Proposed Ballynalacken Windfarm Project

Environmental Impact Assessment Report

Chapter 13: Biodiversity

Topic Chapter Authors:

March 2025

Table of Contents

List of Figures

List of Appendices

Glossary of Terms

Term	Definition
Afforestation	The establishment of a forest or stand of trees (forestation) in an area where there was no previous tree cover.
Appropriate Assessment	An assessment required by the EU Habitats Directive where a project (or plan) would be likely to have a significant effect on a European site, either alone or in combination with other plans or projects.
Ballynalacken Windfarm Project	Ballynalacken Windfarm including 12 No. turbines, turbine foundations and hardstanding areas, Windfarm Site Roads, Internal Windfarm Cabling, Windfarm Control Building, Site Entrances, ancillary works at and for the windfarm, along with the Internal Cable Link, Tinnalintan Substation and ancillary works, and Ballynalacken Grid Connection and grid

	connection works to the Eirgrid Ballyragget Substation. The Project also involves works and activities along the turbine component haul route remote from the site, including the construction of a temporary Blade Transfer Area at HR8
Baseline Environment	The conditions that would pertain in the absence of the proposed project at the time that the project would be constructed / operated / decommissioned. The definition of these baseline conditions should be informed by changes arising from other causes (e.g. other consented developments).
Biodiversity	The biological diversity of the earth's living resources. The total variability among organisms and ecosystems.
Catchment	A catchment is a hydrological unit. Each drop of precipitation that falls into a catchment area eventually ends up in the same river. Catchment areas are separated from each other by watershed.
Climate Change	A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.
Conservation Objective	Objective for the conservation of biodiversity (e.g. specific objective within a management plan or broad objectives of policy).
Conservation Status	The state of a species or habitat including for example, extent, abundance, distribution and their trends.
Couches	Overground nest-like structure used by Otter for resting and/or breeding
Degradation	The condition or process of degrading or being degraded
Designated Site	General term for sites which have been designated for nature conservation and for which legal protection has been conferred onto the sites. In Ireland, these included Special Areas of Conservation and Special Protection Areas. In addition to Natural Heritage Areas designated under national legislation.
Displacement	The action of moving something from its place or position
Distribution	The geographical presence of a feature. This can depend on factors such as climate and altitude
Disturbance	Disturbance is a temporary change in environmental conditions that causes a pronounced change in an ecosystem
EIA	Environmental Impact Assessment
Enhancement	The genuine enhancement of the natural heritage interest of a site or area because the project includes improved management or new habitats or features, which are better than the prospective management, or the habitats or features present there now. There is, therefore, a net or new benefit to the natural heritage
Fauna	Fauna is all of the animal life of any particular region or time
Flora	Flora is the plant life occurring in a particular region or time
Flora Protection Order	The current list of plant species protected by Section 21 of the Wildlife Act, 1976 is set out in the Flora (Protection) Order, 2015, which supersedes orders made in 1980, 1987 and 1999.
Fragmentation	The breaking up of a habitat, ecosystem or land-use type into smaller parcels with a consequent impairment of ecological function
Habitat	The place or type of site where an organism or population naturally occurs. Often used in the wider sense referring to major assemblages of plants and animals found together
Holt	Created or existing underground shelter used by Otter for resting and/or breeding
Natura Impact Statement	Under the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011), an EcIA report including the scientific assessment of a plan or project in relation to

	relevant Natura 2000 sites and other information required to enable a competent authority to carry out an Appropriate Assessment
Natural Heritage Area	The basic designation for wildlife in Ireland is the Natural Heritage Area (NHA). This is an area considered important for the habitats present or which holds species of plants and animals whose habitat needs protection.
Proposed Natural Heritage Area	Proposed NHAs (pNHAs) were published on a non-statutory basis in 1995 and have not since been statutorily proposed or designated. These sites are of significance for wildlife and habitats are subject to limited protection, in the form of agrienvironmental farm planning schemes, NPWS approval for afforestation schemes on pNHA lands and recognition of the ecological value of pNHAs by Planning and Licencing Authorities
Qualifying Interest	Habitats listed on Annex I and Species listed on Annex II of the EU Habitats Directive for which Special Areas of Conservation have been designated
Riparian	Relating to or situated on the banks of a river
Roost	Resting place for a bird or bat
SAC/cSAC	Site designated according to the habitats directive. Special area of conservation means a site of Community importance designated by the Member States through a statutory, administrative and/or contractual act where the necessary conservation measures are applied for the maintenance or restoration, at a favourable conservation status, of the natural habitats and/or the populations of the species for which the site is designated
Sett	Series of underground tunnels and chambers of varying complexity used by Badgers for resting and breeding
Special Protection Area	Area classified under Article 4 of the birds directive (Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds).
Special Conservation Interest	Species listed on Annex I of the EU Birds Directive as well as wetland habitats for which Special Protection Areas have been designated for the conservation of birds

