-07 (O'Mahony et al., 2012) 2012 (Lawton et al., 2015) and 2010- 2015 (O'Mahony, 2016) confirms a range expansion and continued status of least concern.

The species was formerly widespread in Ireland but declined in the 17th century with the deforestation of the country. Pine martens suffered further in the 19th and early 20th centuries due to persecution by gamekeepers and trappers. However, the species is now undergoing a phase of re-colonisation. It has greatly increased its range in recent decades and although its population is still low, it is rising. The animal's resurgence is largely attributed to the banning of strychnine and other poisons, the legal protection afforded the species since 1976 under the Wildlife Acts and the steady increase in afforestation. There is ample habitat available across the country to allow the species to continue its spread and to allow the population to expand as well. While some threats have been identified, none of them are considered sufficiently serious to undermine the continued recovery of the species. Therefore, the Overall Status of the Pine Marten is assessed as Favourable, unchanged since the previous reporting period (NPWS, 2019).

Irish Stoat

The Irish Stoat is a species of Least Concern on a national, European and international scale (Marnell et al., 2019). Due to a lack of research data, no population estimates are available for the Irish Stoat but there is no evidence of decline. The population density of Irish Stoat is variable and dependent on the density of available food.

The Irish Stoat is a subspecies of *Mustela erminea* and is restricted to Ireland and the Isle of Man (Martinkova et al., 2007). It is widespread throughout Ireland, with records from every county. The distribution of the Irish Stoat is locally limited only by the availability of suitable cover and sufficient food (Sleeman, 2016).

Red Squirrel

The Red Squirrel was previously assessed as 'near threatened' due to a 20% decline in range in Ireland since the introduction of the grey squirrel (Marnell et al. 2009). Recent surveys, however, have shown the red squirrel has expanded its range once again in the midlands of Ireland, following the loss of grey squirrels in those areas (Lawton et al., 2015). This recovery, plus the overall widespread distribution across the island of Ireland justify a change of status to least concern.

The population of the red squirrel was previously estimated at 40,000 individuals (NPWS & EHS, 2008); the current figure may be higher in correlation with the recent range expansion (NPWS, 2019).

Red Deer

The Red Deer was previously assessed as least concern (Marnell et al., 2009). Several populations across the island of Ireland and widespread global population of least concern justify this assessment.

There is no national census available, but the population appears stable after a recent expansion (Carden et al., 2011). The distribution of the Red Deer is mainly across Europe. In Ireland, established populations are present in Donegal, Galway, Kerry and

Wicklow, with smaller scattered populations in most other counties. Very large expansion between 1978 and 2008 (Carden et al., 2011) appears to have stabilised in the last ten years.

Red Fox

Previously assessed as least concern (Marnell et al., 2009). Widespread distribution, presence in broad range of habitats and the European status of least concern justify current Irish assessment. It occurs throughout much of the Northern Hemisphere and is widespread in Europe. It is distributed throughout Ireland and found in all counties (Looney, 2016). Accurate statistics are not available, but the breeding population is estimated at 150,000 to 200,000 (Hayden & Harrington, 2000). There is no evidence of a decline.

Irish Hare

Comprehensive distribution and abundance data is available for this species. Irish hare was previously assessed as least concern (Marnell et al., 2019). Its widespread distribution and large population justify retention of this assessment.

The range for this species covers nearly the entire landmass of Ireland including some offshore islands. Despite natural inter-annual fluctuations in population density, the animal is widespread and in places abundant. The Overall Status of the hare is Favourable (NPWS, 2019).

Hedgehog

Hedgehog was previously assessed as least concern (Marnell et al., 2019). The widespread range across Ireland, increased records and the European status of least concern justify this assessment.

In other areas of its distribution, it has been found to be on the decline; in Ireland it is uncertain whether this is also the case. A report on the state of Britain's mammals in 2011 stated that while the hedgehog population was estimated at 30 million in the 1950s, by the 1990s this had declined to 1.5 million (Haigh *et al.*, 2012a; Haigh *et al.*, 2012b).

7.4.5.4 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

Available trends on general Irish mammals are limited however the most recent 'Red List' (Marnell et al., 2019) has judged most of Ireland's terrestrial mammal species to be of 'least concern'.

7.4.5.5 Receiving Environment (the Baseline + Trends)

It is assumed in this report that the baseline environment in relation to Non-Volant Mammal species, as described herein, will be the receiving environment at the time of construction with ongoing trends as identified expected to be reflected during the operational and decommissioning phase.

7.4.6 Bats

The landscape surrounding the Proposed Development is predominantly improved agricultural land and forestry, with hedgerows/treelines along roadsides. The aims of the bat surveys were to assess the bat roost suitability of bridges, buildings and mature trees that could be directly affected and identify potential indirect effects on bats, e.g., from disruption of commuting routes, or lighting. This was carried out through preliminary roost assessments of buildings and suitable trees and watercourse crossing structures such as bridges and culverts (see **Section 7.3.2.19**).

Bat Activity Surveys at the Proposed Development site were undertaken using automated Anabat Express bat detectors and these provided a good representation of bat species present and their activity during their most active periods.

Transect surveys were also carried out on site to determine site usage by bats.

The results of the bat activity surveys indicate that the area of the Proposed Development is used regularly (High Activity) by Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*) and Leisler's Bat (*Nyctalus leisleri*) (**Table 7.19**).

Lesser Horseshoe (*Rhinolophus hipposideros*), an Annex II species, was also recorded during bat activity surveys at Negligible to Low levels of activity (**Table 7.19**).

Due to the frequency of records, Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat and Lesser Horseshoe Bat are considered to be key ecological receptors herein. Natterer's Bat, *Myotis* spp., Nathusius' Pipistrelle and Brown Long-eared Bat are also considered further.

7.4.6.1 Desktop Studies

The Proposed Development is located in OS grid squares R56 and R57. Records for bats species recorded on the National Bat Database of Ireland in these squares was obtained from National Biodiversity Data Centre (NBDC) online mapping. In 2023, the species recorded on the NBDC database within R56 and R57 were: Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Brown Long-eared Bat, Daubenton's Bat, Leisler' Bat and Lesser Horseshoe Bat. The legal protection and conservation status of these species is outlined in **Table 7.16**.

Table 7.15: Legal Protection and Conservation Status of the bat species found within OS grid squares R56 and R57

Bat Name	Legal Protection	Conservation Status (Marnell <i>et al.</i> 2019)
Common Pipistrelle (<i>Pipistrellus pipistrellus</i>)	EU Habitats Directive Annex IV, Wildlife Acts	Least Concern
Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	EU Habitats Directive Annex IV, Wildlife Acts	Least Concern
Leisler's Bat (<i>Nyctalus leisleri</i>)	EU Habitats Directive Annex IV,	Least Concern

Bat Name	Legal Protection	Conservation Status (Marnell et al. 2019)
	Wildlife Acts	
Brown long-eared bat (<i>Plecotus auritus</i>)	EU Habitats Directive Annex IV, Wildlife Acts	Least Concern
Daubenton's Bat (<i>Myotis daubentonii</i>)	EU Habitats Directive Annex IV, Wildlife Acts	Least Concern
Natterer's Bat (<i>Myotis nattereri</i>)	EU Habitats Directive Annex IV, Wildlife Acts	Least Concern
Nathusius Pipistrelle (<i>Pipistrellus nathusii</i>)	EU Habitats Directive Annex IV, Wildlife Acts	Least Concern
Lesser Horseshoe Bat (<i>Rhinolophus hipposideros</i>)	EU Habitats Directive Annex II, Annex IV, Wildlife Acts	Least Concern

7.4.6.2 Data Validity

A full suite of surveys was conducted in 2023 of the Proposed Development site. Based on the CIEEM Advice Note on the Lifespan of Ecological Reports & Surveys (CIEEM, 2019), up to date robust surveys have been conducted within the last year. Hence the survey data/results are valid to inform the impact assessment of the turbines on bat populations.

7.4.6.3 Roost Survey Results

Preliminary Roost Assessments were carried out throughout the Proposed Development site to assess the likelihood of bats being present at various structures, i.e., , trees, bridges and watercourse crossings).

The results of the PRA undertaken in the Proposed Development site can be found below in **Table 7.16**.

Table 7.16: Preliminary Roost Assessment results of trees with roosting potential of the Proposed Development 2023

Code	ITM Grid Ref		Description	Rating
Trees				
	X	Y		
TR1	557463	670564	Deciduous tree, some ivy	Low
TR2	556884	669972	Some ivy, beside track	Low
TR3	556876	669916	Two holes on northern face. Deciduous, beside track.	Moderate
TR4	556918	669854	Broken branch on north and south with open gaps. Along	Moderate

Code	ITM Grid Ref		Description	Rating
			track.	
TR5	556925	669834	Holes on east side by road. Broken branch on west.	Moderate
TR6	556925	669782	Holes on north and south faces. Along track.	Moderate
TR7	557156	670023	Ivy, beside gate	Low
TR8	557122	670094	Ivy covered, treeline along stream.	Low
TR9	556642	671482	Ivy, beside field.	Low
TR10	556728	671480	Ivy, beside stream.	Low
TR11	556736	671510	Hole on east side. Beside stream.	Moderate
TR12	556751	671521	Ivy covered.	Low
TR13	554039	668007	Large, ivy cover, holes on south face.	Moderate
TR14	553979	668139	Some ivy, along road.	Low
TR15	553959	668396	Dead tree, in cow field.	Low
TR16	554922	669061	Along treeline, deciduous.	Low
TR17	554804	668809	Moss on trunk, beside track.	Low

Preliminary Bat Roost Assessment surveys were conducted in 2023 and key features such as trees and bridges were evaluated for their suitability as roosting sites. Surveys carried out in 2023 identified seventeen sites (all trees) in the vicinity of the Proposed Development. These sites were surveyed to establish the presence or absence of the bat roosts, distance to turbines due to their potential for significant effect and evaluate their importance (if present). The results of these surveys are summarised below in **Table 7.17**.

Table 7.17: Roost Survey Results 2023

Location Code	Dawn Survey	Dusk Survey	Importance Evaluation	Closest Turbine (& Distance (m))
TR3	8 instances of Soprano Pipistrelle were recorded. No bats were observed entering or exiting the tree. All bats were	43 instances of Common Pipistrelle recorded. 8 instances of Soprano Pipistrelle were recorded. No bats were observed entering or exiting the tree.	Local (higher value)	T7 (385m)

Location Code	Dawn Survey	Dusk Survey	Importance Evaluation	Closest Turbine (& Distance (m))
	displaying commuting/foraging behaviour. 29/09/2023.	All bats were displaying commuting/foraging behaviour. 04/07/2023.		
TR4	5 instances of - Common Pipistrelle and 23 Soprano Pipistrelle were recorded. 2 Soprano Pipistrelle were observed re-entering at TR4. All remaining bats were displaying commuting/foraging behaviour. 14/09/2023.	1 instance of Soprano Pipistrelle was recorded. The bat was observed displaying commuting behaviour, possibly emerging from the tree. 05/07/2023.	County	T7 (393m)
TR5	1 instances of Leisler's Bat , 5 Myotis spp. , 9 Natterer's bat , and 136 Soprano Pipistrelles were recorded. No bats were observed entering or exiting the tree. All instances of bats were observed displaying commuting/foraging behaviour and social calls. 12/09/2023. -	5 instances of Common Pipistrelles , 2 Leisler's Bat , and 17 Soprano Pipistrelles were recorded. No bats were observed entering or exiting the tree. All instances of bats were observed displaying foraging behaviour. 11/07/2023.	Local (higher value)	T7 (406m)
TR6	1 instances of Common Pipistrelle , 5 Leisler's Bat , 1 Myotis spp. , and 25 Soprano Pipistrelles were recorded. No bats were observed entering or exiting the tree. All instances of bats were observed displaying commuting/foraging behaviour. 26/09/2023.	18 instances of Common Pipistrelle were recorded. 1 instance of Leisler's Bat was recorded. 14 instances of Soprano Pipistrelle were recorded. No bats were observed entering or exiting the tree. No bats were observed entering or exiting the tree. All bats were observed displaying commuting/foraging behaviour. 11/07/2023.	Local (higher value)	T7 (131m)
TR11	7 instances of Common Pipistrelle , 2 Leisler's Bat , 2 Myotis spp. , and 9 Soprano Pipistrelles were	1 instance of Common Pipistrelle , 2 Leisler's Bat , and 27 instances of Soprano Pipistrelle were recorded. 1 Common Pipistrelle and 2 Soprano Pipistrelle were observed	County	T10 (411m)

Location Code	Dawn Survey	Dusk Survey	Importance Evaluation	Closest Turbine (& Distance (m))
	recorded. No bats were observed entering or exiting the tree. All instances of bats were observed displaying commuting/foraging behaviour. 06/09/2023	emerging from TR11. All remaining bats were observed displaying commuting/foraging behaviour. 21/08/2023.		
TR13	6 instances of Common Pipistrelle , and 1 Soprano Pipistrelle were recorded. No bats were observed entering or exiting the tree. All bats were observed displaying commuting/foraging behaviour. 07/09/2023.	6 unknown bat species were recorded. -1 instances of Brown Long-eared Bat , 28 Common Pipistrelle , 4 Leisler Bat , 1 Nathusius' pipistrelle , 11 Natterer's Bat and 10 Soprano Pipistrelle were recorded. No bats were observed entering or exiting the tree. One bat was observed displaying commuting/foraging behaviour and social calls. 23/08/2023.	Local (higher value)	T4 (454m)
WC3	No dawn survey carried out due to low roosting suitability and no roosting activity recorded	2 unknown bat species were recorded. 10 instances of Common Pipistrelle , 13 Leisler's Bat , 10 Lesser Horseshoe Bat and 19 Soprano Pipistrelle were recorded. No bats were observed entering or exiting the tree. All bats was observed displaying commuting/foraging behaviour. 10/08/2023.	Local (lower value)	T2 (8.9 km)
WC6	-19 instances of Common Pipistrelle , and 13 Soprano Pipistrelles were recorded. No bats were observed entering or exiting the tree. All instances of bats were observed displaying commuting/foraging behaviour. 20/09/2023	30 instances of Common Pipistrelle , 3 Daubenton's Bat , 17 Leisler's Bat , 1 Lesser Horseshoe Bat , 11 Myotis spp. and 26 Soprano Pipistrelle were recorded. No bats were observed entering or exiting the water crossing. All bats were observed displaying commuting/foraging behaviour. 02/08/2023.	Local (higher value)	T2 (7.7 km)
WC22	-2 instances of Common Pipistrelle , and 7	4 instances of Common Pipistrelle , 2 Daubenton's Bat , 6 Leisler's Bat , and	Local (higher value)	T2 (5.4 km)

Location Code	Dawn Survey	Dusk Survey	Importance Evaluation	Closest Turbine (& Distance (m))
	Leisler Bat were recorded. No bats were observed entering or exiting the tree. All instances of bats were observed displaying commuting/foraging behaviour. 21/09/2023	45 Soprano Pipistrelle were recorded. No bats were observed entering or exiting the water crossing. All bats were observed displaying commuting/foraging behaviour. 03/07/2023.		
WC24	No dawn survey carried out due to low roosting suitability and no roosting activity recorded	12 instance of Common Pipistrelle and 4 Soprano Pipistrelle were recorded. No bats were observed entering or exiting the water crossing. All bats were observed displaying commuting/foraging behaviour. 13/07/2023.	Local (lower value)	T4 (693 m)
WC26	3 instances of Brown Long-eared Bat, 3 Common Pipistrelle, 2 Leisler Bat, 1 Lesser Horseshoe Bat and 2 Soprano Pipistrelle were recorded. No bats were observed entering or exiting the tree. All instances of bats were observed displaying commuting/ foraging behaviour. 13/09/2023	3 unknown bat species were recorded. 2 Common Pipistrelle, 1 Daubenton's Bat, 2 Myotis spp. and 1 Pipistrelle were recorded. No bats were observed entering or exiting the water crossing. All bats were observed displaying commuting/foraging behaviour. 09/08/2023.	Local	T4 (1.1 km)
WC33	No dawn survey carried out due to low roosting suitability and no roosting activity recorded	4 instances of Common Pipistrelle were recorded. No bats were observed entering or exiting the tree. All instances of bats were observed displaying commuting behaviour. 10/08/2023.	Local (lower value)	T7 (2.9 km)
WC36	No dawn survey carried out due to low roosting suitability and no roosting activity recorded	6 instances of Common Pipistrelle, 1 Myotis Spp. and 10 Soprano Pipistrelle were recorded. No bats were observed entering or exiting the water crossing. —All bats were observed displaying commuting/foraging behaviour. 19/07/2023.	Local (lower value)	T7 (4.3 km)

Location Code	Dawn Survey	Dusk Survey	Importance Evaluation	Closest Turbine (& Distance (m))
WC37	<p>12 instances of Common Pipistrelle, 9 Leisler Bat, 1 Myotis spp. and 21 Soprano Pipistrelle were recorded. No bats were observed entering or exiting the tree. All instances of bats were observed displaying commuting/foraging behaviour. 28/09/2023-</p>	<p>6 instances of Common Pipistrelle, 4 Myotis spp. and 11 instances of Soprano Pipistrelles were recorded. No bats were observed entering or exiting the water crossing. All bats were observed displaying commuting/foraging behaviour. 19/07/2023.</p>	Local (higher valuer)	T9 (3.5 km)

7.4.6.4 Proposed Development Roost Survey Results

No bats were observed entering or exiting five of the trees surveyed at the Proposed Development site - TR3, TR13, TR5, TR6 - deemed to be of high suitability during emergence and/or re-entry surveys. These sites are evaluated as Local Importance (higher value) due to the presence of bat species and high roosting potential of the sites. No bats were observed entering or exiting any of the eight water crossings surveyed at the Proposed Development site - WC3, WC6, WC22, WC24, WC26, WC33, WC36, WC37 - during emergence and/or re-entry surveys. A total of 793 bats were recorded displaying foraging and commuting behaviour as incidental records during emergence/re-entry surveys. WC3, WC24, WC33 and WC36 are evaluated as being of Local Importance (lower value) due to low roosting suitability. The remaining WC sites are evaluated as being of Lower Importance (higher value) due to higher roosting suitability (see **Appendix 7.6**).

Bats were observed emerging and re-entering from two trees. One Soprano Pipistrelle was recorded displaying commuting behaviour, possibly emerging from TR4 and two Soprano Pipistrelle were observed re-entering at TR4. One Common Pipistrelle and two Soprano Pipistrelle were observed emerging from TR11. These sites are evaluated as having County Importance due to confirmed roosting activity (see **Appendix 7.6**).

No bats were observed entering or exiting TR3 during surveys. Bats displaying foraging and commuting behaviour were observed 51 times at TR3 during one dusk survey, 43 being Common Pipistrelles and eight Soprano Pipistrelles. A total of eight bats were recorded during the dawn survey at TR3, all being Common Pipistrelles. TR3 is evaluated as Local Importance (lower value) due to its potential suitability for roosting bats and as no roosting bats were recorded, however, bats were recorded commuting and foraging in the area.

One Soprano Pipistrelle was observed entering TR4 during a dusk survey. While two Soprano Pipistrelles were observed re-entering TR4 during a dawn survey. Soprano Pipistrelles and Common Pipistrelles were observed foraging and commuting around TR4 during the dawn survey undertaken. TR4 is evaluated as of County Importance due to both its suitable roosting potential and observed roosting behaviour of bats at the

site. As such, TR4 is brought forward as a Key Ecological Receptor for evaluation of potential effects as a result of the Proposed Development.

No bats were observed entering or exiting TR6 during surveys. Bats displaying foraging and commuting behaviour were observed 24 times at TR3 during one dusk survey, five being Common Pipistrelles, 17 Soprano Pipistrelles, and two Leisler bats. A total of 32 bats were recorded during the dawn survey at TR4, including five Leisler Bats, one *Myotis* spp., one Common Pipistrelles and 25 Soprano Pipistrelles. Thirty-three bat species were recorded during the dusk survey at TR4, species include 18 Common Pipistrelles, one Leisler Bat and 14 Soprano Pipistrelles. TR4 is evaluated as Local Importance (lower value) due to its potential suitability for roosting bats and although no roosting bats were recorded, bats were recorded commuting and foraging in the area.

A total of three bats were observed exiting TR11 during a dusk survey undertaken, including one Common Pipistrelle and two Soprano Pipistrelle. Leisler's Bats were recorded commuting/foraging during the dusk survey. Seven Common Pipistrelle, two Leisler's Bat, two *Myotis* spp., and nine Soprano Pipistrelles were also recorded commuting/foraging during the dawn survey at TR11. TR11 is brought forward as a Key Ecological Receptor for evaluation of potential effects as a result of the BWF. TR11 is evaluated as Local Importance (higher value) due to its suitability for bat roosting and the presence of roosting bats.

No bats were observed entering or exiting TR13 during surveys. Bats displaying foraging and commuting behaviour were observed 60 times at TR13 during one dusk survey, six being unknown bat species, one Brown Long-eared Bat, 28 Common Pipistrelle, four Leisler Bat, one Nathusius' pipistrelle, 11 Natterer's Bat and ten Soprano Pipistrelle were recorded commuting/foraging. A total of eight bats were recorded during the dawn survey at TR13, including one Leisler Bat, one Soprano Pipistrelle and six Common Pipistrelle. TR13 is evaluated as Local Importance (lower value) due to its potential suitability for roosting bats and although no roosting bats were recorded, bats were recorded commuting and foraging in the area.

No bats were observed entering or exiting WC3. A total of 107 bats were observed displaying commuting or foraging behaviour around WC3 during dusk surveys undertaken there, all of which were recorded as Common Pipistrelle, Leisler's Bat, Lesser Horseshoe Bat and Soprano Pipistrelle. Common Pipistrelle, Leisler's Bat and Soprano Pipistrelles were recorded at the dawn survey. All 10 recordings of Lesser Horseshoe Bats were observed commuting along WC3. WC3 is evaluated as Local Importance (lower value) due to its potential to provide suitable bat roosting habitat and as no roosting bats were recorded.

No bats were observed entering or exiting WC6. A total of 73 bats were observed displaying commuting or foraging behaviour around WC3 during dusk surveys undertaken there, all of which were recorded as Common Pipistrelle, Daubenton's Bat, *Myotis* spp. and Soprano Pipistrelle. One Lesser Horseshoe Bat was heard commuting during the dusk survey. While Common Pipistrelle and Soprano Pipistrelle were recorded at the dawn survey. WC6 is evaluated as Local Importance (lower value) due to its potential to provide suitable bat roosting habitat and as no roosting bats were recorded.

No bats were observed entering or exiting WC22. A total of 66 bats were observed displaying commuting or foraging around WC3 during dusk surveys undertaken there, all of which were recorded as Common Pipistrelle, Daubenton's Bat, Leisler's Bat and Soprano Pipistrelle. While Common Pipistrelle and Leisler's Bat were recorded at the dawn survey. WC22 is evaluated as Local Importance (lower value) due to its potential to provide suitable bat roosting habitat and as no roosting bats were recorded.

No bats were observed entering or exiting WC26. A total of 16 bats were observed displaying commuting or foraging around WC26 during dusk surveys undertaken there, all of which were recorded as Common Pipistrelle and Soprano Pipistrelle. Eleven bats were recorded during the dawn survey, of which, one Lesser Horseshoe Bat was observed displaying commuting behaviour. WC26 is evaluated as Local Importance (lower value) due to its potential to provide suitable bat roosting habitat and as no roosting bats were recorded.

No bats were observed entering or exiting WC33. A total of four bats were observed displaying commuting or foraging around WC33 during dusk surveys undertaken there, all of which were recorded as Common Pipistrelle. No dawn survey was carried out due to its limited potential to provide suitable bat roosting habitat and as no roosting bats were recorded. WC3 is evaluated as Local Importance (lower value).

No bats were observed entering or exiting WC36. A total of 17 bats were observed displaying commuting or foraging around WC36 during dusk surveys undertaken there, all of which were recorded as Common Pipistrelle, *Myotis* spp. and Soprano Pipistrelle. No dawn survey was carried out due to its limited potential to provide suitable bat roosting habitat and as no roosting bats were recorded. WC3 is evaluated as Local Importance (lower value) due to its potential to provide suitable bat roosting habitat.

No bats were observed entering or exiting WC37. A total of 64 bats were observed displaying commuting or foraging around WC37 during dusk surveys undertaken there, all of which were recorded as Common Pipistrelle, *Myotis* spp. and Soprano Pipistrelle. While Common Pipistrelle, Leisler's Bat, *Myotis* spp. and Soprano Pipistrelle were recorded at the dawn survey. WC37 is evaluated as Local Importance (lower value) due to its potential to provide suitable bat roosting habitat and as no roosting bats were recorded. For detailed Bat activity results within the Proposed Development see **Appendix 7.6**.

7.4.6.5 Fieldwork - Passive Survey Results

Twelve locations were chosen for 2023 passive surveys, covering the 11 turbine locations and the habitats in the surrounding areas. Twelve static detectors were deployed in for 14 nights in spring, 19 nights in summer and 12 nights in autumn. See **Table 7.18** below for passive survey results 2023.

Table 7.18: Bat Activity Passive Survey Results 2023

Season	Turbine Location	Bat Species	Average Bat activity levels
Spring Deployment	T1A	Common Pipistrelle	High
		Soprano Pipistrelle	Low
		Nathusius' Pipistrelle	Nil
		Leisler's Bat	Moderate

Season	Turbine Location	Bat Species	Average Bat activity levels
		Myotis Species	Low
		Brown Long Eared Bat	Negligible
		Lesser Horseshoe Bat	Low
	T1	Common Pipistrelle	High
		Soprano Pipistrelle	Low
		Nathusius' Pipistrelle	Negligible
		Leisler's Bat	Moderate
		Myotis Species	Nil
		Brown Long Eared Bat	Negligible
		Lesser Horseshoe Bat	Negligible
	T2	Common Pipistrelle	High
		Soprano Pipistrelle	High
		Nathusius' Pipistrelle	Moderate
		Leisler's Bat	High
		Myotis Species	High
		Brown Long Eared Bat	Moderate
		Lesser Horseshoe Bat	Low
	T3	Common Pipistrelle	High
		Soprano Pipistrelle	Low
		Nathusius' Pipistrelle	Negligible
		Leisler's Bat	Low
		Myotis Species	Negligible
		Brown Long Eared Bat	Negligible
		Lesser Horseshoe Bat	Nil
	T4	Common Pipistrelle	High
		Soprano Pipistrelle	Low
		Nathusius' Pipistrelle	Moderate
		Leisler's Bat	High
		Myotis Species	Low
		Brown Long Eared Bat	Negligible
		Lesser Horseshoe Bat	Negligible
	T5	Common Pipistrelle	Low
		Soprano Pipistrelle	Negligible
		Nathusius' Pipistrelle	Nil
		Leisler's Bat	Negligible
		Myotis Species	Nil
		Brown Long Eared Bat	Nil
		Lesser Horseshoe Bat	Negligible
	T6	Common Pipistrelle	High
		Soprano Pipistrelle	High
		Nathusius' Pipistrelle	Nil
		Leisler's Bat	Low
		Myotis Species	Negligible
		Brown Long Eared Bat	Negligible
		Lesser Horseshoe Bat	Negligible
	T7	Common Pipistrelle	High
		Soprano Pipistrelle	High
		Nathusius' Pipistrelle	Nil
Leisler's Bat		Moderate	
Myotis Species		Moderate	
Brown Long Eared Bat		Low	
Lesser Horseshoe Bat		Negligible	
T8	Common Pipistrelle	High	

Season	Turbine Location	Bat Species	Average Bat activity levels
		Soprano Pipistrelle	High
		Nathusius' Pipistrelle	Nil
		Leisler's Bat	Low
		Myotis Species	Low
		Brown Long Eared Bat	Negligible
		Lesser Horseshoe Bat	Negligible
	T9	Common Pipistrelle	High
		Soprano Pipistrelle	High
		Nathusius' Pipistrelle	Nil
		Leisler's Bat	Low
		Myotis Species	Moderate
		Brown Long Eared Bat	Moderate
	T10	Lesser Horseshoe Bat	Low
		Common Pipistrelle	High
		Soprano Pipistrelle	High
		Nathusius' Pipistrelle	Nil
		Leisler's Bat	Moderate
		Myotis Species	Low
	T11	Brown Long Eared Bat	Low
		Lesser Horseshoe Bat	Negligible
		Common Pipistrelle	High
Soprano Pipistrelle		Low	
Nathusius' Pipistrelle		Negligible	
Leisler's Bat		Low	
Summer Deployment	T1A	Myotis Species	Low
		Brown Long Eared Bat	Negligible
		Lesser Horseshoe Bat	Nil
		Common Pipistrelle	High
		Soprano Pipistrelle	Negligible
		Nathusius' Pipistrelle	Nil
	T1	Leisler's Bat	Negligible
		Myotis Species	Nil
		Brown Long Eared Bat	Negligible
		Lesser Horseshoe Bat	Nil
		Common Pipistrelle	High
		Soprano Pipistrelle	Low
	T2	Nathusius' Pipistrelle	Nil
		Leisler's Bat	Low
		Myotis Species	Negligible
		Brown Long Eared Bat	Low
		Lesser Horseshoe Bat	Nil
		Common Pipistrelle	High
	T3 No data recorded	Soprano Pipistrelle	Nil
		Nathusius' Pipistrelle	Nil
		Common Pipistrelle	Nil

Season	Turbine Location	Bat Species	Average Bat activity levels
		Leisler's Bat	Nil
		Myotis Species	Nil
		Brown Long Eared Bat	Nil
		Lesser Horseshoe Bat	Nil
	T4	Common Pipistrelle	Moderate
		Soprano Pipistrelle	Negligible
		Nathusius' Pipistrelle	Nil
		Leisler's Bat	Moderate
		Myotis Species	Low
		Brown Long Eared Bat	Negligible
		Lesser Horseshoe Bat	Nil
	T5	Common Pipistrelle	High
		Soprano Pipistrelle	High
		Nathusius' Pipistrelle	Nil
		Leisler's Bat	Low
		Myotis Species	Low
		Brown Long Eared Bat	Low
		Lesser Horseshoe Bat	Nil
	T6	Common Pipistrelle	High
		Soprano Pipistrelle	Low
		Nathusius' Pipistrelle	Nil
		Leisler's Bat	Negligible
		Myotis Species	Low
		Brown Long Eared Bat	Negligible
		Lesser Horseshoe Bat	Negligible
	T7	Common Pipistrelle	High
		Soprano Pipistrelle	High
		Nathusius' Pipistrelle	Negligible
		Leisler's Bat	Low
		Myotis Species	Low
		Brown Long Eared Bat	Negligible
		Lesser Horseshoe Bat	Nil
T8	Common Pipistrelle	High	
	Soprano Pipistrelle	High	
	Nathusius' Pipistrelle	Nil	
	Leisler's Bat	Low	
	Myotis Species	Negligible	
	Brown Long Eared Bat	Negligible	
	Lesser Horseshoe Bat	Nil	
T9	Common Pipistrelle	High	
	Soprano Pipistrelle	High	
	Nathusius' Pipistrelle	Nil	
	Leisler's Bat	Negligible	
	Myotis Species	Low	
	Brown Long Eared Bat	Low	
	Lesser Horseshoe Bat	Nil	
T10	Common Pipistrelle	High	
	Soprano Pipistrelle	Moderate	
	Nathusius' Pipistrelle	Nil	
	Leisler's Bat	Negligible	
	Myotis Species	Negligible	

Season	Turbine Location	Bat Species	Average Bat activity levels	
	T11	Brown Long Eared Bat	Nil	
		Lesser Horseshoe Bat	Nil	
		Common Pipistrelle	High	
		Soprano Pipistrelle	High	
		Nathusius' Pipistrelle	Nil	
		Leisler's Bat	Low	
		Myotis Species	Moderate	
		Brown Long Eared Bat	Negligible	
		Lesser Horseshoe Bat	Negligible	
		Common Pipistrelle	High	
		Soprano Pipistrelle	High	
		Nathusius' Pipistrelle	Negligible	
		Leisler's Bat	Low	
		Myotis Species	Low	
Autumn Deployment	T1A	Brown Long Eared Bat	Low	
		Lesser Horseshoe Bat	Negligible	
		Common Pipistrelle	High	
		Soprano Pipistrelle	High	
		Nathusius' Pipistrelle	Negligible	
		Leisler's Bat	Low	
		Myotis Species	Low	
		Brown Long Eared Bat	Low	
		Lesser Horseshoe Bat	Negligible	
		Common Pipistrelle	High	
		Soprano Pipistrelle	High	
		Nathusius' Pipistrelle	Low	
		Leisler's Bat	High	
		Myotis Species	High	
	Brown Long Eared Bat	High		
	Lesser Horseshoe Bat	Low		
	T2	Common Pipistrelle	High	
		Soprano Pipistrelle	Moderate	
		Nathusius' Pipistrelle	Low	
		Leisler's Bat	Low	
		Myotis Species	Low	
		Brown Long Eared Bat	Nil	
		Lesser Horseshoe Bat	Nil	
		Common Pipistrelle	High	
		Soprano Pipistrelle	High	
		Nathusius' Pipistrelle	High	
		Leisler's Bat	Low	
		Myotis Species	High	
		Brown Long Eared Bat	Nil	
		Lesser Horseshoe Bat	Low	
	T3	Common Pipistrelle	High	
		Soprano Pipistrelle	High	
		Nathusius' Pipistrelle	High	
		Leisler's Bat	Low	
		Myotis Species	High	
		Brown Long Eared Bat	Nil	
		Lesser Horseshoe Bat	Low	
		Common Pipistrelle	High	
		Soprano Pipistrelle	High	
		Nathusius' Pipistrelle	Nil	
		Leisler's Bat	Low	
		Myotis Species	Moderate	
Brown Long Eared Bat		Low		
Lesser Horseshoe Bat		Negligible		
T4	Common Pipistrelle	High		
	Soprano Pipistrelle	High		
	Nathusius' Pipistrelle	Nil		
	Leisler's Bat	Low		
	Myotis Species	Moderate		
	Brown Long Eared Bat	Low		
	Lesser Horseshoe Bat	Negligible		
	Common Pipistrelle	High		
	Soprano Pipistrelle	High		
	Nathusius' Pipistrelle	Nil		
	Leisler's Bat	Low		
	Myotis Species	Negligible		
	Brown Long Eared Bat	Negligible		
	Lesser Horseshoe Bat	Nil		
T5	Common Pipistrelle	High		
	Soprano Pipistrelle	High		
	Nathusius' Pipistrelle	Nil		
	Leisler's Bat	Low		
	Myotis Species	Negligible		
	Brown Long Eared Bat	Negligible		
	Lesser Horseshoe Bat	Nil		
	Common Pipistrelle	High		
	Soprano Pipistrelle	High		
	T6		Common Pipistrelle	High
			Soprano Pipistrelle	High

Season	Turbine Location	Bat Species	Average Bat activity levels
		Nathusius' Pipistrelle	Moderate
		Leisler's Bat	Moderate
		Myotis Species	High
		Brown Long Eared Bat	Nil
		Lesser Horseshoe Bat	Negligible
	T7	Common Pipistrelle	High
		Soprano Pipistrelle	Low
		Nathusius' Pipistrelle	Negligible
		Leisler's Bat	Negligible
		Myotis Species	Nil
		Brown Long Eared Bat	Nil
		Lesser Horseshoe Bat	Nil
	T8	Common Pipistrelle	High
		Soprano Pipistrelle	High
		Nathusius' Pipistrelle	Negligible
		Leisler's Bat	Low
		Myotis Species	Low
		Brown Long Eared Bat	Nil
		Lesser Horseshoe Bat	Negligible
	T9	Common Pipistrelle	High
		Soprano Pipistrelle	High
		Nathusius' Pipistrelle	Nil
		Leisler's Bat	Low
		Myotis Species	Low
		Brown Long Eared Bat	High
		Lesser Horseshoe Bat	Negligible
	T10	Common Pipistrelle	High
		Soprano Pipistrelle	High
		Nathusius' Pipistrelle	Nil
		Leisler's Bat	Low
		Myotis Species	Low
		Brown Long Eared Bat	Nil
		Lesser Horseshoe Bat	Negligible
T11	Common Pipistrelle	High	
	Soprano Pipistrelle	High	
	Nathusius' Pipistrelle	Nil	
	Leisler's Bat	High	
	Myotis Species	Low	
	Brown Long Eared Bat	Low	
	Lesser Horseshoe Bat	Negligible	

7.4.6.6 Fieldwork – Transect Survey Results

Transect surveys provide a snapshot of the use of an area by bats, and compliment passive surveys. The location of transect surveys was designed to include surrounding habitats and features which would be of particular interest to bat species, such as buildings and linear habitats such as watercourses, hedgerows and treelines.

Transect surveys were carried out in Spring, Summer and Autumn 2023. The locations of the transect surveys varied, surveys took place on various footprints such as artificial roads and recolonising bare ground adjacent to other habitats including conifer

plantations, heath and grassland habitats surrounding the proposed turbines. Transect survey results are outlined in **Table 7.20** (see **Appendix 7.6**).

Table 7.19: Transect Survey Results 2023

Transect survey results at the Proposed Development site			
Species recorded	Spring 4 No. transects 4.48km of transects in total	Summer 4 No. transects 4.48km of transects in total	Autumn 4 No. transect 4.48km of transects in total
Common pipistrelle (<i>Pipistrellus pipistrellus</i>)	Frequency: at 4 transects (total of 42 calls)	Frequency: at 4 transects (total of 24 calls)	Frequency: at 3 transects (total of 30 calls)
Soprano pipistrelle (<i>Pipistrellus pygmaeus</i>)	Frequency: at 3 transects (total of 13 calls)	Frequency: at 3 transects (total of 15 calls)	Frequency: at 4 transects (total of 33 calls)
Leisler's bat (<i>Nyctalus leisleri</i>)	Frequency: at 2 transect (total of 3 call)	None	Frequency: at 3 transects (total of 4 calls)
Brown Long-eared bat (<i>Plecotus auritus</i>)	None	None	Frequency: at 1 transect (total of 1 call)
<i>Myotis</i> spp.	None	None	Frequency: at 1 transect (total of 1 call)

7.4.6.7 Summary of Bat Activity from Passive and Transect Surveys

The level of bat calls recorded during the 2023 Bat Transect Surveys was spread across several species. Common Pipistrelle was recorded the most (57.83%), followed by Soprano Pipistrelle (36.75%) and Leisler's Bat (4.22%). Brown Long-eared Bat (0.6%) and *Myotis* spp. (0.6%) were also recorded. It is acknowledged that the classification of *Myotis* spp. from sonograms can be imprecise, so for the purposes of this assessment all *Myotis* spp. records from automated detectors were identified only to genus level. High and Medium levels of bat activity were recorded from across the Proposed Development_study area for Common Pipistrelle, Soprano Pipistrelle, Leisler's bat, *Myotis* spp, Brown long-eared and Nathusius' Pipistrelle, while Low levels of Lesser Horseshoe bat activity was recorded.

7.4.6.8 Importance of Bats & Sensitivity to Change

All bat species, and their breeding/resting places, are legally protected in Ireland under the Wildlife Act . The Wildlife Act is the principal national legislation providing for the protection of wildlife and the control of activities which may adversely affect wildlife. For the purpose of the current evaluation, importance levels are as described under Context (above) in respect of both roosts and locations of activity. All bats are listed in Annex IV of the EU Habitats Directive. This legislation protects bats both inside and outside of the Natura 2000 site network. The Bern Convention ensures that governments take into account the conservation needs of species during the formulation of planning and development policies. It also seeks the protection of endangered species and in relation to bats, it stipulates that all bat species and their habitats are conserved.

The levels of recorded activity of common and widespread species, aligned with the habitat suitability being assessed as Low and Moderate results in the area being assessed as of Local Importance (Higher Value).

The importance of species in relation the Proposed Development is outlined in **Table 7.21**.

7.4.6.9 Sensitivity to Change

The key sensitivities of bats are the destruction or disturbance of their roosting places, and the modification of their commuting routes and foraging habitats (NPWS 2013, Collins, 2023). During the day, bats roost in man-made structures (typically houses, farm buildings and bridges), mature trees, and caves. They can suffer direct effects due to the destruction or modification of their roosts (e.g., the demolition of a house or felling of a tree), or indirect effects due to disturbance of the area surrounding a roost (e.g., illumination of exit / entry points, or removal of surrounding vegetation). They are most sensitive to effects during their maternity and hibernation periods, which are from May to August and November to March, respectively. After sunset, bats ‘commute’ from their roosts to a suitable feeding area and spend most of the night foraging for insect prey. They typically favour linear habitat features (e.g., hedgerows and forest edges) for commuting and foraging, and usually avoid brightly-lit areas (Lundy et al., 2011). They may travel several kilometres from their roost and may use different feeding areas on different nights.

7.4.6.10 Bat Foraging and Flight Behaviour

To facilitate the evaluation of collision risk to the various bat species as a result of the Proposed Development, an overview of the typical flight behaviour of each of the bat species recorded at the Proposed Development site is provided in **Table 7.20**. The abundance and sensitivity to collision of each bat species in Ireland is also provided. The sensitivity to collision of each species is categorised based on physical and behavioural characteristics (SNH, 2019).

Table 7.20: Abundance & Typical Flight Behaviour of Bat Species Recorded at the Proposed Development

Bat Species	Abundance	Flight Behaviour	Sensitivity to collision
Common Pipistrelle	Most common and widely distributed	Rapid, twisting flight generally within 10 to 15m of foliage.	High
Soprano Pipistrelle	Common and widely distributed	Rapid, twisting flight generally within 10 to 15m of foliage.	High
Leisler’s Bat	Common and widely distributed	Relatively high-flying species of open habitats. Potentially within rotor sweep zone.	High
Nathusius’ Pipistrelle	Less common and more localised	Forages over water and along forest tracks.	High
Brown Long-eared bat	Common and widely distributed	Forage in woodland flying amongst the foliage, picking moths and other insects off leaves	Low

Daubenton's bat	Common and widely distributed	Strongly associated within watercourses; low, level flight a few centimetres above the surface of the water	Low
Natterer bat	Less common and more localised	Low flying species within 10 to 15m of foliage forages along woodland, mature hedgerow and pastureland	Low
Lesser Horseshoe Bat	Rarer species	Manoeuvre well, will travel in cluttered habitat, keeps close to vegetation, gaps may be avoided	Low

7.4.6.11 Trends in the Baseline Environment (the 'Do-Nothing' scenario)

Under Article 17 of the Habitats Directive, the Irish government is obliged to assess and report on the conservation status of all habitats and species listed in Annexes I, II, IV and V of the directive, including bats. In the latest submission (NPWS 2019), all Irish bat species are considered to be of favourable conservation status. Most bat species are listed as 'least concern' on the all-Ireland red list of mammals (Marnell et al., 2019), including the Nathusius' Pipistrelle. Leisler's Bat is listed as 'near-threatened' because Ireland supports an internationally important population, but the overall population status of this species is known to be stable or increasing. The abundance of Irish bats is monitored by Bat Conservation Ireland (Roche et al., 2012) using annual public surveys such as the 'Car-Based Monitoring Scheme', the 'All-Ireland Daubenton's Bat Waterways Survey', and roost monitoring assessments for Brown Long-eared Bats and Lesser Horseshoe Bats. In combination, these surveys monitor all Irish species except Natterer's bat and Whiskered bat. To date, the populations of all monitored species appear to be stable or increasing. If the Proposed Development does not proceed, the site is expected to remain in the baseline condition and to be used by bat species on an occasional to regular basis. Based on the national trends of these species, the abundance of bats in the surrounding landscape is expected to remain stable, or to increase at a slow rate.

7.4.6.12 Receiving Environment (the Baseline + Trends)

As the conservation status of all Irish bat species is considered to be stable, it is expected that the baseline levels of bat activity will not change significantly by the time of construction of the Proposed Development.

7.4.7 Aquatic Ecology

7.4.7.1 Field Survey Results

The following outlines the available water quality data for the watercourses in context of the Proposed Development. Only recent water quality (i.e., since 2015) is summarised below.

Owenogarney River

There are contemporary EPA biological monitoring stations located on the Owenogarney River (27O01) in the downstream vicinity of the Proposed Development. At Agouleen Bridge the river achieved Q4 (good status) in 2022. However, at Pollagh

Bridge and Annagore Bridge and Old Mill Bridge (downstream of Sixmilebridge), this station is located 5.4 km west of the Proposed Development site boundary and was assessed for a grid connection no longer part of the planning application. This rating fell to Q3-4 (moderate status) in the same period.

In the vicinity of the Proposed Development site, the Owenogarney River (Owenogarney_030 and _040 river waterbodies) was of good ecological status in the 2016-2021 period. Both river bodies were considered 'not at risk' of failing to achieve good ecological status (WFD Risk 3rd cycle). The Snaty Stream, Clashduff Stream, Gortadroma Stream, Belvoir Stream and Ballyvorgal North Stream are all located within these river waterbodies.

Mountrice River

A single contemporary EPA biological monitoring station is located on the Mountrice River (25M03). The river achieved Q4-5 (high status) at Clogher Bridge in 2021.

The Mountrice River (Mountrice_010 river waterbody) was of good status in the 2016-2021 period, the river waterbody was considered 'not at risk' of failing to achieve good ecological status (WFD Risk 3rd cycle). However, agriculture and forestry are recognised pressures within the wider catchment (EPA, 2022).

River Blackwater

A single contemporary EPA biological monitoring station was located on the River Blackwater in the downstream vicinity of the Proposed Development. At station RS25B060120, downstream of survey site B13, the river achieved Q4 (good status) in 2021.

The upper reaches of the river (Blackwater (Clare)_010 river waterbody) were good status in the 2016-2021 period but were considered 'at risk' of not achieving good ecological status due to significant sediment pressures from agriculture and forestry (EPA, 2022). Downstream of Killaly's Bridge (Survey site B13), the river (Blackwater (Clare)_020 river waterbody) was of moderate status in the 2016-2021 period but was not considered at risk.

Gourna River

A single contemporary EPA biological monitoring station was located on the Gourna River in the downstream vicinity of the Proposed Development. At station RS27G020600, in the lower reaches, the river achieved Q4-5 (high status) in 2021.

The Gourna_010 river waterbody achieved good status in the 2016-2021 period and was considered 'not at risk' of failing to achieve good ecological status (WFD Risk 3rd cycle).

EIAR Figures: (included within Appendix 7.7: Aquatic Ecology attached to this report)

7.4.7.2 Fish Stock Assessment (Electro-Fishing)

A catchment-wide electro-fishing survey of 20 sites (see **Appendix 7.7**) in the vicinity of the Proposed Development was conducted in August and September 2023, following notification to Inland Fisheries Ireland and under DECC licence. The results of the

survey are discussed below in terms of fish population structure, population size and the suitability and value of the surveyed areas as nursery and spawning habitat for salmonids, Eel and lamprey species. A full description of the survey results on fish stocks and local habitats is presented in **Appendix 7.7**.

Salmon

Salmon (*Salmo salar*) is an Annex II species of the EU Habitats Directive, habitat preferences include rivers around the Atlantic coasts of Europe and eastern North America. Salmon is one of the most widespread fish in Ireland and is found in most rivers. Salmon fry and parr require rivers with good water quality, cool temperatures, stony river beds and adequate cover provided by aquatic vegetation.

Salmonid populations were widespread in the vicinity of the Proposed Development with Annex II Salmon recorded at a total of 10 sites on the Owenogarny River, River Blackwater and associated tributaries (see **Appendix 7.7**). The highest salmon parr densities and highest quality habitats were present at sites on the Clashduff Stream, Owenogarny River, Gourná River and the Clovemill Stream, located to the south-west of the Proposed Development (see **Appendix 7.7**). Whilst densities were lower (expected given higher energy/spate characteristics, the River Blackwater and selected tributaries (e.g., Mountrice River) were also of high value as salmon spawning and nursery habitats.

Due to the widespread presence of Salmon surrounding the Proposed Development, with high densities recorded, River Blackwater and Mountrice River provide high value spawning and nursery habitat, as such Salmon is included for further consideration as a Key Ecological Feature.

Brown Trout

Brown Trout (*Salmo trutta*) is a salmonid species most commonly found in streams, rivers and lakes in the country. Brown Trout was recorded in 26 sites, and in some cases were the exclusive species in certain sites (see **Appendix 7.7**).

Due to the widespread presence of the species surrounding the Proposed Development, Brown Trout is included for further consideration as a Key Ecological Feature.

Lamprey

Lamprey species (*Lampetra spp.*) are Annex II species of the EU Habitats Directive.

Sea lamprey (*Petromyzon marinus*) spawn annually in the lower reaches of large rivers in summer in nests called redds, River Lamprey spawn in rivers in mid to late spring in redds. After hatching, these larval lamprey drift downstream until they find a suitable muddy or silty part of the riverbed to burrow into. After about six to eight years, sea lamprey ammocoetes develop eyes and turn silvery, transforming into free-swimming adults as they make their way downstream and migrate to sea. River Lamprey migrate to sea after four years.

Brook Lamprey live exclusively in freshwater and can be found in both large and small river channels, although they are more typically found in smaller rivers. The adults spawn in early summer in redds, the larval lamprey drift downstream until they find a suitable muddy or silty part of the riverbed to burrow into. After about five or six years,

brook lamprey ammocoetes develop eyes and turn silvery, transforming into free-swimming adults.

Ammocoetes were recorded from six sites (see **Appendix 7.7**). With the exception of the survey site at River (Clare) Blackwater on the lower reaches of the Blackwater (12.8 per m²), densities of ammocoetes were low (<1 per m²) and habitats were sub-optimal for *Lampetra* spp. (see **Appendix 7.7**). Only single examples of *Lampetra* spp. transformers were recorded at Knockshanvo Stream and the Island River. *Lampetra* spp. had not been previously recorded at these sites. The restricted distribution in the vicinity of the Proposed Development reflected the upland, higher-energy/spate nature of most of the survey watercourses; characteristics which reduce the extent of fine gravels required for spawning and discourages the deposition of fine, organic-rich sediment ≥5cm in depth generally required by larval *Lampetra* spp., no sea lamprey were recorded during the survey. Both sea and river lamprey are known to spawn on the lower Owenagarney River, downstream of Sixmilebridge located 5.4 km west of the Proposed Development site boundary which was assessed for a grid connection no longer part of the planning application (see **Appendix 7.7**).

Given the presence of *Lampetra* spp. during the course of the surveys, though there is restricted distribution, *Lampetra* spp. are included for further consideration as a Key Ecological Feature.

Eel

Eel habitat includes freshwater rivers, where they feed on invertebrates and small fish on the bottom of rivers and lakes. When mature and ready to spawn, eels leave their freshwater habitat and migrate downstream, once in the sea, the eels are believed to travel along ocean currents to cover thousands of kilometres back to the Sargasso Sea to breed.

Eel was widespread but localised in low densities, being recorded at a total of 10 survey sites (see **Appendix 7.7**). The absence of eel from many physically suitable sites (i.e., ample refugia etc.) primarily reflects the upland nature of the majority of surveyed watercourses, which provide sub-optimal eel habitat, as well as known instream barriers in the wider catchments (e.g., Ardnacrusha hydroelectric dam) (see **Appendix 7.7**).

Due to the widespread presence of Eel recorded, Eel is included for further consideration as a Key Ecological Feature.

White-clawed crayfish

White-clawed crayfish is an Annex II species of the EU Habitats Directive. Preferred habitat includes lakes, rivers and streams in limestone districts with firm substrates and moderate productivity levels.

No white-clawed crayfish were recorded via hand-searching or sweep netting of instream refugia during the survey of 56 sites. However, environmental DNA sampling detected the presence of crayfish from the River Blackwater (see **Appendix 7.7**). No crayfish were detected via eDNA in the Broadford River, Owenagarney River or the Gourná River (see **Appendix 7.7**).

Due to the status and secondary evidence of the species recorded during aquatic surveys, White-clawed crayfish is included for further consideration as a Key Ecological Feature on a precautionary basis.

eDNA analysis

As mentioned, White-clawed crayfish eDNA was detected in the composite water sample collected from the lower reaches of the River Blackwater (3 positive qPCR replicates out of 12) (see **Appendix 7.7**). This result was considered as evidence of the species' presence at and/or upstream of the sampling location and supports the historical records for the River Blackwater (NPWS & Triturus data). White-clawed crayfish were not detected in the Broadford River, Owenogarney River or the Gourná River, in keeping with the known distribution of the species in the wider survey area.

Sites on the Owenogarney River, River Blackwater and Gourná River tested positive for crayfish plague (*Aphanomyces astaci*) (2, 1 & 11 positive qPCR replicates out of 12, respectively) (see **Appendix 7.7**). No crayfish plague was detected in the Broadford River (0 positive qPCR replicates out of 12).

Freshwater Pearl Mussel

No Freshwater Pearl Mussel eDNA was detected at the three sampling locations (see **Appendix 7.7**). This result is in keeping with the known absence of records for the species from the respective catchments.

Due to the absence of the species during aquatic surveys, freshwater pearl mussel is not included for further consideration as a Key Ecological Feature.

Biological Water Quality (macroinvertebrates)

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from 56 riverine sites (see **Appendix 7.7**). A total of 14 sites achieved **Q4 (good status)** (see **Appendix 7.7**), and thus met the target good status ($\geq Q4$) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC). Over half of survey sites achieved **≤Q3 (poor status)** in August 2023 (see **Appendix 7.7**). Eutrophication originating from coniferous afforestation and siltation (agriculture) are known to be the major pressures within the survey area and this was supported by observations made during the aquatic surveys.

No macro-invertebrate species are included for further consideration as a Key Ecological Feature.

7.4.7.3 Importance of Aquatic Habitats & Species & Sensitivity to Change

One of the survey sites was evaluated as having **County Importance**, the Owenogarney River, which recorded Otter, an Annex II species and fish populations of county importance notably Salmon, River Lamprey and Sea Lamprey.

None of the remaining aquatic survey sites were evaluated as greater than **local importance (higher value)** (see **Appendix 7.7**).

The remaining 23 survey sites were evaluated as **local importance (lower value)** in terms of their aquatic ecology, primarily due to semi-dry or dry nature of the habitats at the time of survey (see **Appendix 7.7**).

No examples of the Annex I habitats 'Water courses of plain to montane levels with the *Ranunculon fluitantis* and *Callitricho-Batrachion* vegetation and aquatic mosses [3260]' or 'Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]' were recorded at the 21 survey sites. No rare macrophytes or rare aquatic bryophytes were recorded during the survey.

Salmon

The conservation status of Salmon in Ireland is classified as vulnerable (IUCN Irish Status; King *et al.*, 2011) due to a decline in abundance, caused primarily by mortality at sea, habitat loss, barriers to migration, poor water quality, overfishing and sea lice. Salmon juveniles are particularly sensitive to freshwater quality and accessibility.

Brown Trout

Brown Trout is considered to be of Least Concern (IUCN Irish Status; King *et al.*, 2011). However, the species is especially vulnerable to climate change and global warming because it is dependent on an abundance of clear, cold water. As cold water habitats warm, rising temperatures will have negative impacts on a variety of life history phases, from eggs to juveniles to adults. Similar to Salmon, other sensitivities include mortality, habitat loss, barriers to migration, poor water quality, overfishing and sea lice.

Lamprey

The conservation status of Sea Lamprey in Ireland is classified as 'Near Threatened' (IUCN Irish Status; King *et al.*, 2011), and sensitivities include pollution, instream works in river channels and barriers to migration.

River Lamprey and Brook Lamprey are classified as species of Least Concern (IUCN Irish Status), nonetheless, the species is sensitive to pollution, instream works in river channels and barriers to migration.

Eel

Eel is 'Critically Endangered' (IUCN Irish Status; King *et al.*, 2011), and the numbers of juvenile eels reaching the coast have declined dramatically in recent years. Possible reasons for the crash in recruitment include shifts in ocean currents due to climatic changes, mortality at barriers to migration, overfishing, habitat loss, parasites and pollution that affects fertility. One emergent threat is the eel swim-bladder worm, *Anguillicola crassus*. This alien invasive species is a parasitic nematode that infects and damages eels' swim bladders, thereby adversely affecting their swimming performance and ability to migrate.

White-clawed crayfish

The White-clawed crayfish is 'Endangered' (IUCN Global Status; King *et al.*, 2011), the species are particularly susceptible to acute pollution incidents caused by spills of organic material with a high biochemical oxygen demand (BOD), such as cattle slurry or silage, which can cause severe mortality in White-clawed crayfish populations. Another significant threat to White-clawed crayfish is crayfish plague.

A summary of the importance of aquatic species in relation to the Proposed Development is outlined in (Table 7.22).

7.4.7.4 Trends in the Baseline Environment (the 'Do Nothing' scenario)

Salmon

The range of Salmon within Ireland covers a surface area of 61,900km² and is *stable* in the short-term (2007-2018). The long-term trend is not specified (1994-2018) (IFI, 2018).

The population size can vary from large runs in some systems to small numbers of individuals. Population of returning maturing salmon, the primary component of the stock, estimated at approximately 250,000 individuals in recent years has been decline since the mid1970s (King *et al.*, 2011). (I).

White-clawed Crayfish

The range of White-clawed Crayfish within Ireland covers a surface area of 40,200 km² and is *decreasing* in the short-term (2007-2018). However, the range is *increasing* in the long-term (1994-2018) (Gammel *et al.*, 2021).

The population size of the QI species within the range is between 860 and 920 individuals per 1 x 1 km grid square. The short-term trend direction for the population size of the QI species is *decreasing*, while the long-term trend is unknown.

Sea Lamprey

The range of Sea Lamprey within Ireland covers a surface area of 9,500 km² and is *stable* in the short-term (2007-2018). The long-term trend is not specified (1994-2018) (Gallagher *et al.*, 2021).

Based on unpublished redd counts, the distribution of spawning effort and number of redds is low in the SAC channels surveyed (IFI unpublished data). Very low numbers of sea lamprey juveniles have been recorded in the Barrow (King, 2004) and Suir (O'Connor, 2007). However, mean numbers in both the Feale (O'Connor, 2006) and Moy (O'Connor, 2004) exceeded the proposed target level for favourable conservation status (>0.1 juveniles/m²), based on Harvey and Cowx (2003).

Brook Lamprey

The range of Brook Lamprey within Ireland covers a surface area of 52,000 km² and is *stable* in the short-term (2007-2018). The long-term trend is not specified (1994-2018) (Gallagher *et al.*, 2021).

No population estimate available. Current programme of ammocoete surveys will provide a platform for future comparative studies and will permit assessment of population trends. The fact that river and brook lamprey ammocoetes cannot be distinguished renders it impossible to assess the status of either species at this most accessible life history stage (King *et al.*, 2011).

River Lamprey

The range of River Lamprey within Ireland covers a surface area of 4,600 km² and the species has an *uncertain* short-term trend (2007-2018). The long-term trend is not specified (1994-2018) (Gallagher et al., 2021).

No quantitative investigations have been undertaken on adult river lamprey populations. Observations have pointed to substantial numbers of fish running some of the rivers of the southeast –

Slaney, Owenavarragh and Avoca. The fact that river and brook lamprey ammocoetes cannot be distinguished renders it impossible to assess the status of either species at their most accessible life history stage (King *et al.*, 2011).

Brown Trout

Brown trout populations have been impacted in some waters via altered growth rates or decline in population size as a result of nutrient enrichment. Localised extinctions have occurred, but no evidence of substantial decline in population size over the national territory.

Brown trout populations have been impacted in some waters via altered growth rates or decline in population size as a result of nutrient enrichment. Localised extinctions have occurred (e.g. in some small lakes in south Donegal (Kelly et al., 2008)), but no evidence of substantial decline in population size over the national territory.

Eel

The Eel is Critically Endangered (IUCN Irish and Global Status). It is widespread in fisheries surveys of rivers and lakes of all sizes in Ireland. Recruitment of juveniles into Irish catchments has declined dramatically, in line with experience along the Atlantic seaboard.

Eels are widespread in fisheries surveys of rivers and lakes of all sizes in Ireland. Recruitment of juveniles into Irish catchments has declined dramatically, in line with experience along the Atlantic seaboard (King *et al.*, 2011).

7.4.7.5 Receiving Environment (the Baseline + Trends)

One of the survey sites was evaluated as having **County Importance**, the Owenogarney River. The remaining 23 survey sites were evaluated as **local importance (lower value)** in terms of their aquatic ecology, primarily due to the semi-dry or dry nature of the habitats at the time of survey (i.e., non-perennial watercourses). A total of 14 sites on the Rocks Stream, Snaty River, West Cloontra Stream, Knockshanvo Stream, Mountrice River, River Blackwater, Oatfield River, South Ballycar River, West Roo Stream and the Gourná River achieved **Q4 (good status)**, and thus met the target good status ($\geq Q4$) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC). Over half of survey sites achieved **≤Q3 (poor status)** in August 2023 (see **Appendix 7.7**). Eutrophication originating from coniferous afforestation and siltation (agriculture) are known to be the major pressures within the survey area and this was supported by observations made during the aquatic surveys.

EIAR Figures: (included within Appendix 7.7: Aquatic Ecology attached to this report)

Considering the desk study and field survey results described above, and the scope for impacts from the Proposed Development, the following Key Ecological Features have been identified for the purposes of this assessment are summarised in **Table 7.21**.

Table 7.21: Assessment of species importance and identification of Key Ecological Features

Species	Importance	KEF (yes/no)
Plant species	Local Importance (Higher Value)	No
Invasive non-native plant species	N/A	Yes
Marsh Fritillary	County Importance	Yes
Amphibians and reptiles	Local Importance (Lower Value)	Yes
Otter	Local Importance (Higher Value)	Yes
Badger	Local Importance (Higher Value)	Yes
Pine Marten	Local Importance (Higher Value)	Yes
Red Squirrel	Local Importance (Higher Value)	Yes
Red Deer	Local Importance (Lower Value)	No
Irish Hare	Local Importance (Higher Value)	Yes
Other terrestrial mammals	Local Importance (Lower Value)	No
Lesser Horseshoe Bat	Local Importance (Higher Value)	Yes*
Other Bat species	Local Importance (Higher Value)	Yes
Freshwater Pearl Mussel	Local Importance (Higher Value)	No
Other Aquatic species	Local Importance (Higher Value)	Yes

*Scoped in on a precautionary basis in relation to European Sites.

7.5 Embedded Mitigation

From the early design stages of the Proposed Development, an iterative process of a constraints-led design was employed, whereby ecological information was incorporated into the design process to avoid impacting potentially important ecological features where possible. The Proposed Development design has incorporated the following embedded mitigation measures to minimise the potential for significant effects on ecological features. Further information is provided in EIAR **Chapter 5 Project Description**.

7.5.1 Construction Methods

Best practice construction measures will be adopted to minimise potential construction and decommissioning impacts on Key Ecological Features. These are detailed within the Construction Environmental Management Plan (CEMP) (see EIAR **Appendix 5.1**) and include measures to minimise working areas to avoid unnecessary habitat removal/alteration and disturbance, and measures to avoid/minimise the generation of

additional noise, dust, light spill and vibration. In particular, removal of trees and dense vegetation such as hedgerows and scrub will be limited wherever possible. Avoiding nocturnal lighting of suitable habitat will limit disturbance effects on bats and other nocturnal and crepuscular species. The CEMP also includes measures to avoid pollution of terrestrial and aquatic habitats within and adjacent to the Proposed Development site.

Measures that will be implemented during the construction, operation and decommissioning phases of the Proposed Development described within the CEMP include:

- No removal of habitats or movement of construction machinery will occur outside of the development works areas during the construction phase, clearly marking out the works footprint for site staff;
- There is potential for retained trees and hedgerows to become damaged by construction activity whereby damage to roots would occur if they remained unprotected during construction activities. Measures to protect trees that will be implemented in full include the installation of tree protection barriers around the root protection zones of retained trees and hedgerows. Where essential works are required within root protection zones, ground protection (such as cellweb membrane) will be installed, following consultation with a qualified arboriculturist, to minimise risks of damage to roots;
- Existing hedgerows and trees being retained within and in the vicinity of the Proposed Development site will be protected in line with current guidance and on the advice of an appointed arboriculturist (NRA, 2006);
- Production of an Invasive Species Management Plan is included as **Appendix 7.8**. This will include measures to eradicate and control invasive species such as Japanese Knotweed;
- All edible and putrescible waste will be stored and disposed of at licensed waste facilities. Construction materials will be stored and stockpiled according to strategies set out within the CEMP;
- Excavations will be covered at night to prevent mammals getting trapped. If this is not possible, a method of egress such as a ladder will be provided; and
- All plant and machinery will comply with specific noise legislation (S.I. No. 320/1988 - European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1988 (as amended)) and will be turned off when not in use.

In particular, embedded construction mitigation measures include the following measures to avoid effects on aquatic habitats and species:

- Measures will be implemented to maintain a buffer of 15m from minor watercourses and land drains (except where they are crossed by tracks or, in the case of minor land drains, where a lesser buffer is applied or where the drain is re-directed);
- Excavated soil from access road construction will be reused on-site for berms, landscaping, and along road margins. Berms will be placed away from

interceptor drains to avoid flow obstruction or siltation risk. Constructed drainage systems will manage runoff from various areas, reducing potential silt runoff during construction and operation. The Proposed Development will implement a Sustainable Drainage System (SuDS) with on-site flow retention, buffer zones, and silt removal techniques to promote environmentally responsible water management;

- Drilling fluids such as Clearbore (an environmentally friendly, high-performance water-based mud suitable for tunnelling and drilling operations) or fluids with similar environmental properties will be used in drilling operations. Where the proposed grid connection cable route encounters minor culverts, the ducts will be installed above or below the culvert depending on its depth in accordance with construction methodologies outlined in the CEMP; and
- Measures, such as directional lighting and low spill lights, will be employed to minimise light spill onto watercourses.

7.5.2 Operational Methods

The best practice measures described above in relation to construction methods will also be adopted during operational maintenance, as described within the CEMP. Specifically, operational maintenance will minimise the level of removal of suitable habitat (e.g., heathland, grassland, hedgerows, scrub) and use existing access routes where possible. Best practice methods will be adopted to minimise disturbance (e.g., to minimise generation of additional noise, light and vibration), with a particular focus on avoiding activity within nocturnal periods, when particularly notable species such as bats (e.g., Lesser Horseshoe Bat) are active.

Operational maintenance will include measures to prevent any pollution from fuels, turbine fluids and silty water through the appropriate use of silt fences, cut-off drains and silt traps. Any pollution incidents will be reported immediately to the operational site manager and other external agencies as necessary. Any environmental incidents will be followed by appropriate remedial measures in consultation with those external agencies.

7.5.3 Timing of Works

To minimise the potential for impacts on sensitive species, works with the potential for harm and/or disturbance of such species will be undertaken at the appropriate time of year to avoid/minimise effects (in accordance with relevant best practice guidance). Where this is not possible, works will be preceded and/or accompanied by appropriate ecological monitoring and/or supervision (see below).

7.5.4 Ecological Clerk of Works

An appropriately qualified and experienced Ecological Clerk of Works (ECoW) will be appointed to address issues relating to ecological features during the construction, operational and decommissioning phases, as described within the CEMP. Their responsibilities will include:

- Undertake a pre-construction walkover survey of works areas within the Proposed Development and appropriate buffers (in accordance with relevant best practice guidance) to ensure that significant effects on sensitive species will be avoided;
- Level of authority to suspend works in the event of a risk to a protected species
- Inform and educate site personnel of sensitive ecological features within/in close proximity to the Proposed Development site and how effects on these features could occur;
- Oversee management of ecological issues during the construction and decommissioning period and advise on ecological issues as they arise;
- Provide guidance to contractors to ensure legal compliance with respect to protected habitats and species; and
- Liaise with officers from consenting authorities and other relevant bodies, and with contractors, providing regular updates in relation to the progress of the Proposed Development phases.

7.6 Assessment of Effects

7.6.1 Assessment Scope

Potential impacts on ecological features from the Proposed Development during its construction, operation and decommissioning phases are described in this section. The potential for impacts to adversely affect the identified Key Ecological Features is assessed in accordance with the process described in **Section 7.3.4**. This assessment takes into consideration embedded mitigation within the Proposed Development design as described in **Section 7.5**. Where embedded mitigation measures are insufficient to avoid potentially significant effects on Key Ecological Features, further mitigation measures will be required, as described in **Section 7.7**.

The assessment of effects is structured as follows:

- Assessment of effects in relation to designated sites of nature conservation interest;
- Assessment of effects in relation to Key Ecological Features (i.e., habitats and species); and
- Assessment of potential effects in combination with other projects (i.e. cumulative assessments).

7.6.2 Assessment of Effects on Designated Sites

7.6.2.1 *Natura Impact Statement*

In accordance with best practice guidance, and in compliance with Article 6(3) of the Habitats Directive, this EIAR chapter is accompanied by the following supporting documents:

- **Screening for Appropriate Assessment Report;** and

- **Natura Impact Statement.**

As per EPA guidance, 'a biodiversity section of an EIAR should not repeat the detailed assessment of potential effects on European sites contained in a Natura Impact Statement' but should 'incorporate their key findings as available and appropriate'. As such, this section provides a summary of the key assessment findings regarding relevant European sites with features of ecological interest.

Relevant European sites within the potential Zol (i.e., 15 km) were initially screened for connectivity with the Proposed Development site. Connectivity with a European site was evaluated using a conceptual site model which identifies potential impact source-pathways between the Proposed Development site and the European site. The conceptual model (based on source-pathway-receptor connectivity) is a standard tool used in environmental assessment. In order for an effect to be likely, all three elements (source, pathway, and receptor) of this mechanism must be in place. All phases of the Proposed Development (i.e., construction, operation and decommissioning) were considered.

Assessment of potential effects on River Shannon and River Fergus Estuaries SPA (004077) is undertaken in EIAR **Chapter 8**. As such, three European sites were screened in for further assessment in this chapter in relation to potential Proposed Development impacts on ecological features (excluding ornithological features):

- Lower River Shannon SAC (002165);
- Danes Hole, Poulnalecka SAC (000030); and
- Ratty River Cave SAC (002316).

Assessment of effects on ecological features of these three European sites from the Proposed Development is provided below.

7.6.2.2 Lower River Shannon SAC (002165)

Lower River Shannon SAC is located 0 m from the Proposed Development as the TDR spans the SAC via the Killaloe Bypass, no works are proposed at this location. This European site is designated for its internationally important aquatic habitats and species. Those potentially relevant to the Proposed Development comprise:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation;
- Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*);
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*);
- Freshwater Pearl Mussel;
- Sea Lamprey;
- Brook Lamprey;
- River Lamprey;
- Salmon; and

- Otter.

The Proposed Development is potentially linked to the Lower River Shannon SAC with connectivity via watercourses with drain works locations associated with the Proposed Development, connectivity via watercourse crossing works along Grid Connection routes, and connectivity via Turbine Delivery Routes through or in close proximity to this SAC. In addition, field surveys undertaken to inform the Proposed Development identified evidence of the following relevant qualifying species of the SAC within the Proposed Development and/or its potential Zol:

- Salmon: recorded at ten sites on the Owenogarney River, River Blackwater and associated tributaries, including high value spawning and nursery habitats;
- Lamprey species: lamprey ammocoetes (*Lampetra* sp.) were recorded from six sites. No Sea Lamprey were recorded; and
- Otter: evidence of Otter activity (e.g., spraints) was identified in close proximity to the Proposed Development site, and suitable terrestrial habitat (e.g., for dens) is present within the Proposed Development site.

As such, it is necessary to consider the potential for effects on SAC qualifying habitats and species:

- Within the SAC, due to the hydrological connectivity between the Proposed Development site and the SAC; and
- Within the Zol and in close proximity to the Proposed Development site, in the case of mobile species such as fish species and Otter which could also form part of QI populations for the SAC.

For detailed assessment of potential effects on the integrity of qualifying features of Lower River Shannon SAC, see EIAR **Appendix 7.2, Section 1.9.2**). Following consideration of impacts on habitats, fish species and Otter, it was concluded that, taking into consideration the embedded mitigation within the Proposed Development (notably those to prevent pollution and disturbance of watercourses), significant effects on the integrity of the Lower River Shannon SAC will not occur as a result of the Proposed Development.

7.6.2.3 Danes Hole, Poulnalecka SAC (000030)

Danes Hole, Poulnalecka SAC is located 2km from the Proposed Development site. The SAC qualifies on account of its populations of Lesser Horseshoe Bat, containing an important winter hibernation roost, mating site, maternity roost and commuting routes between these sites. The 'Caves not open to the public' which support these roosts also form a qualifying habitat for the SAC, and the SAC contains the qualifying habitat 'Old sessile oak woods with Ilex and Blechnum in the British Isles'.

Regarding potential effects on the integrity of Danes Hole, Poulnalecka SAC through effects on hibernating Lesser Horseshoe Bats, core foraging habitat for Lesser Horseshoe Bats in winter is considered to be within 1.2 km of the hibernation roost² (Lesser horseshoe bat, Species Information Guide. Back from the Brink). As the Proposed Development is 2 km from the SAC at its nearest point, the Proposed Development is significantly outside of the core winter foraging range for this species regarding this hibernation roost site. As such, habitat loss, degradation or

fragmentation, or disturbance occurring within the Proposed Development site during construction, operation and decommissioning will not affect foraging habitat used by hibernating Lesser Horseshoe Bats. The Proposed Development design includes embedded mitigation to minimise disturbance, including the minimisation of noise, dust, light and vibration (see Section 7.5), which will be sufficient to avoid significant adverse effects on hibernating bats using the roost and adjacent foraging habitat during construction, operation or decommissioning.

Assessment of Lesser Horseshoe Bat SACs effects must take into consideration potential effects on the designated maternity roost, mating site and commuting routes used by this species, both within the SAC and where these qualifying Lesser Horseshoe Bats use habitat outside of the SAC boundary. According to best practice guidance provided in the Lesser Horseshoe Bat Species Action Plan 2022-2026 (NPWS & VWT, 2022), based on the known foraging ranges of this species, the presence of suitable commuting and foraging habitat within a radius of at least 2.5km from summer roosts is important to the integrity of the roost. In addition, linear landscape features should preferably be retained within a 5km radius of roosts with 20 or more Lesser Horseshoe Bats. As such, any developments with the potential to affect Lesser Horseshoe Bat commuting and foraging habitat within 5km of a known important roost should be subject to detailed consideration of potential effects on the integrity of the roost.

Detailed bat surveys have indicated Negligible to Low activity of by Lesser Horseshoe Bats within and adjacent to the Proposed Development, with a total of 11 registrations recorded. No roosts of Lesser Horseshoe Bat were recorded within, or adjacent to the Proposed Development, and no suitable roosting habitat for Lesser Horseshoe Bat was identified.

The Proposed Development design includes mitigation measures to minimise the potential for effects on foraging Lesser Horseshoe Bats during construction, operation and decommissioning (see **Section 7.5**). This includes measures to prevent light spill onto suitable foraging and commuting habitat (e.g., hedgerows, woodland edges, watercourses), pollution of watercourses, and removal/alteration of suitable foraging and commuting habitat.

Considering the distance of the Proposed Development from the SAC (i.e., towards the outer limit of the core foraging area around the maternity roost), the Negligible to Low level of Lesser Horseshoe Bat foraging and commuting activity recorded during the field surveys of the Proposed Development, and the embedded mitigation measures within the Proposed Development design, significant effects on foraging and commuting Lesser Horseshoe Bats belonging to the SAC population are not anticipated. As Lesser Horseshoe Bat is deemed to be a species of low collision risk (NatureScot, 2021), considering the factors described above (notably the distance between the Proposed Development turbines and the SAC, and the level of Lesser Horseshoe Bat activity recorded during field surveys), no significant effects through turbine fatalities are anticipated.

As described above, the qualifying habitat 'Caves not open to the public' is designated due to it supporting Lesser Horseshoe Bat hibernation and maternity roosts. Due to the distance between this qualifying habitat (and therefore the important Lesser Horseshoe

Bat roosts it supports), and the embedded mitigation measures to minimise disturbance, no significant adverse effects on 'Caves not open to the public' regarding their ability to support these important bat roosts are anticipated.

Taking into consideration the mitigation outlined above, and the distance of the Proposed Development from the relevant qualifying features (notably in the context of known Lesser Horseshoe Bat movement patterns), adverse effects on the integrity of Danes Hole, Poulnalecka SAC will not occur as a result of the Proposed Development. These conclusions apply to all potential turbine options with no difference in adverse effects identified between them.

7.6.2.4 Ratty River Cave SAC (002316)

Ratty River Cave SAC is located 4.3km from the Proposed Development. The SAC qualifies on account of its populations of Lesser Horseshoe Bat, with a hibernation roost recorded in the caves and a maternity roost located nearby. Foraging areas for these Lesser Horseshoe Bats roosting within the SAC have not been confirmed. The 'Caves not open to the public' which support these roosts also form a qualifying habitat for the SAC.

Regarding potential effects on the integrity of Ratty River Cave SAC through effects on hibernating Lesser Horseshoe Bats, core foraging habitat for Lesser Horseshoe Bats in winter is considered to be within approximately 1.2km of the core hibernation roost³. As the Proposed Development is 4.3km from the SAC at its nearest point, the Proposed Development is significantly outside of the core winter foraging range for this species. As such, habitat loss, degradation or fragmentation, or disturbance occurring within the Proposed Development during construction, operation and decommissioning will not affect foraging habitat used by hibernating Lesser Horseshoe Bats. In addition, considering this separation distance, the scale of impacts from the Proposed Development, and the mitigation within the Proposed Development design (see Section 7.5), there is no potential for significant disturbance of the Lesser Horseshoe Bat hibernation roost during construction, operation or decommissioning.

Ratty River Cave SAC is also designated for its Lesser Horseshoe Bat maternity roost. The conservation goals for this species are to preserve suitable commuting and foraging habitat within 2.5 km of maternity roosts and commuting habitat within 2.5 km (to an ideal range of 5 km) from roost locations. As the Proposed Development is 4.3 km from the SAC at its nearest point, and suitable foraging habitat (e.g., woodland, hedgerows, scrub) are present within and adjacent to the Proposed Development site, effects on foraging Lesser Horseshoe Bats associated with the SAC maternity roost need to be considered; notably effects through habitat loss, degradation and fragmentation, and disturbance. These effects need to be considered during the construction, operational and decommissioning phases.

Detailed bat surveys have indicated Negligible to Low activity of Lesser Horseshoe Bat was recorded within and adjacent to the Proposed Development, with a total of 11 registrations recorded. No roosts of Lesser Horseshoe Bat were recorded within or in close proximity to the Proposed Development, and no suitable roosting habitat for Lesser Horseshoe Bat was identified.

The Proposed Development design includes mitigation measures (see Section 7.5) to minimise the potential for effects on foraging Lesser Horseshoe bats during the construction, operation and decommissioning of the Proposed Development. In particular, this includes measures to prevent light spill onto suitable foraging and commuting habitat (e.g., hedgerows, woodland edges, watercourses), pollution of watercourses, and minimise the loss of and enhance suitable foraging and commuting habitat.

Considering the distance of the Proposed Development from the SAC (i.e., towards the outer limit of the core foraging area around the maternity roost), the Negligible to Low level of Lesser Horseshoe Bat foraging and commuting activity recorded during the field surveys of the Proposed Development, and the embedded mitigation measures within the Proposed Development design, significant effects on foraging and commuting Lesser Horseshoe Bats belonging to the SAC population are not anticipated. As Lesser Horseshoe Bat is deemed to be a species of low collision risk (NatureScot, 2021), considering the factors described above (notably the distance between the Proposed Development turbines and the SAC, and the level of Lesser Horseshoe Bat activity recorded during field surveys), no significant effects through turbine fatalities are anticipated.

As described above, the qualifying habitat 'Caves not open to the public' is designated due to it supporting roosting Lesser Horseshoe Bats. Due to the distance between this qualifying habitat (and therefore the important Lesser Horseshoe Bat roosts it supports) and the Proposed Development site, and the embedded mitigation measures to minimise disturbance, no significant adverse effects on 'Caves not open to the public' regarding their ability to support these important bat roosts are anticipated.

Taking into consideration the mitigation outlined above, and the distance of the Proposed Development from the relevant qualifying features (notably in the context of known Lesser Horseshoe Bat movement patterns), adverse effects on the integrity of Ratty River Cave SAC will not occur as a result of the Proposed Development. These conclusions apply to all potential Turbine options with no difference in adverse effects identified between them.

7.6.2.5 *Nationally Designated Sites*

Based on their proximity to the Proposed Development, their ecological interest features, and the potential scope for impacts from the Proposed Development, the following nationally designated sites (i.e., NHAs and pNHAs) were included for further assessment regarding potential effects on ecological features (their distances from the Proposed Development site are provided in brackets):

- Gortacullin Bog NHA (10 m);
- Woodcock Hill Bog NHA (1.3 km);
- Doon Lough NHA (1.7 km);
- Knockalisheen Marsh pNHA (400 m);
- Garrannon Wood pNHA (1.7 km); and
- Fergus Estuary and Inner Shannon, North Shore pNHA (1.9 km).

Assessment of effects on ecological features of these six confirmed and proposed nationally designated sites is provided below. Based on the features for which they are designated, their proximity to the Proposed Development site and/or the scope for impacts from the Proposed Development, no other confirmed or proposed nationally designated sites require detailed assessment of effects regarding features of ecological interest.

7.6.2.6 *Gortacullin Bog NHA*

Gortacullin Bog NHA is located 10m west of the Proposed Development site. This site is of national importance for its peatland raised bog habitat. The site contains blanket bog on its lower central and eastern slopes, with wet heath occupying drier areas on slightly higher ground. There is a large flush in the north of the site, whilst regenerating cutover bog with scrub woodland occurs in the south-centre.

There will be no works within this designated site, and therefore there will be no permanent or temporary loss of habitat (e.g., peatland) within Gortacullin Bog NHA. As described in **Section 7.5**, the Proposed Development design includes embedded mitigation measures to minimise the potential for disturbance and other effects on adjacent land (e.g., through pollution, dust and hydrological impacts) during construction and operation; notably those measures detailed within the CEMP (EIAR **Appendix 5.1**). In addition, detailed assessment of effects has been undertaken in relation to important species which potentially use habitat within Gortacullin Bog NHA (notably Hen Harrier and Red Grouse; see EIAR **Chapter 8**).

Considering the lack of works within Gortacullin Bog NHA, and the embedded mitigation measures within the Proposed Development design, potential effects on the integrity of Gortacullin Bog NHA from the Proposed Development are considered **not significant**.

7.6.2.7 *Other Nationally Designated Sites*

The other five confirmed and proposed nationally designated sites scoped in for assessment of effects are located between 400m and 1.9km from the Proposed Development. These sites are designated or proposed for designation primarily for their nationally important habitats including bog, heath, marsh and open water.

There will be no permanent or temporary habitat loss within these sites, and embedded mitigation measures during construction and operation (see **Section 7.5**) will ensure that significant disturbance and pollution effects on habitats within these sites are avoided. Detailed assessment of effects has been undertaken in relation to the important species which potentially also use these nationally designated sites (in EIAR **Chapters 7 & 8**).

Considering the distance between these nationally designated sites and the Proposed Development, and the embedded mitigation measures within the Proposed Development design, potential effects on the integrities of these nationally designated sites are considered **not significant**.

7.6.2.8 *Cumulative Effects on Designated Sites*

Projects (including wind farm developments) considered for cumulative effects on ecological features are detailed in **Section 7.6.3**. The potential for these plans and

projects to give rise to cumulative effects with the Proposed Development on any European sites is assessed in detail in EIAR **Appendix 7.2**.

Seven operational and proposed wind farm developments were identified for cumulative effects assessment in relation to the Proposed Development (see **Table 7.27**), along with a range of other developments including solar farms, quarries and residential developments. As detailed in **Section 7.6.2.1**, three European sites require detailed assessment of potential adverse effects on features of ecological interest (excluding ornithology; see EIAR **Chapter 8**) from the Proposed Development.

As described in **Section 7.6.2.1**, the field surveys and assessment undertaken to inform this report indicate that the Proposed Development site is not of significant value to species which form Qualifying Interests of relevant European sites; namely Lesser Horseshoe Bat, and aquatic receptors such as fish species and Otter. Embedded mitigation (see **Section 7.5**) is expected to reduce the potential for significant effects on these species (e.g., through disturbance, pollution or other habitat effects) to a level such that, even in the context of nearby projects, the Proposed Development does not have the potential to give rise to significant adverse effects on ecological features to the extent that the integrities of any European sites could be adversely affected. As such, potential cumulative effects from the Proposed Development and other projects on the integrities of any European sites regarding their features of ecological interest are considered not significant.

Similarly, embedded mitigation (see **Section 7.5**) is in place to avoid effects on Gortacullin Bog NHA and other relevant nationally designated sites, which will prevent significant disturbance and avoid any land take or pollution of habitat within any nationally designated sites. Considering this, even in the context of nearby projects, the Proposed Development does not have the potential to give rise to significant adverse effects on any nationally designated sites. Potential cumulative effects on nationally designated sites regarding their features of ecological interest from the Proposed Development are considered not significant. Furthermore, the SHMP accompanying the Proposed Development includes measures to enhance relevant habitats (e.g., heath) adjacent to the Proposed Development, which will increase the extent and/or quality of these habitats and provide enhancements for important species using these nationally designated sites.

7.6.3 Assessment of Effects on Key Ecological Features

7.6.3.1 Construction Effects

The assessment of effects on Key Ecological Features during the construction of the Proposed Development is described below and summarised in **Table 7.24**, in accordance with the effect terminology described in **Section 7.3.4**. Potential effects identified during the construction phase of the Proposed Development are as follows:

- **Direct habitat loss and fragmentation:** permanent and temporary reductions to the extent, quality, and connectivity of the habitats present on site;
- **Disturbance and displacement:** disturbance of protected and/or priority species from additional noise, dust, light, vibration, and human activity, with the possibility of causing displacement;

- **Direct mortality of individuals:** fatalities or injuries to sensitive species caused by construction activities; and
- **Pollution of habitats:** through construction-related activities such as pollutant sedimentation and the use, assembly and storage of machines and materials (risk of chemical and fuel spills); particularly regarding aquatic habitats.

Habitats

Direct habitat loss or change is inevitable in the development of any wind farm, especially when the development of access roads, turbines, substation buildings and other associated construction and decommissioning activity is considered. This can result in reduced habitat heterogeneity and connectivity as well as reduced foraging, sheltering, breeding and commuting opportunities for protected and priority species.

Direct habitat loss due to the development of wind farms tends to be relatively small (Drewitt & Langston, 2006). Permanent land take within the Proposed Development site will largely be limited to the area of the turbine bases, substation and additional access routes. Additional temporary land take during construction will include the construction compound, two temporary storage areas and the turbine delivery route. As described in **Section 7.5**, the Proposed Development design includes embedded mitigation to minimise construction effects and bat buffer zones where woodland is cleared around Turbines to minimise the potential for collision risk.

As described in **Section 7.4.2**, habitats within the Proposed Development within which the turbines will be constructed and additional project infrastructure will be established predominantly comprise conifer plantation, agricultural land, grassland and scrub. In the absence of mitigation, the extents of habitat loss during the construction of the Proposed Development are as indicated in **Table 7.22**. This Table presents the findings from the different Turbine options but for the sake of the assessment the worst case has been assumed (Vestas V150).

Table 7.22: Anticipated habitat loss during the construction of the Proposed Development in the absence of mitigation

Habitat type	Pre-construction extent within the Proposed Development Site (ha/m)	Extent of permanent land take (ha/m)
Proposed Development with Nordex N133 habitat loss		
BL3 Buildings and artificial surfaces	16.697 ha	3.195 ha
BL3/ ED2 Buildings and artificial surfaces/ Spoil and bare ground	0.113 ha	-
BL3/ ED3 Buildings and artificial surfaces/ Recolonising bare ground	0.095 ha	-
BL3/ GA1 Buildings and artificial surfaces/ Improved agricultural grassland	0.917 ha	-

BL3/ GA2 Buildings and artificial surfaces/ Amenity Grassland	11.620 ha	0.0945 ha
BL3/GA2/WD5 Buildings and artificial surfaces/ Amenity Grassland/ Scattered trees and parkland	0.632 ha	-
BL3/ GS4 Buildings and artificial surfaces/ Wet grassland	0.251 ha	-
BL3 /WS1 Buildings and artificial surfaces/ Scrub	0.188 ha	-
BL3 /WS2 Buildings and artificial surfaces/ Immature Woodland	0.891 ha	-
ED2 Spoil and bare ground	0.380 ha	0.0867 ha
ED2/GM1 Spoil and bare ground/ Marsh	0.703 ha	
ED3 Recolonising bare ground	0.364 ha	0.0627 ha
GA1 Improved agricultural grassland	51.406 ha	0.1301 ha
GA1/GS4 Improved agricultural grassland/ Wet Grassland	0.266 ha	-
GA1/WS1 Improved agricultural grassland/ Scrub	2.637 ha	-
GM1 Marsh	0.340 ha	-
GS1/GS3 Dry calcareous and neutral grassland/ Dry-humid acid grassland	0.035 ha	-
GS2 Dry meadows and grassy verges	0.786 ha	0.008 ha
GS2/HD1 Dry meadows and grassy verges/ Dense bracken	0.066 ha	-
GS3 Dry-humid acid grassland	5.764 ha	0.0627 ha
GS3/GS4 Dry-humid acid grassland/ Wet grassland	1.039 ha	0.1301 ha
GS3/GS4/HH1 Dry-humid acid grassland/ Wet grassland/ Dry siliceous heath	0.033 ha	-
GS3/HH1 Dry-humid acid grassland/ Dry siliceous heath	0.590 ha	0.0001 ha
GS3/WS1 Dry-humid acid grassland/ Scrub	5.302 ha	0.0880 ha
GS4 Wet grassland	30.020 ha	0.7169 ha
GS4/HH2 Wet grassland/ Dry calcareous heath	0.199 ha	-
GS4/HH3 Wet grassland/ Wet heath	0.154 ha	-
GS4/HH3/PB2 Wet grassland/ Wet heath/ Lowland blanket bog	0.075 ha	-
GS4/PB2 Wet grassland/ Lowland blanket bog	0.299 ha	0.0119 ha
GS4/WS1 Wet grassland/ Scrub	3.064 ha	0.0092 ha
HD1 Dense bracken	0.122 ha	-
HD1/WS1 Dense bracken/ Scrub	0.593 ha	-

HH3 Wet heath	14.058 ha	3.6067 ha
HH3/WD4 Wet heath/Conifer plantation	3.044 ha	0.1585 ha
HH3/WS1 Wet heath/Scrub	1.110 ha	0.3514 ha
WD1 (Mixed) broadleaved woodland	2.156 ha	0.3376 ha
WD2 Mixed broadleaved woodland/ conifer plantation	1.984 ha	0.0240 ha
WD3 (Mixed) conifer woodland	1.168 ha	0.0091 ha
WD4 Conifer plantation	62.186 ha	21.1474 ha
WD4/WS1 Conifer plantation/Scrub	2.740 ha	0.1731 ha
WL2 Treeline	0.133 ha	-
WN6 Wet willow-alder-ash woodland	1.374 ha	0.0032 ha
WS1 Scrub	13.234 ha	1.4054 ha
WS1/WD2 Scrub/ Mixed broadleaved woodland/ conifer plantation	0.023 ha	0.0026 ha
WS1/WS2 Scrub/ Immature woodland	1.436 ha	0.0050 ha
WS2 Immature woodland	0.584 ha	-
WS3 Ornamental/non-native shrub	0.431 ha	-
WS5 Recently-felled woodland	10.460 ha	2.30 ha
BL1 Stone walls and other stonework	1029.05 m	174.61 m
BL2 Earth banks	4935.04 m	329.17 m
BL2/WL1 Earth banks/ Hedgerows	791.96 m	176.86 m
BL2/WL1/WL2 Earth banks/ Hedgerows/ Treelines	251.86 m	-
BL2/WL2 Earth banks/ Treelines	329.27 m	-
FW1 Eroding/upland rivers	97.63 m	-
FW4 Drainage ditches	3553.18 m	211.67 m
WL1 Hedgerows	7836.29 m	764.55 m
WL1/WL2 Hedgerows/ Treelines	7094.51 m	21.29 m
WL2 Treelines	5461.43 m	300.24 m
Proposed Development with Nordex N149 habitat loss		
BL3 Buildings and artificial surfaces	16.697 ha	3.1927 ha
BL3/ ED2 Buildings and artificial surfaces/ Spoil and bare ground	0.113 ha	-
BL3/ ED3 Buildings and artificial surfaces/ Recolonising bare ground	0.095 ha	-
BL3/ GA1 Buildings and artificial surfaces/ Improved agricultural grassland	0.917 ha	-
BL3/ GA2 Buildings and artificial surfaces/ Amenity Grassland	11.620 ha	0.0945 ha

BL3/GA2/WD5 Buildings and artificial surfaces/ Amenity Grassland/ Scattered trees and parkland	0.632 ha	-
BL3/ GS4 Buildings and artificial surfaces/ Wet grassland	0.251 ha	-
BL3 /WS1 Buildings and artificial surfaces/ Scrub	0.188 ha	-
BL3 /WS2 Buildings and artificial surfaces/ Immature Woodland	0.891 ha	
ED2 Spoil and bare ground	0.380 ha	0.0867 ha
ED2/GM1 Spoil and bare ground/ Marsh	0.703 ha	-
ED3 Recolonising bare ground	0.364 ha	0.0627 ha
GA1 Improved agricultural grassland	51.406 ha	0.1301 ha
GA1/GS4 Improved agricultural grassland/ Wet Grassland	0.266 ha	-
GA1/WS1 Improved agricultural grassland/ Scrub	2.637 ha	-
GM1 Marsh	0.340 ha	-
GS1/GS3 Dry calcareous and neutral grassland/ Dry-humid acid grassland	0.035 ha	-
GS2 Dry meadows and grassy verges	0.786 ha	0.0083 ha
GS2/HD1 Dry meadows and grassy verges/ Dense bracken	0.066 ha	-
GS3 Dry-humid acid grassland	5.764 ha	1.2098 ha
GS3/GS4 Dry-humid acid grassland/ Wet grassland	1.039 ha	0.0355 ha
GS3/GS4/HH1 Dry-humid acid grassland/ Wet grassland/ Dry siliceous heath	0.033 ha	-
GS3/HH1 Dry-humid acid grassland/ Dry siliceous heath	0.590 ha	0.0001 ha
GS3/WS1 Dry-humid acid grassland/ Scrub	5.302 ha	0.0880 ha
GS4 Wet grassland	30.020 ha	0.7184 ha
GS4/HH2 Wet grassland/ Dry calcareous heath	0.199 ha	-
GS4/HH3 Wet grassland/ Wet heath	0.154 ha	-
GS4/HH3/PB2 Wet grassland/ Wet heath/ Lowland blanket bog	0.075 ha	-
GS4/PB2 Wet grassland/ Lowland blanket bog	0.299 ha	0.0119 ha
GS4/WS1 Wet grassland/ Scrub	3.064 ha	0.0092 ha
HD1 Dense bracken	0.122 ha	-
HD1/WS1 Dense bracken/ Scrub	0.593 ha	-
HH3 Wet heath	14.058 ha	3.6422 ha

HH3/WD4 Wet heath/Conifer plantation	3.044 ha	0.1585 ha
HH3/WS1 Wet heath/Scrub	1.110 ha	0.3514 ha
WD1 (Mixed) broadleaved woodland	2.156 ha	0.4075 ha
WD2 Mixed broadleaved woodland/ conifer plantation	1.984 ha	0.0240 ha
WD3 (Mixed) conifer woodland	1.168 ha	0.0091 ha
WD4 Conifer plantation	62.186 ha	24.7314 ha
WD4/WS1 Conifer plantation/Scrub	2.740 ha	0.1731 ha
WN6 Wet willow-alder-ash woodland	1.374 ha	0.0032 ha
WS1 Scrub	13.234 ha	1.6888 ha
WS1/WD2 Scrub/ Mixed broadleaved woodland/ conifer plantation	0.023 ha	0.0026 ha
WS1/WS2 Scrub/ Immature woodland	1.436 ha	0.0050 ha
WS2 Immature woodland	0.584 ha	-
WS3 Ornamental/non-native shrub	0.431 ha	-
WS5 Recently-felled woodland	10.460 ha	2.3587 ha
BL1 Stone walls and other stonework	1029.05 m	174.61 m
BL2 Earth banks	4935.04 m	460.36 m
BL2/WL1 Earth banks/ Hedgerows	791.96 m	176.73 m
BL2/WL1/WL2 Earth banks/ Hedgerows/ Treelines	251.86 m	-
BL2/WL2 Earth banks/ Treelines	329.27 m	-
FW1 Eroding/upland rivers	97.63 m	102.64 m
FW4 Drainage ditches	3553.18 m	211.67 m
WL1 Hedgerows	7836.29 m	894.75 m
WL1/WL2 Hedgerows/ Treelines	7094.51 m	21.29 m
WL2 Treelines	5461.43 m	300.24 m
Proposed Development with Vestas V150 habitat loss		
BL3 Buildings and artificial surfaces	16.697 ha	3.2495 ha
BL3/ ED2 Buildings and artificial surfaces/ Spoil and bare ground	0.113 ha	-
BL3/ ED3 Buildings and artificial surfaces/ Recolonising bare ground	0.095 ha	-
BL3/ GA1 Buildings and artificial surfaces/ Improved agricultural grassland	0.917 ha	-
BL3/ GA2 Buildings and artificial surfaces/ Amenity Grassland	11.620 ha	0.0945 ha
BL3/GA2/WD5 Buildings and artificial surfaces/	0.632 ha	-

Amenity Grassland/ Scattered trees and parkland		
BL3/ GS4 Buildings and artificial surfaces/ Wet grassland	0.251 ha	-
BL3 /WS1 Buildings and artificial surfaces/ Scrub	0.188 ha	-
BL3 /WS2 Buildings and artificial surfaces/ Immature Woodland	0.891 ha	-
ED2 Spoil and bare ground	0.380 ha	0.0867 ha
ED2/GM1 Spoil and bare ground/ Marsh	0.703 ha	
ED3 Recolonising bare ground	0.364 ha	0.0627 ha
GA1 Improved agricultural grassland	51.406 ha	0.1301 ha
GA1/GS4 Improved agricultural grassland/ Wet Grassland	0.266 ha	-
GA1/WS1 Improved agricultural grassland/ Scrub	2.637 ha	-
GM1 Marsh	0.340 ha	-
GS1/GS3 Dry calcareous and neutral grassland/ Dry-humid acid grassland	0.035 ha	-
GS2 Dry meadows and grassy verges	0.786 ha	0.0083 ha
GS2/HD1 Dry meadows and grassy verges/ Dense bracken	0.066 ha	-
GS3 Dry-humid acid grassland	5.764 ha	1.2103 ha
GS3/GS4 Dry-humid acid grassland/ Wet grassland	1.039 ha	0.0355 ha
GS3/GS4/HH1 Dry-humid acid grassland/ Wet grassland/ Dry siliceous heath	0.033 ha	
GS3/HH1 Dry-humid acid grassland/ Dry siliceous heath	0.590 ha	0.0001 ha
GS3/WS1 Dry-humid acid grassland/ Scrub	5.302 ha	0.0880 ha
GS4 Wet grassland	30.020 ha	0.7169 ha
GS4/HH2 Wet grassland/ Dry calcareous heath	0.199 ha	-
GS4/HH3 Wet grassland/ Wet heath	0.154 ha	-
GS4/HH3/PB2 Wet grassland/ Wet heath/ Lowland blanket bog	0.075 ha	-
GS4/PB2 Wet grassland/ Lowland blanket bog	0.299 ha	0.0119 ha
GS4/WS1 Wet grassland/ Scrub	3.064 ha	0.0092 ha
HD1 Dense bracken	0.122 ha	-
HD1/WS1 Dense bracken/ Scrub	0.593 ha	
HH3 Wet heath	14.058 ha	3.6068 ha

HH3/WD4 Wet heath/Conifer plantation	3.044 ha	0.1585 ha
HH3/WS1 Wet heath/Scrub	1.110 ha	0.3514 ha
WD1 (Mixed) broadleaved woodland	2.156 ha	0.4114 ha
WD2 Mixed broadleaved woodland/ conifer plantation	1.984 ha	0.0240 ha
WN6 Wet willow-alder-ash woodland	1.374 ha	0.0032 ha
WD3 (Mixed) conifer woodland	1.168 ha	0.0091 ha
WD4 Conifer plantation	62.186 ha	25.2511 ha
WD4/WS1 Conifer plantation/Scrub	2.740 ha	0.1731 ha
WS1 Scrub	13.234 ha	1.6119 ha
WS1/WD2 Scrub/ Mixed broadleaved woodland/ conifer plantation	0.023 ha	0.0026 ha
WS1/WS2 Scrub/ Immature woodland	1.436 ha	0.0050 ha
WS2 Immature woodland	0.584 ha	-
WS3 Ornamental/non-native shrub	0.431 ha	-
WS5 Recently-felled woodland	10.460 ha	-
BL1 Stone walls and other stonework	1029.05 m	174.61 m
BL2 Earth banks	4935.04 m	461.45 m
BL2/WL1 Earth banks/ Hedgerows	791.96 m	176.73 m
BL2/WL1/WL2 Earth banks/ Hedgerows/ Treelines	251.86 m	-
BL2/WL2 Earth banks/ Treelines	329.27 m	-
FW1 Eroding/upland rivers	97.63 m	105.46 m
FW4 Drainage ditches	3553.18 m	211.67 m
WL1 Hedgerows	7836.29 m	901.27 m
WL1/WL2 Hedgerows/ Treelines	7094.51 m	21.29 m
WL2 Treelines	5461.43 m	300.24 m

Habitats on site are largely dominated by agricultural land, conifer woodland and wet grassland, within which the turbines will be constructed. These habitats are highly modified and of low ecological value, with habitats of greater ecological value (e.g., heath, broadleaved woodland, other grassland types) covering smaller areas within the Proposed Development. As described in **Section 7.5**, the Proposed Development includes embedded mitigation to minimise loss and disturbance of habitats, with particular emphasis on avoiding the loss, alteration, fragmentation and/or disturbance of more ecologically important habitats within and adjacent to the Proposed Development.

Heath and Bog

As indicated in **Table 7.22**, the construction of the Proposed Development involves the removal of dry and wet heath, bog and mosaics of these habitats (i.e., with scrub, woodland and grassland). Notably, this includes the loss of 3.6ha of wet heath (equating to 25.6% of this habitat within the Proposed Development), and the loss of

1.1ha of wet heath/scrub (equating to 31.6% of this habitat within the Proposed Development). Loss of bog will be minimal, comprising 0.3ha of wet grassland/lowland blanket bog. Heath and bog are both recognised as habitats of high ecological value, supporting protected and notable species of flora and fauna, and relevant in the context of nearby designated sites. Whilst the Proposed Development design includes embedded measures to minimise loss of this habitat during construction, considering the anticipated loss and fragmentation of heath and associated mosaic habitats, in the absence of additional mitigation the construction of the Proposed Development is considered to potentially have a significant negative effect on heath and associated mosaic habitats at a Local level (slight effect).

Grassland and Scrub

As indicated in **Table 7.22**, the construction of the Proposed Development involves the removal of grassland, scrub and mosaics of these habitats. Notably, this includes the loss of 0.7ha of wet grassland (equating to 2.3% of this habitat within the Proposed Development), and the loss of 1.6ha of scrub (equating to 12% of this habitat within the Proposed Development). Relatively small areas (i.e., up to 1.2 ha) of dry-humid acid grassland, dry-humid acid grassland/scrub, dry-humid acid grassland/dry siliceous heath, immature woodland and dry-humid acid grassland/wet grassland will also be removed to facilitate the Proposed Development. Scrub and certain grassland types (e.g., wet grassland, acid grassland) are recognised as habitats of high ecological value, supporting protected and notable species of flora and fauna. Whilst the Proposed Development design includes embedded measures to minimise loss of this habitat during construction, considering the anticipated loss and fragmentation of grassland, scrub and associated mosaic habitats, in the absence of additional mitigation the construction of the Proposed Development is considered to potentially have a significant negative effect on scrub, grassland and associated mosaic habitats at a Local level (slight effect).

Woodland

As indicated in **Table 7.22**, the construction of the Proposed Development involves the removal of woodland and associated mosaic habitats. Notably, this includes the loss of 25.25ha of conifer plantation (equating to 40% of this habitat within the Proposed Development). Removal of other woodland types will be minimal, including 1.4ha of scrub/immature woodland, and 0.4ha of mixed broadleaved woodland.

Considering the embedded mitigation measures to minimise loss of woodland habitat during construction, woodland of greater ecological value (e.g., mixed broadleaved woodland) is minimal and will not have a significant effect on the extent, quality or connectivity of this habitat. However, 40% loss of conifer plantation represents a significant reduction in the extent and connectivity of this habitat. Whilst a habitat of relatively low ecological value, conifer plantation is of potential value to certain notable species; namely bird species such as Woodcock and Hen Harrier, and terrestrial mammal species such as Pine Marten and Red Squirrel). Considering this, in the absence of mitigation, the construction of the Proposed Development is considered to potentially have a significant negative effect on conifer plantation habitat at a Local level (slight effect).

Hedgerows and Treelines

As indicated in **Table 7.22**, the construction of the Proposed Development involves the removal of hedgerows and treelines; specifically, 901m of hedgerows (equating to 7.9% of this habitat within the Proposed Development), 300m of treelines (equating to 5.5% of this habitat within the Proposed Development) and 21.29m of hedgerows/treelines (equating to 0.3% of this habitat within the Proposed Development). Hedgerows and treelines are recognised as habitats of high ecological value, supporting protected and notable species of flora and fauna. Whilst the Proposed Development design includes embedded measures to minimise loss of this habitat during construction, considering the anticipated loss and fragmentation of hedgerows and treelines, in the absence of additional mitigation the construction of the Proposed Development is considered to potentially have a significant negative effect on hedgerows and treelines at a Local level (slight effect).

Drainage Ditches

As indicated in **Table 7.22**, the construction of the Proposed Development involves the removal of 211.6m of drainage ditches, equating to 5.9% of this habitat within the Proposed Development. Whilst the Proposed Development design includes embedded measures to minimise loss of this habitat during construction, considering the anticipated loss and fragmentation of drainage ditches, in the absence of additional mitigation the construction of the Proposed Development is considered to potentially have a significant negative effect on drainage ditches at a Local level (slight effect).

Other Habitats

As indicated in **Table 7.22**, the construction of the Proposed Development involves the removal of other habitats including buildings and artificial surfaces, spoil and bare ground. These habitats are of very low ecological value and are generally unsuitable for specially protected and notable species. As such, effects regarding the loss or fragmentation of other habitats within the Proposed Development are considered not significant.

In addition to direct loss and fragmentation, the Proposed Development has the potential for effects on habitats through disturbance and pollution. Especially sensitive habitats include watercourses and habitats used by specially protected and notable species such as heath and woodland. As described in **Section 7.5**, the Proposed Development includes embedded mitigation during construction to minimise disturbance and pollution of sensitive habitats, including measures specified within the CEMP. Considering the scope for impacts from the Proposed Development, these embedded measures are considered sufficient to avoid significant disturbance and pollution of habitats within and adjacent to the Proposed Development. As such, effects on ecological features regarding the disturbance and pollution of habitats within and adjacent to the Proposed Development are considered not significant.

Plant Species

As described in **Section 7.4.2**, no specially protected or notable plant species were recorded within or in close proximity to the Proposed Development during the field surveys undertaken in 2021. Triangular Clubrush, a rare and highly threatened vascular plant species in Britain and Ireland, is known from the lower reaches of the Owenagarney/Ratty River. Embedded mitigation during the construction of the

Proposed Development (see **Section 7.5**) includes measures to minimise pollution and disturbance effects on watercourses (e.g., habitats potentially supporting Triangular Clubrush) and avoid harm to any other important flora which could potentially be present. ECoW support (see **Section 7.5.4**) including pre-works surveys will ensure that any important flora are identified prior to construction and appropriate measures are put in place to avoid harming these species. Considering the ecological baseline regarding important flora, and the embedded mitigation measures, effects on plant species during the construction of the Proposed Development are considered not significant.

Invasive Non-native Plant Species

As described in **Section 7.4.2.28**, invasive non-native species have been identified within and adjacent to the Proposed Development. These include Japanese Knotweed, Himalayan Knotweed, Butterfly-bush and Common Rhododendron. In the absence of mitigation, construction works could disturb stands of invasive plants and/or soils contaminated with invasive plant material and cause them to spread within the Proposed Development and in the surrounding land. Construction plant can also potentially carry seeds or viable plant material from other works sites if not adequately cleaned, causing the spread of these species over a wider area. Activities with the potential for effects include:

- Vegetation clearance, mowing, hedge-cutting or other landscaping activities;
- Spread of seeds or plant fragments during the movement or transport of soil;
- Spread of seeds or plant fragments through the local surface water and drainage network;
- Contamination of vehicles or equipment with seeds or plant fragments which are then transported to other areas; and
- Importation of soil from off-site sources contaminated with invasive species plant material.

In the absence of additional mitigation, the Proposed Development could cause the spread of invasive non-native plant species within the Proposed Development site and the wider landscape. Based on the scope for potential effects from the spread of these species resulting from the Proposed Development, spread of invasive non-native species during construction is considered to potentially have a significant negative effect at a Local level (slight effect). Relevant mitigation is described in **Section 7.6.4**. An Invasive Species Management Plan is provided as **Appendix 7.8**.

Marsh Fritillary

Whilst no evidence of Marsh Fritillary was recorded within or in close proximity to the Proposed Development site, grassland within the Proposed Development site was highly suitable for Marsh Fritillary, containing abundant Devil's-bit Scabious, and numerous nearby records of this species were identified during the desk study. The Proposed Development site and adjacent land has therefore been identified as potentially being of Local importance (Higher value) for Marsh Fritillary on a precautionary basis.

As described in **Section 7.5**, the Proposed Development includes embedded mitigation during construction to minimise the loss and fragmentation of suitable Marsh Fritillary

habitat (i.e., wet grassland and heath), avoid significant disturbance and minimise construction fatalities. Considering this embedded mitigation, disturbance effects on Marsh Fritillary during construction will not be significant. However, in the absence of additional mitigation, the construction of the Proposed Development will cause a decrease in the availability and connectivity of suitable Marsh Fritillary habitat. As such, in the absence of additional mitigation the construction of the Proposed Development is considered to potentially have a significant negative effect on Marsh Fritillary at a Local level (slight effect) through habitat loss and fragmentation.

Amphibians and Reptiles

Whilst no evidence of amphibian or reptile presence was recorded within or in close proximity to the Proposed Development site, habitats within the Proposed Development site was highly suitable for amphibians and reptiles, providing abundant foraging and sheltering opportunities. Multiple nearby records of amphibians and reptiles were identified during the desk study. The Proposed Development and adjacent land has therefore been identified as potentially being of Local importance (Higher value) for amphibians and reptiles on a precautionary basis.

As described in **Section 7.5**, the Proposed Development includes embedded mitigation during construction to minimise loss and fragmentation of suitable amphibian and reptile habitat, to minimise pollution of waterbodies suitable for amphibians and reptiles, and to avoid significant disturbance or harm. Notably, best practice construction measures (**Section 7.5.1**) and ecological supervision (**Section 7.5.4**) will ensure suitable habitat within/near works areas is identified (through pre-construction surveys) and appropriate mitigation is subsequently adopted (e.g., appropriate timing of works, precautionary working methods). Considering the lack of amphibian and reptile presence recorded within the ecological baseline of the Proposed Development, and this embedded mitigation, construction effects on amphibians and reptiles through habitat loss and fragmentation, pollution, disturbance and direct mortality are considered not significant.

Terrestrial Mammals

Otter

The Proposed Development site and adjacent land has been identified as being of Local importance (Higher value) for Otter. Evidence of Otter activity (e.g., spraints) was identified in close proximity to the Proposed Development site, and suitable terrestrial habitat (e.g., for dens) is present within the Proposed Development site. Watercourses with hydrological connectivity to the site are suitable for foraging and commuting, and Otters using the Proposed Development site and adjacent land potentially form part of the population forming a Qualifying Interest of the nearby Lower River Shannon SAC (see **Section 7.6.2.2** for assessment of effects).

As described in **Section 7.5**, the Proposed Development includes embedded mitigation during construction to minimise loss, fragmentation and pollution of suitable Otter habitat, and to avoid significant disturbance (e.g., of aquatic habitat for foraging and commuting, and of terrestrial habitat suitable for dens). Notably, best practice construction measures (**Section 7.5.1**) and ecological supervision (**Section 7.5.4**) will prevent pollution of watercourses and ensure suitable habitat for holts within/near works

areas are identified (through pre-construction surveys) and appropriate mitigation is subsequently adopted. Considering the level of Otter activity recorded within the ecological baseline of the Proposed Development, and this embedded mitigation, construction effects on Otter through habitat loss and fragmentation, pollution and disturbance are considered not significant.

Badger

The Proposed Development and adjacent land has been identified as being of Local importance (Higher value) for Badger. Badger foraging and commuting activity was recorded within and adjacent to the Proposed Development, with habitats used including conifer plantation, mixed and broadleaved woodland, farmland and grassland. No setts were recorded.

As described in **Section 7.5**, the Proposed Development includes embedded mitigation during construction to minimise loss and fragmentation of suitable Badger habitat, and to avoid significant disturbance of suitable foraging habitat (e.g., grassland, farmland) and habitat suitable for setts (e.g., woodland, scrub, hedgerows). Notably, best practice construction measures (**Section 7.5.1**) and ecological supervision (**Section 7.5.4**) will minimise light spill onto suitable foraging and commuting habitat and ensure that suitable habitat for setts within/near works areas is identified (through pre-construction surveys) and appropriate mitigation is subsequently adopted. Considering the level of Badger activity recorded within the ecological baseline of the Proposed Development site, and this embedded mitigation, construction effects on Badger through habitat loss and fragmentation and disturbance are considered not significant.

Pine Marten

The Proposed Development site and adjacent land has been identified as being of Local importance (Higher value) for Pine Marten. Pine Marten activity was recorded in conifer plantation adjacent to the Proposed Development, which comprises suitable foraging habitat for this species.

As described in **Section 7.5**, the Proposed Development includes embedded mitigation during construction to minimise loss and fragmentation of suitable Pine Marten habitat (i.e., conifer plantation), and to avoid significant disturbance of this habitat. Whilst the Proposed Development will involve the removal of 25.25ha conifer plantation within the Proposed Development site and (notably) the wider landscape. Best practice construction measures (**Section 7.5.1**) and ecological supervision (**Section 7.5.4**) will minimise light spill onto suitable foraging habitat and ensure suitable habitat within/near works areas is identified (through pre-construction surveys) and appropriate mitigation is subsequently adopted. Considering this embedded mitigation, and the limited extent of habitat loss in a local and wider context, construction effects on Pine Marten through habitat loss and fragmentation and disturbance are considered not significant. Mitigation specified in the SHMP will include the enhancement of retained conifer plantation for Key Ecological Features including Pine Marten.

Red Squirrel

The Proposed Development site and adjacent land has been identified as being of Local importance (Higher value) for Red Squirrel. Red Squirrel activity was recorded in

conifer plantation adjacent to the Proposed Development, which comprises suitable habitat for this species.

As described in **Section 7.5**, the Proposed Development includes embedded mitigation during construction to minimise loss and fragmentation of suitable Red Squirrel habitat (i.e., conifer plantation), and to avoid significant disturbance of this habitat. Whilst the Proposed Development will involve the removal of 25.25ha of conifer plantation, this habitat loss is minimal in the context of wider retained conifer plantation within the Proposed Development site and (notably) the wider landscape. Best practice construction measures (**Section 7.5.1**) and ecological supervision (**Section 7.5.4**) will minimise light spill onto suitable foraging habitat and ensure suitable habitat within/near works areas is identified (through pre-construction surveys) and appropriate mitigation is subsequently adopted. Considering this embedded mitigation, and the limited extent of habitat loss in a local and wider context, construction effects on Red Squirrel through habitat loss and fragmentation and disturbance are considered not significant. Mitigation specified in the SHMP will include the enhancement of retained conifer plantation for Key Ecological Features including Red Squirrel.

Irish Hare

The Proposed Development site and adjacent land has been identified as potentially being of Local importance (Higher value) for Irish Hare, with activity recorded in heathland and grassland.

As described in **Section 7.5**, the Proposed Development site includes embedded mitigation during construction to minimise loss and fragmentation of suitable Irish Hare habitat, and to avoid significant disturbance of suitable foraging and sheltering habitat (e.g., grassland, heathland, bog). Notably, best practice construction measures (**Section 7.5.1**) and ecological supervision (**Section 7.5.4**) will minimise disturbance of suitable habitat and ensure suitable habitat is identified (through pre-construction surveys) and appropriate mitigation is subsequently adopted. Considering the level of Irish Hare activity recorded within the ecological baseline of the Proposed Development, the limited extent of works in suitable habitat for this species, and the embedded mitigation, construction effects on Irish Hare through habitat loss and fragmentation and disturbance are considered not significant.

Bats

The Proposed Development site and adjacent land has been identified as being of Local importance (Higher value) for foraging and commuting bats; notably Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat and Lesser Horseshoe Bat. Natterer's Bat, Myotis species, Nathusius's Pipistrelle and Brown Long-eared Bat were also recorded during field surveys of the Proposed Development and adjacent land. Lesser Horseshoe Bats foraging and commuting in land within and adjacent to the Proposed Development site potentially belong to populations forming Qualifying Interests of the nearby Danes Hole, Poulnalecka SAC and Ratty River Cave SAC (see **Sections 7.6.2.3** and **7.6.2.4** for detailed assessment of effects).

As described in **Section 7.5**, the Proposed Development includes embedded mitigation during construction to minimise loss and fragmentation of suitable bat habitat (e.g., woodland, higher quality grassland, hedgerows), and to avoid significant disturbance of

this habitat. Notably, best practice construction measures (**Section 7.5.1**) and ecological supervision (**Section 7.5.4**) will minimise light spill onto suitable foraging habitat and potential roost sites. Whilst no bat roosts have been identified as requiring removal to facilitate the Proposed Development, pre-construction surveys will be undertaken to identify any potential roosts which would be affected, with mitigation subsequently adopted as appropriate. (eg appropriate timing of works to avoid sensitive periods, provision of bat boxes to replace tree roosts etc). Considering this embedded mitigation, disturbance and direct mortality effects on bats during construction will not be significant. However, in the absence of additional mitigation, the construction of the Proposed Development will cause a decrease in the availability and connectivity of suitable bat foraging and commuting habitat. As such, in the absence of additional mitigation the construction of the Proposed Development is considered to potentially have a significant negative effect on foraging and commuting bats at a Local level (slight effect) through habitat loss and fragmentation.

Aquatic Species

As detailed in Section 7.4.7, various important aquatic species were identified within the potential ZOI of the Proposed Development (e.g., using watercourses with hydrological connectivity to the Proposed Development), including species relevant to the Lower River Shannon SAC (see Section 7.6.2.2 for assessment of effects). Populations of aquatic species are considered to be of Local importance (Higher value). This applies to species including Salmon, Brown Trout, Lamprey species, Eel and White-clawed Crayfish. Otter is discussed separately above.

Underground cable ducting will cross six water courses, to be undertaken using Horizontal Directional Drilling (HDD) (Crossing No. 10A, 19A, 26A, 32A, and 43A). Additionally, two grid crossing points (No. 2 and 11, Option 1 Grid Route) will be installed using HDD. The watercourses at these locations were all classified as being of Local importance (Higher value) due to the presence of salmonids, Lamprey and/or good water quality. Vibrations and disturbances associated with drilling can disrupt the physical structure of aquatic habitats. This may include changes in sediment composition, substrate stability and overall habitat quality.

Construction can have wide-ranging impacts on aquatic species. During the Horizontal Directional Drilling (HDD) process, small quantities of greases known as 'drilling fluids' are commonly used to keep components of the drill rig cool and lubricated. These drilling fluids are typically composed of a mixture of bentonite clay, which can be harmful to the environment. Therefore, there is a risk of polluting the watercourse. Similarly, materials used on site, including concrete and fuel for the vehicles, could potentially spill into the watercourses. Artificial light can disrupt the natural behaviour of fish, causing them to avoid areas or attracting them to areas (where they be more susceptible to predation). Light spill can be particularly significant for species which are largely nocturnal such as Eel (Stein et al., 2016).

Vibrations from drilling can induce stress to fish, leading to avoidance behaviour impacting their feeding, spawning, migration and overall immune functioning and health. This avoidance behaviour may result in shifts in distribution within the river system as the fish seek quieter areas. Fish rely on their lateral line to detect vibrations and changes in water pressure. Excessive vibrations could potentially interfere with their

ability to use this sensory system effectively, which may affect their ability to navigate and find food, as well as detect predators. Additionally excessive vibrations may impact fish swim bladders, which could affect the fish's ability to maintain its position in the water column or control its buoyancy.

Low-frequency noise (5-10Hz) can elicit awareness responses from juvenile Salmon, including decreased heart rate and breathing movement (Knudsen, Engger & Sand, 1994). Therefore, even anthropogenic sounds at low levels, may lead to changes in behaviour and mask biologically important sounds, which could impact spawning, foraging and disrupt migrations and habitat selection.

The required felling and habitat loss for the wind farm operation may reduce shade in parts of the watercourse that run through the Proposed Development. Shade plays a crucial role in juvenile and nursery aquatic habitats, providing cover for fish. This allows them to better observe approaching objects while making it more challenging for oncoming prey to detect them (Helfman, 1981). The reduced shade and leaf litter would ultimately lead to a reduction in habitat complexity. Clear-felling activity causes exposure, and weathering, which can also impact water quality by increasing siltation.

Increased siltation from clear-felling and drilling works could have detrimental impacts on fish such as increased mortality, reduced suitable spawning areas, lower success rates for eggs/early life stages, gill irritation/trauma, altered blood chemistry, impaired movement/swimming ability, modified foraging behaviour, and diminished territoriality (Wildfish, 2017). Salmonid and Lamprey (Brook and River) eggs require a well-oxygenated environment during embryonic development, which is facilitated by permeable gravel beds with interstitial pore spaces. Excessive sediment can obstruct these pores, impeding the circulation of oxygenated water and thereby decreasing egg survival (Wildfish, 2017). Long-term consequences include habitat degradation and the potential for reduced genetic diversity.

Spilled oil may cover the water's surface and submerged objects, smothering critical habitats for eels. Toxic chemicals in the oil and drilling fluids can harm fish by damaging their gills, liver, and other vital organs. Reduced oxygen levels resulting from the presence of oil can lead to hypoxia, posing a serious threat to fish survival. Additionally, the contamination disrupts fish feeding behaviour, as well as hindering the natural reproductive process and thus reducing successful reproduction rates.

Increasing siltation can create unsuitable conditions for White-clawed Crayfish, as it causes increasing turbidity and in combination with decreased dissolved oxygen concentrations, can have adverse effects on crayfish populations (Holdich, 2003). Silt particles may also clog up the gills of the crayfish, leading to respiratory stress. White-clawed Crayfish are particularly susceptible to acute pollution incidents, which if large enough can cause mass mortality (Peay, 2003). As such, White-clawed Crayfish require good quality water and have been known to climb out of the water to escape poor water quality. Habitat degradation and reduced water quality can therefore lead to population fragmentation and isolation (Peay, 2002).

As described in **Section 7.5**, the Proposed Development includes embedded mitigation during construction to minimise loss and fragmentation of habitat suitable for aquatic species. The important aquatic species described above were all recorded outside of the Proposed Development site only, and there will be no removal of potentially

important habitat for these species during the construction of the Proposed Development, with drainage ditches to be removed (see **Section 7.6.3.1**) comprising habitat of low to negligible suitability for these species. The removal of these sections of drainage ditch therefore does not have the potential for significant effects on these species. Effects on aquatic species through habitat loss and fragmentation during the construction of the Proposed Development are considered **not significant**.

Considering the potential effects described above, avoidance of disturbance, pollution and associated mortality (e.g., from pollution events) is a key consideration. This is reflected by the embedded mitigation measures within the CEMP (see **Section 7.5**).

Measures will be implemented to maintain a buffer of 15m from minor watercourses and land drains (except where they are crossed by tracks or, in the case of minor land drains, where a lesser buffer is applied or where the drain is re-directed). Therefore, habitat around watercourses will be maintained and there will be minimal reduction of shading on the watercourse.

The CEMP includes best practices to reduce noise, light pollution spillages, and vibration generation, aiming to minimise disturbance. All plant and machinery will adhere to specific noise legislation (S.I. No. 320/1988 - European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1988 (as amended)) and be powered off when not in use. Additionally, efforts will be made to avoid artificial lighting in habitats (including waterbodies) used by potentially sensitive ecological receptors.

The CEMP also includes measures to avoid pollution of waterbodies within, and adjacent to, the Proposed Development site. This includes using drilling fluids such as Clearbore, which is an environmentally friendly, high-performance water-based mud suitable for tunnelling and drilling operations, or fluids with similar environmental properties. Where the proposed grid connection cable route encounters minor culverts, the ducts will be installed above or below the culvert depending on its depth in accordance with construction methodologies outlined in the CEMP.

Refuelling activities will primarily take place outside of the Proposed Development site. Machinery refuelling will occur at designated locations at least 50 meters away from water courses, utilizing a double-skinned fuel bowser towed by a spill-prevention-equipped 4x4, with authorization limited to designated personnel. The fuel bowser will be parked on a level area in the construction compound when not in use and a limited amount of fuel will be stored on-site in the temporary construction compound and banded to at least 100% of the storage capacity of the fuels to be stored. For concrete usage, pre-mixed concrete will be the primary choice, with exceptions made for specific substation components and drainage culverts, which will utilise hollow core and pre-cast concrete, respectively. Concrete pours at turbine locations will be carefully scheduled. Spoil arisings will be stored at a maximum height of 2m and located at least 25m away from watercourses. Additionally, silt fences will be employed between spoil storage and water crossings to prevent silt runoff. Indirect pollution impacts on watercourses are unlikely with embedded mitigation.

Excavated soil from access road construction will be reused on-site for berms, landscaping, and along road margins. Berms will be placed away from interceptor drains to avoid flow obstruction or siltation risk. Constructed drainage systems will

manage runoff from various areas, reducing potential silt runoff during construction and operation. The development will implement a SuDS drainage system with on-site flow retention, buffer zones, and silt removal techniques to promote environmentally responsible water management.

Considering this embedded mitigation, and the scope for effects, effects on aquatic species through disturbance, pollution and associated mortality during the construction of the Proposed Development are considered **not significant**. The status of aquatic habitats and species will continue to be monitored during and post-construction (see **Section 7.9**), the findings of which will inform any requirement for additional mitigation.

Summary

Table 7.23: Construction effect characterisation for Key Ecological Features

KEF	Effect	Effect magnitude	Effect significance
Habitats	Habitat loss and fragmentation	Small	Long-term slight negative effect (significant at a Local level)
	Disturbance, displacement and pollution	Negligible	Not significant
Plant species	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant
Invasive non-native plant species	Spread of invasive non-native species	Small	Long-term slight negative effect (significant at a Local level)
Marsh Fritillary	Habitat loss and fragmentation	Small	Long-term slight negative effect (significant at a Local level)
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant
Amphibians and reptiles	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant
Otter	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant
Badger	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant
Pine Marten	Habitat loss and fragmentation	Minor	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant

KEF	Effect	Effect magnitude	Effect significance
	Direct mortality	Negligible	Not significant
Red Squirrel	Habitat loss and fragmentation	Minor	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant
Irish Hare	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant
Bats	Habitat loss and fragmentation	Small	Long-term slight negative effect (significant at a Local level)
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant
Aquatic species	Habitat loss and fragmentation	Minor	Not significant
	Disturbance, displacement, pollution	Minor	Not significant
	Direct mortality	Minor	Not significant

7.6.3.2 Operational Effects

The assessment of effects on Key Ecological Features during the operation of the Proposed Development is described below and summarised in **Table 7.25**, in accordance with the effect terminology described in **Section 7.3.4**. The Proposed Development has an anticipated lifespan of 35 years. Potential effects identified during the operational phase are as follows:

- **Direct habitat loss and fragmentation:** permanent and temporary reductions to the extent, quality, and connectivity of the habitats present on site to facilitate operational maintenance;
- **Disturbance and displacement:** disturbance of protected and/or priority species from additional noise, dust, light, vibration, and human activity, with the potential to cause displacement;
- **Direct mortality of individuals:** fatalities or injuries to sensitive species caused by operational activities; notably potential collisions with operational turbines;
- **Pollution of habitats:** through operational activities such as the use, assembly and storage of machines and materials (risk of chemical and fuel spills); particularly regarding aquatic habitats.

Habitats

Habitat removal and alteration during the operational phase of the Proposed Development will be limited to small-scale temporary removal, with any works undertaken in accordance with the embedded mitigation described in **Section 7.5**. Any temporarily removed habitat will be allowed to reinstate naturally once the works have

been completed. Considering the extent of habitat removal and alteration anticipated, effects from operational habitat loss and fragmentation are considered not significant.

Whilst anticipated to be relatively small in scale (particularly relative to construction works), operational maintenance has the potential to cause disturbance and pollution of retained habitats. All operational maintenance will be undertaken in accordance with the embedded mitigation described in **Section 7.5**, including measures to minimise noise, vibration and light spill. Measures to avoid pollution of watercourses will be adopted. Considering the scope for impacts from maintenance works, and the embedded mitigation during the operation of the Proposed Development, effects from operational habitat disturbance and pollution are considered not significant.

Plant Species

As described in **Section 7.4.2**, no specially protected or notable plant species were recorded within or in close proximity to the Proposed Development site during the field surveys undertaken in 2021. Triangular Clubrush, a rare and highly threatened vascular plant species in Britain and Ireland, is known from the lower reaches of the Owenogarney/Ratty River. Embedded mitigation during the operation of the Proposed Development (see **Section 7**) includes measures to minimise pollution and disturbance effects on watercourses (e.g., habitats potentially supporting Triangular Clubrush) and avoid harm to any other important flora which could potentially be present. Measures will also be in place to minimise the loss of habitat suitable for supporting important flora. ECoW support (see **Section 7.5.4**) during relevant maintenance activities will ensure that any important flora are identified prior to operational activities and appropriate measures are put in place to avoid harming these species. Considering the ecological baseline regarding important flora, and the embedded mitigation measures, effects on plant species during the operation of the Proposed Development are considered not significant.

Invasive Non-native Plant Species

As described in **Section 7.4.2.28**, invasive non-native species have been identified within and adjacent to the Proposed Development site. These include Japanese Knotweed, Himalayan Knotweed, Butterfly-bush and Common Rhododendron. In the absence of mitigation, operational works could potentially disturb stands of invasive plants and/or soils contaminated with invasive plant material and cause them to spread within the Proposed Development and in the surrounding land. Activities with the potential for effects include:

- Vegetation clearance, mowing, hedge-cutting or other landscaping activities;
- Spread of seeds or plant fragments through the local surface water and drainage network; and
- Contamination of vehicles or equipment with seeds or plant fragments which are then transported to other areas.

In the absence of additional mitigation, operational maintenance to facilitate the Proposed Development could cause the spread of invasive non-native plant species within the Proposed Development site and the wider landscape. Based on the scope for potential effects from the spread of these species resulting from the Proposed Development, spread of invasive non-native species during operation is considered to

potentially have a significant negative effect at a Local level (slight effect). Relevant mitigation is described in **Section 7.6.4**.

Invertebrates

Whilst no evidence of Marsh Fritillary was recorded within or in close proximity to the Proposed Development, habitats within the Proposed Development site were potentially suitable for Marsh Fritillary, containing abundant Devil's-bit Scabious, and numerous nearby records of this species were identified during the desk study. The Proposed Development and adjacent land has therefore been identified as potentially being of Local importance (Higher value) for Marsh Fritillary on a precautionary basis.

As described in **Section 7.5**, the Proposed Development includes embedded mitigation during the operational phase to minimise the loss and fragmentation of suitable Marsh Fritillary habitat (i.e., wet grassland and heath) and avoid significant disturbance of suitable habitat. Removal of suitable habitat for this species during the operation of the Proposed Development is expected to be minimal. ECoW support (see **Section 7.5.4**) during relevant maintenance activities will ensure that any suitable Marsh Fritillary habitat is identified prior to operational activities and appropriate measures (e.g., further surveys and mitigation) are implemented to avoid harming this species. Considering the ecological baseline regarding this species, and the embedded mitigation measures, effects on Marsh Fritillary during the operation of the Proposed Development are considered not significant.

Amphibians and Reptiles

Whilst no evidence of amphibian or reptile presence was recorded within or in close proximity to the Proposed Development, habitats within the Proposed Development site were highly suitable for amphibians and reptiles, and multiple nearby records were identified during the desk study. The Proposed Development and adjacent land has therefore been identified as potentially being of Local importance (Higher value) for amphibians and reptiles on a precautionary basis.

As described in **Section 7.5**, the Proposed Development includes embedded mitigation during the operational phase to minimise the loss and fragmentation of suitable amphibian and reptile habitat (i.e., rough grassland, heath, hedgerows, scrub and waterbodies) and avoid significant disturbance of suitable habitat. Removal of suitable habitat for these species during the operation of the Proposed Development is expected to be minimal. ECoW support (see **Section 7.5.4**) during relevant maintenance activities will ensure that any suitable amphibian and reptile habitat is identified prior to operational activities and appropriate measures (e.g., precautionary working methods, including sensitive timing of works) are implemented to avoid harming any amphibians or reptiles. Considering the ecological baseline regarding these species, and the embedded mitigation measures, effects on amphibians and reptiles during the operation of the Proposed Development are considered not significant.

Terrestrial Mammals

The Proposed Development site and adjacent land has been identified as potentially being of Local importance (Higher value) for Otter, Badger, Pine Marten, Red Squirrel and Irish Hare. These species were recorded using or potentially using a range of habitats within and adjacent to the Proposed Development site; notably conifer

plantation (for Pine Marten and Red Squirrel), watercourses and scrub (for Otter) and agricultural fields, grassland and woodland edges (for Badger).

As described in **Section 7.5**, the Proposed Development includes embedded mitigation during the operational phase to minimise the loss and fragmentation of suitable mammal habitat and avoid significant disturbance of suitable habitat (notably habitat suitable for Otter dens and Badger setts). Removal of suitable habitat for these species during the operation of the Proposed Development is expected to be minimal, and light spill onto habitat used by nocturnal mammal species during operation will be avoided. ECoW support (see **Section 7.5.4**) during relevant maintenance activities will ensure that any suitable habitat for dens, setts or sheltering by these species is identified prior to operational activities, and that appropriate measures (e.g., precautionary working methods, including sensitive timing of works) are implemented to avoid harm or significant disturbance. Considering the ecological baseline regarding these species, and the embedded mitigation measures, effects on Otter, Badger, Pine Marten, Red Squirrel and any other terrestrial mammal species during the operation of the Proposed Development are considered not significant.

Bats

The Proposed Development site and adjacent land have been identified as being of Local importance (Higher value) for foraging and commuting bats; notably Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat and Lesser Horseshoe Bat. Natterer's Bat, Myotis species, Nathusius's Pipistrelle and Brown Long-eared Bat were also recorded during field surveys of the Proposed Development and adjacent land.

As described in **Section 7.5**, the Proposed Development includes embedded mitigation during the operational phase to minimise the loss and fragmentation of suitable bat foraging and commuting habitat (i.e., rough grassland, heath, hedgerows, scrub and watercourses) and avoid significant disturbance of suitable habitat. Removal of potential roost sites will also be avoided wherever possible. Removal of suitable bat habitat during the operation of the Proposed Development is expected to be minimal, and light spill onto habitat used by bats (notably potential roost sites and key foraging and commuting areas) during operation will be avoided. ECoW support (see **Section 7.5.4**) during relevant maintenance activities will ensure that any suitable bat habitat is identified prior to operational activities and appropriate measures (e.g., further surveys, precautionary working methods, sensitive timing of works) are implemented to avoid any harming or disturbance of bats. Considering this embedded mitigation, and the scope for impacts during the operational stage, effects on foraging, roosting and commuting bats through habitat loss, fragmentation and disturbance during the operation of the Proposed Development are considered not significant.

Both direct collision with turbine blades and barotrauma resulting from close contact with blades have been reported as an issue for bats at operational wind farms (Cryan & Barclay, 2009). The susceptibility of different bat species to such impacts depends on multiple factors; notably their tendency to fly at rotor blade height. A general assessment of vulnerability of bat species to collisions with wind turbines, based on best available scientific information, is provided in **Table 7.25**. SNH (2019) provides a generic assessment of bat collision risk for UK species, based on species behaviour and flight categorisation as well as evidence of casualty rates in the UK and Europe.

This bat species collision risk assessment is considered to represent best available information for use in an Irish context. This species collision risk categorisation is used in combination with relative abundance to indicate the potential vulnerability of bat populations. Relative abundances for Irish species were determined in accordance with guidance provided by Wray et al. (2010) in combination with available population data.

Table 7.24: Estimated turbine collision risk for bat species

Relative abundance	Collision risk for Irish bat species		
	Low	Medium	High
Common (100,000 plus)	Brown Long-eared Bat		Common Pipistrelle Soprano Pipistrelle
Rare (10,000 – 100,000)	Daubenton's Bat Natterer's Bat Whiskered Bat Lesser Horseshoe Bat		Nathusius's Pipistrelle Leisler's Bat

Population vulnerability: yellow = low, orange = medium, red = high. Species of particular relevance to the Proposed Development are indicated in bold.

In summary, of the four bat species of particular importance in the context of the Proposed Development (Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat and Lesser Horseshoe Bat), three species are of high collision risk, whilst one (Lesser Horseshoe Bat is of low collision risk). It should be noted that Leisler's Bat, whilst fairly rare in Great Britain and Europe, is one of the most common bat species in Ireland, with an estimated population of 73,000-130,000 (2007-2012) (Roche, 2014).

The Proposed Development includes embedded mitigation to minimise the risk of collisions and baropressure effects, notably by clearing linear Tree/Hedgerow features and forestry features within 97 m of turbine blade tips to make this area unfavourable for bats and thus discourage them from flying through/in close proximity to turbines. The current recommended guidance for this mitigation is dependent upon the Turbine size and for the sake of this assessment, it has been assumed that the largest Turbine will be deployed (Vesta V150). As such activity through operation of Turbines will be insufficient for significant effects to arise. Collision and baropressure effects will be monitored through carcass searching as per Monitoring Section 7.9.

Aquatic Species

As detailed in **Section 7.4.7**, various important aquatic species were identified within the potential Zol of the Proposed Development (e.g., using watercourses with hydrological connectivity to the Proposed Development), including species relevant to the Lower River Shannon SAC (see **Section 7.6.2.2** for assessment of effects). Populations of aquatic species are considered to be of Local importance (Higher value). This applies to species including Salmon, Brown Trout, Lamprey species, Eel and White-clawed Crayfish. Otter is discussed separately above.

Construction effects relevant to aquatic species are described in detail in **Section 7.6.3.2**. These effects are also relevant in the context of operational maintenance activities for the Proposed Development. Whilst habitat loss and fragmentation during operation will be minimal, the operation of the Proposed Development will involve activities with the potential to cause additional light spill, vibration and pollution (including siltation of watercourses), with potential disturbance and mortality effects. However, considering the scope of operational maintenance, the potential for such effects is far lower than during the construction phase. In addition, detailed embedded mitigation measures (see **Sections 7.5** and **7.6.3.1**) will be adopted to avoid disturbance of watercourses and prevent pollution of aquatic habitat used by important species. Considering this embedded mitigation, and the scope for effects during the operational phase, effects on aquatic species through habitat loss and fragmentation, disturbance, pollution and associated mortality during the operation of the Proposed Development are considered **not significant**. The status of aquatic habitats and species will continue to be monitored throughout the operation of the Proposed Development (see **Section 7.9**), the findings of which will inform any requirement for additional mitigation.

Summary

Table 7.25: Operational effect characterisation for Key Ecological Features

KOF	Effect	Effect magnitude	Effect significance
Habitats	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
Plant species	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant
Invasive non-native plant species	Spread of invasive non-native species	Small	Long-term slight negative effect (significant at a Local level)
Invertebrates	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant
Amphibians and reptiles	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant
Terrestrial mammals	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant
Bats	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant

KOF	Effect	Effect magnitude	Effect significance
	Direct mortality (including turbine collisions)	Minor	Not significant
Aquatic species	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
	Direct mortality	Negligible	Not significant

7.6.3.3 Decommissioning Effects

The assessment of effects on ecological features during the decommissioning phase of the Proposed Development is described below and summarised in **Table 7.26**. Potential effects identified during the decommissioning phase are as follows:

- **Direct habitat loss:** permanent and temporary reductions to the extent, quality, and connectivity of the habitats present; and
- **Disturbance and displacement:** disturbance of protected and/or priority species from additional noise, dust, light, vibration, and human activity, with the potential to cause displacement.

Invasive Non-native Plant Species

As described in **Section 7.4.2.28**, invasive non-native species have been identified within and adjacent to the Proposed Development. These include Japanese Knotweed, Himalayan Knotweed, Butterfly-bush and Common Rhododendron. These could potentially spread over the lifespan of the Proposed Development, resulting in greater abundances and wider distributions for these species.

In the absence of mitigation, decommissioning works could potentially disturb stands of invasive plants and/or soils contaminated with invasive plant material and cause them to spread within the Proposed Development and in the surrounding land. Activities with the potential for effects include:

- Vegetation clearance, mowing, hedge-cutting or other landscaping activities;
- Spread of seeds or plant fragments during the movement or transport of soil;
- Spread of seeds or plant fragments through the local surface water and drainage network;
- Contamination of vehicles or equipment with seeds or plant fragments which are then transported to other areas; and
- Importation of soil from off-site sources contaminated with invasive species plant material.

In the absence of additional mitigation, decommissioning works could cause the spread of invasive non-native plant species within the Proposed Development site and the wider landscape. Based on the scope for potential effects from the spread of these species resulting from the Proposed Development, spread of invasive non-native species during decommissioning is considered to potentially have a significant negative effect at a Local level (slight effect). Relevant mitigation is described in **Section 7.6.4**. An Invasive Species Management Plan is provided as **Appendix 7.8**.

Habitats and Species

No other potential impacts other than those already discussed above for the construction and operational phases are likely to occur during decommissioning. Turbine design enables decommissioning to be a relatively straightforward process, during which cranes will disassemble each turbine, and turbine sections will then be removed. The upper sections of the foundations projecting above ground will be removed, and the remainder of the foundations and hardstanding areas covered over with topsoil and left to regenerate naturally. Underground cables will be cut back at the turbine termination, and either be recycled or left buried in-situ. Site materials will be disposed of in accordance with current waste legislation.

Habitat removal and alteration during decommissioning will be limited to small-scale temporary removal, with any works undertaken in accordance with the embedded mitigation described in **Section 7.5**. Any temporarily removed habitat will be allowed to reinstate naturally once decommissioning has been completed. Considering the extent of habitat removal and alteration anticipated, effects from habitat loss and fragmentation during decommissioning are considered **not significant**, both with regard to the habitats themselves and the flora and fauna they support.

All decommissioning activities will be undertaken in accordance with the embedded mitigation described in **Section 7.5**, including measures to minimise noise, vibration and light spill. Measures to avoid pollution of watercourses will be adopted, and light spill onto habitat used by nocturnal species during operation will be avoided. ECoW support (see **Section 7.5.4**) during relevant maintenance activities will ensure that any suitable habitat for sensitive species (e.g., Marsh Fritillary, amphibians and reptiles, terrestrial mammals, bat species, aquatic species) is identified prior to decommissioning activities, and that appropriate measures (e.g., precautionary working methods, including sensitive timing of works) are implemented to avoid harm or significant disturbance. Considering the scope for effects in view of this embedded mitigation, and the ecological baseline, disturbance, displacement and pollution effects on habitats and species (excluding invasive non-native plant species, as described above) during the decommissioning of the Proposed Development are considered **not significant**.

Summary

Table 7.26: Decommissioning effect characterisation for Key Ecological Features

KOF	Effect	Effect magnitude	Effect significance
Habitats	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
Plant species	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
Invasive non-native plant species	Spread of invasive non-native species	Small	Long-term slight negative effect (significant at a Local level)
Invertebrates	Habitat loss and fragmentation	Negligible	Not significant

KOF	Effect	Effect magnitude	Effect significance
	Disturbance, displacement, pollution	Negligible	Not significant
Amphibians and reptiles	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
Terrestrial mammals	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
Bats	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant
Aquatic species	Habitat loss and fragmentation	Negligible	Not significant
	Disturbance, displacement, pollution	Negligible	Not significant

7.6.3.4 Cumulative Effects

As described in EIAR **Chapter 20 Impact Interactions and Cumulative Effects**, a planning search was carried out to identify proposed, permitted and constructed projects in the wider receiving environment which could potentially contribute to cumulate effects with the Proposed Development. Cumulative effects are defined by CIEEM (2018) as: *“Additional changes caused by a proposed development in conjunction with other developments or the combined effect of a set of developments taken together”*.

Windfarm projects within 20km and other Projects within 10km considered for cumulative effects were identified using various online plans and resources. Many consent applications pertain to one-off residential dwellings or farm buildings/structures along the regional roads. Considering their scale, these applications are highly unlikely to have cumulative effects upon the Key Ecological Features identified in relation to the Proposed Development. Therefore, only developments of a particular size and nature have been considered further for cumulative assessment.

As per SNH (2018) guidance on Assessing the Cumulative Impacts of Onshore Wind Energy Developments, cumulative effects arising from developments may be:

- Additive (i.e., multiple independent additive model);
- Antagonistic (i.e., the sum of impacts are less than in a multiple independent additive model); and
- Synergistic (i.e., the cumulative impact is greater than the sum of the multiple individual effects).

Wind Farm Projects with Potential Cumulative Effects

Other proposed, permitted and constructed wind farms within 20km of the Proposed Development site were considered for the potential to give rise to cumulative effects. The proximity and status (i.e., operational, permitted or pending) of these wind farms has been taken into consideration within this assessment.

Seven wind farm developments were identified as requiring assessment of cumulative effects in relation to the Proposed Development, as summarised in **Table 7.27** below.

Table 7.27: Wind farm developments considered for cumulative effects

Wind farm	Status	Distance from Proposed Development	No. of turbines	Blade tip height	Max. rotor diameter
Knockshanvo	Pre-planning	0.5 km N	9	179.5-185 m	149-163 m
Ballyclar	Pre-planning	4.7 km S	12	150-158 m	NA
Carrownagowan	Granted	5.1 km NE	19	169 m	136 m
Fahybeg Onshore Wind Farm	Planning (appealed)	6.0 km E	8	169- 176.5 m	131-138 m
Lackareagh	Pre-planning	6.4 km NE	7	N/A	N/A
Parteen Turbine	Operational	9.4 km SE	1	N/A	53 m
Vision Care Turbine	Operational	13.7 km NE	1	N/A	Radius 40 m

Each additional turbine erected in the landscape can potentially increase the scope for cumulative effects on habitats and species. Effects are likely to be more pronounced for highly mobile species which rely on larger continuous areas in which they forage and commute (e.g., bats).

Other Projects with Potential Cumulative Effects

Existing or proposed projects in the vicinity of the Proposed Development site have the potential to cumulatively impact on ecological features; particularly through increased fragmentation of the landscape, disturbance, barrier effects, and intensification of collision or displacement effects. In this case, such developments include solar farms, quarries and residential developments. Developments considered for cumulative effects are detailed in **Table 7.28**.

Assessment of Cumulative Effects on Habitats

The constraints-led design approach for the Proposed Development has minimised the requirement for habitat removal, with habitat removal predominantly involving habitats of relatively low ecological value which are widespread regionally and in the local area: notably conifer plantation, lower quality grassland and artificial surfaces. Whilst embedded mitigation will be adopted to minimise loss and fragmentation of important habitats, the Proposed Development will involve the permanent loss of habitats of greater ecological value including heath, bog, higher quality grassland, scrub, hedgerow, tree lines and drainage ditches (see **7.6.3.1**). Considering the extent of this habitat removal, and in spite of potential additional projects described above in the vicinity of the Proposed Development, even in the absence of mitigation, cumulative impacts associated with habitat loss are considered as not significant.

Considering the scope for habitat disturbance and pollution from the Proposed Development, and the embedded mitigation detailed in **Section 7.5**, there is no potential for significant cumulative effects on habitats through disturbance or pollution.

Assessment of Cumulative Effects on Species

The constraints-led design approach for the Proposed Development has minimised the potential for effects on protected and notable species through habitat loss and fragmentation, disturbance and displacement, and direct mortality. Embedded mitigation detailed in **Section 7.13** also includes measures to avoid and/or minimise potential effects on these species.

Certain species requiring detailed assessment (e.g., plant species, Marsh Fritillary, reptiles and amphibians) are relatively sedentary and are therefore less likely to be subject to significant cumulative effects. In addition, these species were included as Key Ecological Features for further consideration on a precautionary basis (e.g., based on the presence of suitable habitat and desk study records), with significant populations yet to be identified within or in close proximity to the Proposed Development site. Whilst activity by terrestrial mammals (e.g., Otter, Badger, Pine Marten, Red Squirrel) was recorded within and/or adjacent to the Proposed Development, significant activity in affected habitat (e.g., dens, setts, areas subject to high levels of foraging activity) was not identified, and large areas of suitable habitat for these species will be retained within and adjacent to the Proposed Development site and in the wider landscape. Considering the embedded mitigation, the scope for effects on these species and the availability of suitable habitat in the surrounding landscape, cumulative effects on plant species, Marsh Fritillary, reptiles and amphibians, terrestrial mammals and aquatic species are considered **not significant**.

Regarding potential cumulative effects on bats, the constraints-led design approach has minimised the risk of disturbance, displacement and reduced habitat extent/connectivity. This is based on the extent of habitat removed as part of the embedded mitigation leaving the majority of suitable habitat intact to support habitat connectivity. Significant cumulative effects through these impact pathways are not anticipated.

Table 7.28: Non wind farm developments considered for cumulative effects

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
Within 10 km from Project Site				
Solar Farm	2360249 Clare County Council	Approximately 4.5km West from the proposed windfarm site	A solar farm on a site of 70 hectares consisting of the following: 309,008 sq. m. of solar photovoltaic panels on ground mounted steel frames; a 38 kV electrical substation with electrical control building and associated compound with palisade fence; the	Permission was granted on the 10th of October 2023 with 14 No. conditions. From examination of the online planning file, it is our

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
			<p>installation of 21 electrical skids within 7 no. electrical compounds (with acoustic barrier fencing); underground power and communication cables and ducts, including underground cabling along the L3056 public road; new and upgraded internal access tracks (including stream crossings as required); 3 no. upgraded site entrances to the public road (one entrance to L-3054 (Lackyle Heights), and 2 no. entrances to L-30541); boundary fencing (including 607m of acoustic barrier fencing on the eastern boundary); landscaping and biodiversity enhancement measures; and all associated ancillary development, site works and services. The solar farm will be operational for 40 years.</p> <p>A Natura Impact Statement (NIS) has been prepared in respect of the proposed development and will be submitted to the planning authority with the application.</p> <p>Permission was granted on the 10th of October 2023.</p>	<p>understanding that this project has not yet commenced.</p> <p>This development is scoped in for cumulative assessment due to its proximity to the Proposed Development.</p>
Quarry	18818 Clare County Council	Approximately 4km South from the proposed wind farm site	<p>For development which will consist of an expansion to an existing quarry consisting of 10 hectares located adjacent to the existing working quarry including extraction of rock by blasting means down to 150mOD; Extracted rock will be processed at the existing working quarry; Landscaping of the quarry during the operational phase and restoration of the quarry on completion of extraction; All associated ancillary facilities / works; The applicant is seeking a 16 year permission</p>	<p>Clare County Council issued notification to grant planning permission subject to nineteen conditions on the 13th of December 2019. The facility is currently operational.</p> <p>This operational quarry, which is identified as a source of materials for construction of</p>

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
			<p>as part of the application. The application is accompanied by an Environmental Impact Assessment Report (EIAR)</p> <p>Application was submitted on the 17th of October 2018 and was granted on the 13th of December 2019.</p>	<p>the Proposed Development, is scoped in for cumulative assessment due to its proximity to the Proposed Development.</p>
Residential Development	<p>2023065 EIAR Portal Reference</p> <p>22959 Limerick County Council</p>	Approximately 8.8km South from the proposed windfarm site	Proposed development of 98 no. residential units and a significant Biodiversity area, on a site of 9.45 hectares, which comprises Phase 3 of an overall Masterplan site.	<p>Granted permission with 27 No. Conditions on the 28th of June 2023.</p> <p>An appeal was submitted on the 24th of July 2023.</p> <p>This development, which is yet to be determined, is scoped in for cumulative assessment due to its proximity to the Proposed Development.</p>
Restoration of Old Quarry Site	18995 Clare County Council	Approximately 6km East from the proposed windfarm site	<p>For the restoration of 3.76 hectares of an extant sand and gravel quarry to agricultural grassland. The development is necessary to comply with condition no. 4 of substitute consent 03.SU.0127 and will include importation of inert material and all associated development works.</p> <p>Permission was granted on the 9th of March 2023.</p>	<p>Permission was granted on the 9th of March 2023.</p> <p>Condition 2b states that the maximum annual rate of intake shall not exceed 18,000 metric tonnes.</p> <p>This development is scoped in for cumulative assessment due to its proximity to the Proposed Development.</p>
Residential Development	2023143 EIAR Portal Reference	Approximately 8.8km South from the proposed windfarm site	Proposed development of 54 no. residential units which comprises Phase 4 of an overall Masterplan site	Permission was granted on the 11 th of October 2023 with 30 No. Conditions.

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
	221114 Limerick County Council			<p>From examination of the online planning file, it is our understanding that this project has not yet commenced.</p> <p>This development is scoped in for cumulative assessment due to its proximity to the Proposed Development.</p>
Solar Farm	22591 Clare County Council	Approximately 5km Southeast from the proposed windfarm site and within 350m of TDR	<p>For a 10-year planning permission for a solar array at Ballyglass, Coolderry, Dromintobin North, Reanabrone, and Oakfield (townlands) Ardnacrusha, Co Clare. The development will consist of c265,000 m² of solar panels on ground mounted frames, 8 no. single storey control cabins with associated electrical transformer units and hardstand areas, 2 no. ring main units, underground cabling within the solar array site and within the L70382 public road to connect solar array field parcels, security fencing, CCTV, access tracks (upgrade of existing and new), upgrades to four existing agricultural field entrances on the R463, I3046 and L70382 and creation of new entrance on L70382, temporary construction compound, landscaping and all associated ancillary apparatus and development works. The solar array will connect to the national grid and will have an operational lifespan of 35 years. A Natura Impact Statement (NIS) has been prepared in respect of the</p>	<p>The application was submitted on the 4th of July 2022 and was granted on the 17th of February 2023 with 13 conditions.</p> <p>This development is scoped in for cumulative assessment due to its proximity to the Proposed Development.</p>

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
			<p>proposed development and will be submitted to the planning authority with the application.</p> <p>The application was submitted on the 4th of July 2022 and was granted on the 17th of February 2023 with 13 conditions.</p>	
Solar Farm	16368 Clare County Council	Approximately 9km South West from the proposed windfarm site	<p>For a 10-year permission for the development of a solar PV panel array consisting of up to 29,225.37 sq.m of solar panels on ground mounted steel frames, 1 No. substation, 3 No. inverter cabins, underground cable ducts, a temporary site compound area and ancillary facilities, boundary security fencing, site landscaping, a site entrance and access track, CCTV and all associated site works located in the townland of Ballymorris.</p> <p>The application was granted on the 24th of April 2017 with 17 conditions.</p>	<p>The application was granted on the 24th of April 2017 with 17 conditions.</p> <p>This development is scoped in for cumulative assessment due to its proximity to the Proposed Development.</p>
Solar Farm	1731 Clare County Council	Approximately 9.1km South West from the proposed windfarm site	<p>For a 10-year permission for the development of a solar PV farm consisting of up to 34,334 sq.m of solar panels on ground mounted steel frames, 1 no. substation, 2 no. inverter cabins, a battery storage container, underground cable ducts, a temporary site compound area and ancillary facilities, boundary security fencing, site landscaping, upgrade to existing farm track and new internal access track, CCTV and all associated site works. The development includes the demolition of the existing ruined cottage on site. The proposed solar farm will be</p>	<p>“Construction on the Terra project is expected to commence mid next year, creating 60 jobs during the 12-week build.” – Clare Champion reports on July 14th, 2017.</p> <p>From examination of the online article, it is our understanding that this project has commenced construction as of mid-2018.</p> <p>This development is scoped in for</p>

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
			<p>connected to the National Grid.</p> <p>Permission was granted by Clare County Council on 11th of August 2017.</p>	<p>cumulative assessment due to its proximity to the Proposed Development.</p>
<p>Ballymorris South Solar Farm</p>	<p>17411 Clare County Council</p>	<p>Approximately 9.8km Southwest</p>	<p>The development will consist of a 10 year permission for the construction of a Solar PV Energy development within a total site area of up to 9.4 hA, to include one single storey electrical substation building, electrical transformer/inverter station modules, solar PV ground mounted on steel support structures, access roads, fencing, CCTV, and associated electrical cabling, ducting and ancillary infrastructure.</p> <p>Permission was granted as of 22nd of June 2018.</p>	<p>From examination of the online planning file, it is our understanding that this project has commenced construction as of Q1 2021.</p> <p>This development is scoped in for cumulative assessment due to its proximity to the Proposed Development.</p>
Within 350m of TDR and GCR				
<p>Road Works</p>	<p>198000 Limerick County Council</p>	<p>Within 350m of TDR</p>	<p>The proposed improvement works will be carried out within the existing 60kph speed limit zone over a length of 750m between L6135 Curraghchase Junction and the L6125 Junction. The improvement works proposed comprise a reduction of the N69 carriageway width to 6.5m over the 750m length of the scheme with a footway installed on the southern side (school side) and kerbing and a grass verge on the northern side of the carriageway. The proposed works also include for the installation of LED public lighting on the northern side of the carriageway, road lining and signage as well as surface water drainage along both sides of the N69 carriageway and pavement improvement works. Accommodation works will be undertaken as required</p>	<p>The improvement works are planned along the N69, which is a large part of the Proposed Development's TDR. This development is therefore scoped in for cumulative assessment.</p>

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
			<p>including improvement works in and around the community hub of the national school and GAA club grounds. The implementation of the works proposed will result in a rearrangement of the existing road network in the vicinity of the scheme. Changes to the existing road network will include the reduction of road width to 6.5m over a 750m length and the installation of a kerbed footway abutting the westbound carriageway and kerbing and a verge abutting the eastbound carriageway over the scheme length.</p> <p>The application for planning permission was submitted on 31st of January 2019.</p>	
Residential Development	201114 and 211328 Limerick County Council	Within 350m of TDR	<p>Construction on Site 1 of 96no. residential units: 2no. 4 bedroom detached units, 20no. 4 bedroom semi-detached units, 8no. 3 bedroom semi-detached units, 32no. 3 bedroom terraced units, 13no. 2 bedroom terraced units, 17no. 2 bedroom duplex units, 4no. 1 bedroom duplex units. Provision of Creche and Community Building including external play area(Gross Floor Area - 787 sq.m, Creche 610 sq.m & Community Building 177 sq.m). Provision of shared communal and private open space, car parking, bicycle storage, bin storage, vehicular and pedestrian access, public lighting, site landscaping, services, signage, ESB substation and all associated site development works. Development to include access onto the Mungret Road(R859). The planning application is accompanied by</p>	<p>From examination of the online planning file, it is our understanding that this project has commenced construction as of 21st of February 2022.</p> <p>This development is scoped in for cumulative assessment based on its proximity to the TDR.</p>

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
			<p>a Natura Impact Statement. Planning permission was granted on the 27th of May 2021.</p>	
Residential Development	211152 Limerick County Council	Within 350m of TDR	<p>A residential development comprising 89 no. residential units, (9 no. detached houses, 36 no. semi-detached houses, 20 no. terraced houses, 24 no. duplex units), demolition of existing farm buildings, additional parallel parking along the Castletroy College road, accessed via a new entrance onto the Castletroy College road and all ancillary site development works. Ancillary site development works include a new connection to the public water main, foul and surface water drainage, access roads, footpaths, vehicle parking, landscaping, boundary treatments and site development works above and below ground. The planning application is accompanied by an EIAR (Environmental Impact Assessment Report) and an NIS (Natura Impact Statement).</p> <p>Planning permission was granted on the 20th of April 2022.</p>	<p>From examination of the online planning file, it is our understanding that this project has not yet commenced.</p> <p>This development is scoped in for cumulative assessment based on its proximity to the TDR.</p>
Residential Development	191236 Limerick County Council	Within 350m of TDR	<p>A residential development comprising 92 no. residential units, (60 no. houses, 32 apartments) This includes 1 no block of 32 apartments specifically intended to accommodate independent living for older persons. The planning application is accompanied by an EIAR and NIS. There is also additional parallel parking along the Castletroy College road, accessed via a new entrance</p>	<p>From examination of the online planning file construction is ongoing.</p> <p>This development is scoped in for cumulative assessment based on its proximity to the TDR.</p>

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
			<p>onto the Castletroy College road and all ancillary site development works. Ancillary site development works include a new connection to the public water main, foul and surface water drainage, access roads, footpaths, vehicle parking, landscaping, boundary treatments and site development works above and below ground.</p> <p>Planning permission was granted on the 4th of March 2021 by Limerick County Council.</p>	
Residential Development	19547 Limerick County Council	Within 350m of TDR	<p>A residential development comprising 70 no. residential units, (16 no. semi-detached houses, 6 no. terrace houses, 4 no. duplex units, 1 no. 4 storey apartment block over basement), 2 storey Creche and community playing pitch, accessed via the Castletroy College road and all ancillary site development works.</p> <p>Planning permission was granted on 28th of May 2020 by Limerick County Council.</p>	<p>From examination of the online planning file construction is ongoing.</p> <p>This development is scoped in for cumulative assessment based on its proximity to the TDR.</p>
Road Works	306146 An Bord Pleanála (ABP)	Within 350m of TDR	<p>Foynes to Limerick Road (including the Adare Bypass) including all ancillary and consequential works.</p> <p>The application was approved with conditions on the 30th of August 2022 by ABP.</p>	<p>The improvement works are planned along the N69, which is a large part of the Proposed Development's TDR. This development is therefore scoped in for cumulative assessment.</p>
Road Works	306199 ABP	Within 350m of TDR	<p>Foynes to Rathkeale Protected Road Scheme 2019, Rathkeale to Attyflin Motorway Scheme 2019 and Foynes Service Area Scheme 2019 (forming the Foynes to Limerick Road (including Adare Bypass)).</p> <p>The application was approved</p>	<p>The improvement works are planned along the N69, which is a large part of the Proposed Development's TDR. This development is therefore scoped in</p>

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
			with modifications on the 30th of August 2022 by ABP.	for cumulative assessment.
Residential Development	20256 Limerick County Council	Within 350m of TDR	<p>A residential development comprising 57 units (comprising 21 no. semi-detached houses, 3 no terrace, 2 duplex units) and 1 four storey apartment block over basement comprised of 31 apartments revisions to development granted under planning 18/698 consisting of alteration to a portion of the open space area, all accessed via existing entrance onto the Kilmurry Road and all ancillary site development works including connections to the public water main, foul and surface water drainage, access roads, footpaths, vehicle parking, landscaping, boundary treatments and site development works above and below ground. The planning application is accompanied by a Natura Impact Statement.</p> <p>Planning permission was granted on 8th of December 2020.</p>	<p>From examination of the online planning file construction commenced in May 2021 and was completed as of February 2022.</p> <p>The construction phase of the residential is complete and should therefore have no interaction with the Proposed Development. This development is therefore scoped out of the cumulative assessment.</p>
Residential Development	211400 Limerick County Council	Within 350m of TDR	<p>A residential development comprising 96 no. residential units, (16 no. semi-detached houses, 6 no. terrace houses, 2 detached units along with 2 no. 5 storey apartment blocks over basement, comprised of 72 no. apartments and basement parking), bin & bike stores, demolition of existing farm buildings, additional parallel parking along the Castletroy College road, accessed via a new entrance onto the Castletroy College road and all ancillary development works. Ancillary site development works include a new connection to the public water main, foul</p>	<p>From examination of the online planning file, it is our understanding that this project has not yet commenced.</p> <p>This development is scoped in for cumulative assessment based on its proximity to the TDR.</p>

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
			<p>and surface water drainage, access roads, footpaths, vehicle parking, landscaping, boundary treatments and site development works above and below ground. The planning application is accompanied by a NIS(Natura Impact Statement).</p> <p>Planning permission was granted on the 9th of June 2022.</p>	
Residential Development	21311588 Limerick County Council	Within 350m of TDR	<p>Application - Construction of 371 residential units, proposed access road and two storey childcare facility.</p> <p>Planning permission was granted on the 26th of May 2022.</p>	<p>From examination of the online planning file, it is our understanding that this project has commenced as of February 2023.</p> <p>This development is scoped in for cumulative assessment based on its proximity to the TDR.</p>
Residential Development	21350 Limerick County Council	Within 350m of TDR	<p>A residential development comprising 62no. residential units(14no. semi-detached house, 10no. terrace houses, 4no. duplex units, 2no. 5 storey apartment blocks over basement, comprised of 34no. apartments and basement parking), revisions to development granted under planning reference 20/256 consisting of alteration of portion of the open space area and alterations to the visitor drop off area, all accessed via existing entrance onto the Kilmurry Road and all ancillary site development works on lands at Newtown, Castletroy, Co. Limerick. Ancillary site development works include connections to the public water main, foul and surface water drainage, access roads,</p>	<p>From examination of the online planning file, it is our understanding that this project has not yet commenced.</p> <p>This development is scoped in for cumulative assessment based on its proximity to the TDR.</p>

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
			<p>footpaths, vehicle parking, landscaping, bin & bike store, boundary treatments and site development works above and below ground. The planning application is accompanied by an EIAR(Environmental Impact Assessment Report) and an NIS(Natura Impact Statement).</p> <p>Planning permission was granted on the 3rd of December 2021.</p>	
Road Works	218001 Limerick County Council	Within 350m of TDR	The construction of an overflow channel and new culvert under the N69 in the vicinity of Marine Cove Road.	The improvement works are planned under the N69, which is a large part of the Proposed Development's TDR. This development is therefore scoped in for cumulative assessment.
Residential Development	22313124 Limerick County Council	Within 350m of TDR	<p>A 10 year permission for the construction of 384no. residential units (202 no. houses, 182 no. apartments), creche and associated site works.</p> <p>The application was submitted for planning on the 31st of March 2022.</p>	This development, which is yet to be determined, is scoped in for cumulative assessment based on its proximity to the TDR.
Road Works	228018 Limerick County Council	Within 350m of TDR	Development works that will consist of upgrades/reconstruction works commencing on the R526 (north-east of Ballykeefe Roundabout), along South Circular Rd, Henry St and terminating at Mill Lane in Limerick City Centre.	The R526 is a fly over which runs over the N18 (along the Turbine Delivery Route of the Proposed Development). The works associated with this road development should not interact with the N18 road and is therefore scoped out of the cumulative assessment.

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
Quarry	23294 Limerick County Council	Within 350m of TDR	The development will consist of the restoration and infilling of the existing and future void over an area of (c. 17.2 ha) of existing permitted quarry (05/7029 and ABP 13.QC.2098) using approximately 2,464,000m ³ or 4,435,200 tonnes of inert soil and stone material or stone by-product, or river dredge spoil. The application was submitted for planning on the 6 th of June 2023.	This development is scoped in for cumulative assessment based on its proximity to the TDR.
Land Disturbance	2337 Clare County Council	Within 350m of TDR	To fill land with topsoil, subsoil, stone and inorganic construction material to raise the level of the land for agricultural purposes. A Natura Impact Statement is included with the application. The application was submitted for planning on the 25 th of January 2023.	The principal road used is to be the R465 from Limerick City. Material will also be brought from Killaloe via the R471 and R463. The TDR of the Proposed Development runs along the R471 which intersects with R463. This development is scoped in for cumulative assessment based on its use of common roads and proximity to the Proposed Development site.
Road Works	238002 Limerick County Council	Within 350m of TDR	The development works will consist of and extension of the existing embankment on the landowner's side and various other road upgrade works including a shared raised footpath and cycleway and footway with fencing. The application was submitted for planning on the 27 th of February 2023.	This development is therefore scoped in for cumulative assessment due to its proximity to the TDR of the Proposed Development.
Road Works	238004	Within 350m of	The proposed improvement	The improvement

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
	Limerick County Council	TDR	works that comprise of 550m of revised road layout on the N69 and 90m of realigned side road L1403 and will provide for various additional road upgrade features including a footway, signal-controlled pedestrian crossings, kerbing and hardscaping, etc. The application was submitted for planning on the 20 th of April 2023.	works are planned along the N69, which is a large part of the Proposed Development's TDR. This development is therefore scoped in for cumulative assessment.
Residential Development	314013 ABP	Within 350m of TDR	The construction of 21 no. dwellings and all associated site works. The application is accompanied by a Natura Impact Statement (NIS). The application was submitted to ABP on the 6 th of July 2022 and the case was due to be decided on the 8 th of November 2022.	This development, which is yet to be determined, is scoped in for cumulative assessment due to its proximity to the TDR of the Proposed Development.
Port Works	2018007 EIA Portal Reference 301561 ABP	Within 350m of TDR	Port capacity extension to consist of modifications to the existing jetties and quays, phased expansion of the port estate and all associated site development works. The application was granted permission on the 21 st of December 2018 by ABP.	This development is scoped out for cumulative assessment on the basis that the indicative construction schedule in the planning file was ca. 3 years (assumed to end in early 2022) and that this development will therefore have no interactions with the Proposed Development.
Road Works	2019214 EIA Portal Reference 306146 ABP	Within 350m of TDR	Approximately 15.6km of Type 2 dual carriageway express road extending from Foynes to Rathkeale, approx. 17.5km of dual carriageway motorway from Rathkeale to Attyflin and a service area for Heavy Goods Vehicles approximately 5ha in size near Foynes. The application was approved	The improvement works will have potential interactions with a section of the N69, which is a part of the Proposed Development's TDR. This development is therefore scoped in

Project	Planning / Project Ref.	Nearest Distance to the Proposed Development Site	Description	Scoped in / out for cumulative assessment
			on the 30 th of August 2022.	for cumulative assessment.
Port Works	2020031 EIAR Portal Reference	Within 350m of TDR	Jetty Extension between East Jetty and West Quay of area 0.361ha. Pontoon relocation and landing structures with access to West Quay of area 0.0071ha. The foreshore lease was granted on the 11 th of January 2022 Foreshore Ref: FS006837.	This development is scoped out for cumulative assessment on the basis that it is a foreshore application and will therefore have no interactions with the Proposed Development.
Solar Farm	248066 ABP	Within 350m of TDR	10-year permission. for the development. of a solar PV farm consisting of up to 35,582m ² of solar panels on mounted steel frames, 1 no. substation; 3 no. inverter cables, underground cable ducts and all associated works. Planning permission was granted on the 5 th of April 2018 by ABP.	This development is scoped out for cumulative assessment on the basis that its construction schedule will not coincide with that of the Proposed development, having been granted planning permission in April 2018. It is assumed that this development will therefore have no interactions with the Proposed Development.

7.6.4 Invasive Species Management Plan

The Proposed Development will include a detailed **Invasive Species Management Plan** to avoid causing the spread of invasive plant species. This will be adopted during all stages (e.g., construction, operation and decommissioning) of the Proposed Development and reviewed/updated in response to any significant changes in the ecological baseline regarding invasive non-native plant species throughout all of the Project phases. Measures within the Invasive Species Management Plan will include:

- All relevant staff will be briefed and made aware of issues regarding the presence of invasive non-native species, the management plan and its requirements, and their responsibilities;
- Control by marking out contaminated areas (i.e., with a 7m radius of any stands);

- Ensuring vehicles do not work within contaminated areas, and treating contaminated soils carefully;
- ECoW to continue to monitor the extents and distributions of invasive species and use this information to inform any updates to the invasive species management plan;
- Eradication through long-term treatment with herbicides. Treatment methods must be appropriate to the habitats present within/nearby (e.g., avoiding effects on watercourses or hedgerows); and
- Disposal at a licensed landfill site.

These mitigation measures are considered to be sufficient to avoid adverse effects on habitats and species through the spread of invasive non-native plant species. An Invasive Species Management Plan is provided as **Appendix G**.

7.6.5 Construction Phase

The assessment of effects undertaken in **Section 7.6.3.1** identified the following potentially significant effects on ecological features during the construction of the Proposed Development:

- Direct loss and fragmentation of important habitats, including habitats used (or potentially used) by Marsh Fritillary and bats; and
- Spread of invasive non-native plant species (see **Section 7.6.4**).

As stated in **Section 7.5**, the Proposed Development design includes the following measures which will serve to minimise habitat loss and fragmentation effects:

- Retainment of areas of more important habitat within the landscape design (e.g., bog, heath, higher quality grassland/woodland/scrub);
- Minimisation of the extent of habitat loss during construction wherever possible;
- Selection of delivery routes which use existing built infrastructure wherever possible, with laying of cables underground; and
- Presence of an ECoW to oversee any ecological issues during construction.

The following supplementary and/or additional measures are proposed to avoid significant effects on the identified Key Ecological Features. In addition to avoiding significant effects on relevant Key Ecological Features, these measures will further reduce the potential for adverse effects on populations of other flora and fauna.

7.6.6 Habitat Reinstatement and Creation

Habitats will be created in proportion with the type and extent of habitat loss during construction (**Table 7.23**). The design and management of this habitat will take into consideration the suitability of this habitat for the Key Ecological Features identified in this EIAR chapter. The locations of habitat reinstatement and enhancement measures will take into consideration the risk of operational effects (e.g., turbine collisions), with creation of features which could bring sensitive species (e.g., bats) into proximity with wind turbines will be avoided. Detailed habitat re-instatement and creation is described in the SHMP for the Proposed Development. This includes the creation and/or

enhancement of the following habitats identified as being important in the context of the Proposed Development: heath and bog, grassland, scrub and hedgerows, and conifer plantation. The total study area in which habitats will be managed comprised 173.66ha of managed habitats and 14.48km of linear managed habitats (e.g., hedgerows). This significantly exceeds the habitat loss anticipated within the Proposed Development (**Table 7.23**) and will provide a significant biodiversity enhancement (including for the Key Ecological Features identified in this EIAR Chapter). Details of habitat management regimes are specified in the SHMP.

7.6.7 Operational Phase

The assessment of effects undertaken in **Section 7.6.3.2** identified the following potentially significant effects on ecological features during the operation of the Proposed Development:

- Direct mortality of bats associated with turbine collisions and baropressure effects; and
- Spread of invasive non-native plant species (see **Section 7.6.4**).

As stated in **Section 7.5**, the Proposed Development design includes measures to minimise adverse effects during operation; notably the clearance of suitable habitat within 97m of each turbine tower, reducing the likelihood of bats flying through/near operational turbines. Habitats within the wider area will be enhanced and managed for a range of species to provide a significant biodiversity enhancement. Monitoring will also be implemented (see below) to identify any bat fatalities; the findings of which will be used to inform any additional mitigation requirements.

7.6.7.1 Monitoring

As described in **Section 7.9**, detailed monitoring will be undertaken for 15 years post construction to ensure the mitigation and enhancement measures specified in this EIAR chapter are satisfying their aims, and inform any additional management measures and/or changes in management practices. In particular, monitoring will focus on the condition of Key Ecological Features (i.e., species and habitats) within and adjacent to the Proposed Development (notably in any identified mitigation and enhancement areas), and on monitoring turbine collisions and baropressure effects through frequent carcass searches in years 1, 2, 3, 4, 5, 7, 10 and 15 post-construction. If monitoring identifies the presence of significant effects, or any additional scope for mitigation and/or enhancements, these will be implemented into future management to benefit the Key Ecological Features identified in this report. Further details of monitoring in relation to Key Ecological Features are provided in the SHMP.

7.6.8 Decommissioning Phase

The assessment of effects undertaken in **Section 7.6.3.3** identified the following potentially significant effects on ecological features during the operation of the Proposed Development:

- Spread of invasive non-native plant species (see **Section 7.6.4**).

Any habitat that is temporarily cleared during the decommissioning phase will be reinstated on a like-for-like basis, and areas from which Proposed Development infrastructure is removed will be restored to their pre-construction baseline conditions. Following this habitat reinstatement, the Proposed Development footprint will be subject to frequent monitoring to determine the progress of habitat reinstatement and inform any requirement for management to facilitate this reinstatement (e.g., supplementary planting with native species).

At the end of the first year following the decommissioning of the Proposed Development, a reassessment of the Proposed Development footprint will be undertaken to assess the habitats and species present and inform any further management requirements. This will ensure that the Proposed Development footprint is suitable for Key Ecological Features and other wildlife in the long-term. Further monitoring information is provided in **Section 7.9**.

7.6.9 Enhancement Measures

In accordance with ecological best practice and to achieve net gains for biodiversity, enhancements will be delivered to ensure the Proposed Development has an overall positive effect on ecological features. Detailed enhancement measures are specified in the SHMP for the Proposed Development, which present the objectives and targets of enhancements, along with prescriptions for management and monitoring to achieve these objectives. These enhancements will include the improvement and creation of additional heathland, scrub, conifer forest and grassland.

7.8 Residual Effects

The following features were identified as Key Ecological Features and were therefore subject to detailed assessment of effects within this EIAR chapter:

- European sites: specifically Lower River Shannon SAC, Danes Hole, Poulnalecka SAC, Ratty River Caves SAC;
- Nationally designated sites with ornithological interest features, notably Gortacullin Bog NHA;
- Habitats: notably heath and bog, grassland and scrub, woodland, treelines, hedgerows and drainage ditches;
- Invasive non-native plant species:
- Invertebrate species: namely Marsh Fritillary;
- Amphibian and reptile species:
- Terrestrial mammal species: namely Otter, Badger, Pine Marten, Red Squirrel and Irish Hare;
- Bats; and
- Aquatic species.

As described in the assessment of effects presented in **Section 7.6**, taking into consideration embedded mitigation within the Proposed Development design, the following effects were assessed as being potentially significant:

- **Effects during construction:** direct loss and fragmentation of habitats, including habitats of value to Marsh Fritillary and bat species, and the spread of invasive non-native plant species;
- **Effects during operation:** bat mortality through turbine collisions and baropressure effects, and the spread of invasive non-native plant species; and
- **Effects during decommissioning:** spread of invasive non-native plant species.

Although the final Turbine specification has not been decided upon, these conclusions are applicable to all potential options as the infrastructure and construction methodology will be consistent whichever option is chosen.

As such, additional mitigation measures are proposed within **Section 7.7** to avoid these significant effects on Key Ecological Features and deliver enhancements for Key Ecological Features and other wildlife. These include measures prescribed within the SHMP for the Proposed Development.

Considering the scope for effects from the Proposed Development, it is deemed that these mitigation and enhancement measures will be sufficient to avoid significant effects on these Key Ecological Features (i.e., habitats and species). As such, no residual effects are anticipated.

7.9 Monitoring

As specified in the CEMP (EIAR **Appendix 5.1**) and the SHMP for the Proposed Development, a post-construction monitoring schedule has been devised. This will ensure the mitigation measures specified in this EIAR chapter are satisfying their aims, and inform any additional management measures and/or changes in management practices. Monitoring will be led by a suitably qualified and experienced ecologist and informed by emerging data from the Proposed Development.

For most management prescriptions, monitoring will take place annually within the first five years of operation and then subsequently in years 7, 10 and 15. This will follow implementation of the plan to confirm whether habitats have successfully established and to ascertain if any remedial measures need to take place as identified within a feedback loop. A short report will be produced following these visits, to ensure documentation of the ongoing effectiveness of the SHMP and to identify any actions which are required to ensure that there are no significant effects on biodiversity. A final assessment of the condition of the management prescriptions would be undertaken in the year prior to decommissioning.

Specific monitoring to be undertaken during the operation of the Proposed Development regarding ecological features will be as follows.

7.9.1 Habitat Monitoring

Habitats within and adjacent to the Proposed Development site will be monitored as above to ensure that they are in the required condition and delivering the maximum benefit to species identified in this EIAR chapter.

7.9.2 Bat Monitoring

In reference to the potential effects on bats identified in this EIAR chapter (notably the potential collision and baropressure mortality effects identified in **Section 7.6.6**), detailed monitoring will be undertaken to detect any significant changes in bat activity relative to pre-construction surveys. This will aim to assess changes in bat activity patterns. Bat activity will be measured within monitoring years continuously between April and October at each turbine location, in combination with carcass searches

During carcass searches (to be undertaken in conjunction with bird carcass searches; see EIAR **Chapter 8**), all bat carcasses will be photographed and logged in an annual fatality search report, which will be submitted to relevant stakeholders and the planning authority for consultation to inform any remedial actions that may be necessary. The current collision risk estimates predict that the effects will not be significant in nature. However, changes in baseline species activity during the operation of the Proposed Development may increase the collision risk to bat individuals. As such, it is possible that additional mitigation (e.g., curtailment) may be required if bat mortality is found to be at an unacceptable level far beyond what the baseline data submitted herein supported. A comprehensive onsite fatality monitoring programme will follow best practice guidance (SNH, 2021) and include:

- Carcass removal trials to establish levels of predator removal of possible fatalities. This will be conducted following recommended best 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 publication predation trials set using trail cameras following guidance set out in (Smallwood, 2010) provides the most accurate results;
- 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 described above. At the time of publication, 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"; and
- Search intervals will follow SNH (2021) guidance. Recorded fatalities will be calibrated against known predator removal rates to provide an estimate of overall fatality rates. The analysis tool Evidence of Absence V2 is recommended as a minimum, or other equivalent guidance as dictated by up-to date standards and practices.

7.9.3 Other Species Monitoring

In addition to assessing habitat suitability (see **Section 7.9.1**), periodic monitoring will be undertaken to understand the distributions and abundances of Key Ecological Features and other wildlife during the operation of the Proposed Development. This will include monitoring of Marsh Fritillary, terrestrial mammals (Otter, Badger, Pine Marten, Red Squirrel and Irish Hare). This monitoring willin accordance with best practice methods.

7.10 References

- Adams, E.M., Gulka, J. & Williams, K.A. (2021) *A review of the effectiveness of operational curtailment for reducing bat fatalities at terrestrial wind farms in North America. PLoS ONE*, 16(11), 1-21.
- Arnett, E.B., Brown, W.K., Erickson, W.P., Fiedler, J.K., Hamilton, B.L., Henry, T.H., Jain, A., Johnson, G.D., Kerns, J., Koford, R.R., Nicholson, C.P., O'Connell, T.J., Piorkowski, M.D. & Tankersley Jr, R.D. (2008) *Patterns of bat fatalities at wind-energy facilities in North America. Journal of Wildlife Management*, 72, 61-78.
- Arnett, E.B, Huso, M.M.P., Schirmacher, M.R. & Hayes. J.P. (2011) *Altering turbine speed reduces bat mortality at wind-energy facilities. Frontiers in Ecology and the Environment*, 9(4), 209-214.
- Baerwald, E.F., D'Amours, G.H., Klug, J.B. & Barclay, R.M.R. (2008) *Barotrauma is a significant cause of bat fatalities at wind turbines. Current Biology*, 18, 695-696.
- BCT. (2016) *Core Sustainance Zones: Determining zone size*. The Bat Conservation Trust, London.
- CIEEM. (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Version 1.2 – Updated April 2022. [Available at: [Guidelines for Ecological Impact Assessment \(EclA\) | CIEEM](#) – accessed 25/10/2023].
- Collins, J. (2023) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (4th Edition). The Bat Conservation Trust, London.
- Crisp, D.T., (2000) *Trout and Salmon. Ecology, Conservation and Rehabilitation*. Blackwell Science: Oxford.
- Cryan, R.M. & Barclay, R.M.R. (2009) *Cause of bat fatalities at wind turbines: hypotheses and predictions. Journal of Mammalogy*, 90, 1330-1340.
- Department of Housing, Planning, and Local Government. (2019) *Draft Revised Wind Energy Development Guidelines*. Government of Ireland.
- DoCHG. (2017) *National Biodiversity Action Plan 2017-2021*. Department of Culture, Heritage and the Gaeltacht.
- Drewitt, A. & Langston, R. (2006) *Assessing the impacts of wind farms on birds. In: Wind, Fire and Water: Renewable Energy and Birds*, 148, 29–42.
- Edkins, M.T. (2014) *Impacts of wind energy development on birds and bats: Looking into the problem*. Environment Agency. (2003) *Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003'*.
- Environmental Protection Agency. (2022) *Guidelines on the information to be contained in Environmental Impact Assessment Reports*.

- EPA. (2017) *Guidelines on the information to be Contained in Environmental Impact Assessment Reports August 2017 – Draft*. Environmental Protection Agency.
- European Commission. (2011) *Wind energy development and Natura 2000*.
- Fossitt, J.A. (2000) *A guide to habitats in Ireland*. The Heritage Council, Kilkenny.
- Harris, S., Cresswell, P. & Jefferies, D. (1989) *Surveying Badgers*. Mammal Society, Occasional Publications, 9, London.
- Harris, S., Jefferies, D., Cheeseman, C. & Booty, C. (1994) *Problems with Badgers?* 3rd Edition, RPSCA, Horsham.
- Helfman, G. S. (1981). *The Advantage to Fishes of Hovering in Shade*. Copeia. Vol. 1981, No.2. pp:391-400.
- Holdich, D. (2003). *Ecology of the White-clawed Crayfish*. Conserving Natura 2000 Rivers. Ecology Series No.1.
- Horn, J.W., Arnett, E.B. & Kunz, T.H. (2008) *Behavioural Responses of Bats to Operating Wind Turbines*. *Journal of Wildlife Management*, 72, 123-132.
- Hotker, H., Thomsen, K.M. & Jeromin, H. (2006) *Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats – facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation*. Michael-Otto-Institut im NABU, Bergenhusen.
- IFI. (2010) *IFI Biosecurity Protocol for Field Survey Work*. Inland Fisheries Ireland.
- IFI. (2016) *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus Co. Dublin. IFI/2016/1- 4298.
- Johnson, D.H., Shrier, B. M., O’Neal, J. S., Knutzen, J. A., Augerot, X., O’Neil, T. A. & Pearsons, T. N. (2007) *Salmonid Field Protocols Handbook: Techniques for Assessing Status and Trends in Salmon and Trout Populations*. American Fisheries Society, Bethesda, Maryland.
- Kelly, F.L., Harrison, A., Connor, L., Allen, M., Rosell, R. & Champ, T. (2008) North South Shared Aquatic Resource (NS SHARE) lakes project: fish in lakes, task 6.9: classification tool for fish in lakes final report. Unpublished report to Central Fisheries Board.
- King, J.J. & Linnane, S.M. (2004) The status and distribution of lamprey and shad in the Slaney and Munster Blackwater SACs. Irish Wildlife Manuals, No 14. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin Ireland
- King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O’Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011) Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- Knudsen, F.R., Enger, P.S. & Sand, O. (1994) *Avoidance Responses to Low Frequency Sound in Downstream Migrating Atlantic Salmon Smolt, Salmo salar*. *Journal of Fish Biology* 45:227–33, 1994.
- Lundy, M.G., Augheny, T., Montgomery, W.I. & Roche, N. (2011) *Landscape for Irish bats & species-specific roosting characteristics*. Bat Conservation Ireland.
- National Roads Authority. (2005) *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*. Dublin: National Roads Authority.

- National Roads Authority. (2009) *Guidelines for Assessment of Ecological Impacts of National Roads Schemes Rev. 2*. Dublin.
- Northern Ireland Environment Agency (NIEA) (2019). *Otters & Development*. Online. Available at: <https://cieem.net/wp-content/uploads/2019/07/natural-information-otters-and-development-2011.pdf>.
- NPWS (2013) *Site Synopsis: Danes Hole, Poulnalecka SAC (Site Code 000030)*. National Parks and Wildlife Service. [Available at: SITE SYNOPSIS (npws.ie) – accessed 14/08/2023].
- NPWS (2014) *Site Synopsis: Ratty River Cave SAC (Site Code 002316)*. National Parks and Wildlife Service. [Available at: SITE SYNOPSIS (npws.ie) – accessed 14/08/2023].
- NPWS (2015) *Site Synopsis: River Shannon and River Fergus Estuaries SPA (Site Code 004077)*. National Parks and Wildlife Service. [Available at: SITE SYNOPSIS (npws.ie) – accessed 14/08/2023].
- NPWS (2019a) *Site Synopsis: Curraghchase Woods SAC (Site Code 000174)*. National Parks and Wildlife Service. [Available at: SITE SYNOPSIS (npws.ie) – accessed 14/08/2023].
- NPWS (2019b) *The Status of EU Protected Habitats and Species in Ireland*. Volume 2: Habitat Assessments. Unpublished NPWS report.
- NRA. (2006) *Guidelines For The Treatment Of Otters Prior To The Construction Of National Road Schemes*. National Roads Authority.
- NRA. *Guidelines For The Treatment Of Badgers Prior To The Construction Of National Road Schemes*. National Roads Authority.
- O'Connor, W. (2004). A survey of juvenile lamprey populations in the Moy catchment. Irish Wildlife Manuals No. 15. National Parks and Wildlife Service. Dept. of Environment, Heritage and Local Government, Dublin Ireland.
- O'Connor, W. (2006). A survey of juvenile lamprey populations in the Boyne catchment. Irish Wildlife Manuals No. 24. National Parks and Wildlife Service. Dept. of Environment, Heritage and Local Government, Dublin Ireland.
- O'Connor, W. (2007). A survey of juvenile lamprey populations in the Corrib and Suir catchments. Irish Wildlife Manuals No. 26. National Parks and Wildlife Service. Dept. of Environment, Heritage and Local Government, Dublin Ireland.
- Office of the Planning Regulator. (2021) *Appropriate Assessment Screening for Development Management*. OPR Practice Note PN01. [Available at: <https://www.opr.ie/wp-content/uploads/2021/03/9729-Office-of-the-Planning-Regulator-Appropriate-Assessment-Screening-booklet-15.pdf> – accessed 17/11/2023].
- Peay, S. (2002). *Guidance on Habitat for White-clawed Crayfish and its Restoration*. Environment Agency Technical Report W1-067/TR.
- Peay S (2003). *Monitoring the White-clawed Crayfish Austroptamobius pallipes*. Conserving Natura 2000 Rivers Monitoring Series No. 1. English Nature, Peterborough.
- Roche, N.A. (2014) *Irish bats in the 21st Century*. Bat Conservation Ireland.
- Ross, E. (2017) *A freshwater pearl mussel survey of the Ratty-Owenogarney River and Blackwater (Clare) River channels draining the Knockanuarha-Seefin uplands in County Clare*.
- Scottish Natural Heritage. (2021) *Bats and onshore wind turbines: surveys, assessment, and mitigation*.

- Smallwood, K.S. (1999) *Novel Scavenger Removal Trials Increase Wind Turbine-Caused Avian Fatality Estimates. The Journal of Wildlife Management*, 74, 1089-1097.
- Smith, G.F., O'Donoghue, P., O'Hara, K. & Delaney, E. (2011) *Guidance for Habitat Survey and Mapping*. The Heritage Council, Kilkenny.
- Sundseth, K., & Roth, P. (2014) *Article 6 of the Habitats Directive - Rulings of the European Court of Justice*. European Commission.
- Wray, S., Wells, D., Long, E. & Mitchell-Jones, T. (2010) *Valuing Bats in Ecological Impact Assessment, In Practice*, 23-26.
- Wyse Jackson, M., Fitzpatrick, U., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016) *Ireland Red List No. 10: Vascular Plants*. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.
- Wildfish (2017). *The impact of excess fine sediment on invertebrates and fish in riverine systems Literature Review*. Online. Available at: [Sediment.docx \(wildfish.org\)](http://www.wildfish.org/Sediment.docx).