List of Abbreviations

Abbreviation	Full Term
AA	Appropriate Assessment
CSZ	Core Sustenance Zone
CWA	Construction Works Area
DBS	Devils-Bit Scabious
EIA	Environmental Impact Assessment
EMF	Electromagnetic Fields
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
FPM	Freshwater Pearl Mussel
FPO	Flora Protection Order
HDD	Horizontal Directional Drilling
HRW	Haul Route Works
IAPS	Invasive Alien Plant Species

Abbreviation	Full Term
IFI	Inland Fisheries Ireland
IUCN	International Union for Conservation of Nature
NBDC	National Biodiversity Data Centre
NHA	Natural Heritage Area
NPWS	National Parks and Wildlife Service
OHL	Overhead Line
OS	Ordnance Survey
pNHA	Proposed Natural Heritage Area
PRA	Preliminary Roost Assessment
QI	Qualifying Interest
SAC	Special Area of Conservation
SCI	Special Conservation Interest
SPA	Special Protection Area
SPR	Source-Pathway-Receptor
VP	Vantage Point
WFD	Water Framework Directive
WWTP	Wastewater Treatment Plant

CHAPTER 13 BIODIVERSITY

EIAR 13.1 INTRODUCTION

EIAR 13.1.1 The Authors of this Chapter (Competent Experts)

The Biodiversity chapter was prepared by Inis Environmental Consultancy team members who are scientific experts in various fields of ecology and biodiversity. The team members were;

Dr Alex Copland BSc PhD MIEnvSc MCIEEM is Technical Director with INIS. He is a full member of both the Chartered Institute of Ecology and Environmental Management (CIEEM) and the Institute of Environmental Sciences (IES) and has over 25 years of professional experience working in both statutory and private companies, in third-level research institutions and with environmental NGOs. He is proficient in experimental design and data analysis and has managed several large-scale, multi-disciplinary ecological projects. These have included research and targeted management work for species of conservation concern, the design and delivery of practical conservation actions with a range of stakeholders and end-users, education and interpretation on the interface between people and the environment and the development of co-ordinated, strategic plans for birds and biodiversity. He has written numerous scientific papers, developed and contributed to evidence-based position papers, visions and strategies on birds and habitats in Ireland. He has supervised the successful completion of research theses for several post-graduate students, including doctoral candidates. He also sits on the Editorial Panel of the scientific journal, *Irish Birds*, which publishes original ornithological research relevant to Ireland's avifauna.

Andrew Whitfield MA BA CEnv CEcol (Associate Consultant to INIS Environmental Consultants Ltd.) has over thirty years of undertaking and co-ordinating ecological and environmental impact assessments across a wide variety of infrastructure projects, varying in scale from new nuclear power generation facilities, major road and rail construction schemes to housing developments. Andrew has undertaken Habitat Regulations Assessments of a number of Plans and Projects including transport improvement options for the Scottish Government, water supply options for Greater London and for the Heads of the Valleys road improvements in South Wales where marsh fritillary and lesser horseshoe bats were potentially affected by the developments. Andrew has extensive experience of undertaking Phase 1 Habitat Surveys, Breeding and Wintering Bird Surveys, Otter, and Badger Surveys, Red Squirrel Surveys, Amphibian Surveys and Butterfly and dragonfly Surveys. He has also undertaken research on the threatened pear-bordered and high brown fritillary butterflies in the UK and has extensive knowledge of butterfly and other invertebrate ecology. He has also given evidence at approximately 20 Planning Inquiries/Hearings in the UK and Ireland.

Megan Doyle MSc, BSc is an Ecologist and Qualifying Member of the Chartered Institute of Ecology and Environmental Management. Megan was 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 Screenings for Appropriate Assessment, Natura Impact Statements and Environmental Impact Assessment Reports. Megan has also compiled professional reports pertaining to Bird Survey Seasons, Gull Management, Tree Clearance, and Ecological Clerk of Works (ECoW) audits. Megan has experience in bird surveying techniques such as Vantage Point Surveys, CBS Transects and Wetland Bird Surveys following Best Practice Guidance and standardised methodologies (e.g. Hardey *et al.*, 2013; SNH, 2017). She has also been involved in Bat Surveys, Habitat Surveys and Mammal Surveys.

Conor Daly MSc BSc (Hons.) ACIEEM is an Ecologist with INIS who updated and amended this report. Conor was awarded an MSc in Biodiversity and Conservation and an Honours BSc in Zoology. Conor has been conducting ecological surveys for projects since 2021 for a variety of projects including industrial estates and Windfarms (Small-Large). 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.

Esther McMorrow Donnellan MSc BA is an Ecologist and Qualifying Member of the Chartered Institute of Ecology and Environmental Management. Esther was awarded with a distinction MSc in Environmental Leadership and BA in Geography and History from NUI Galway. Esther has extensive bird survey experience, including Vantage Point surveys, CBS Transect surveys and breeding wader walkover surveys. She has considerable experience in bat surveys, including preliminary roost assessment surveys and emergence and re-entry surveys following Best Practice Guidance and standardised methodologies (e.g. Lundy *et al*., 2011; Collins, 2016). She has also been involved in Habitat surveys and Mammal surveys. Esther has extensive report writing experience, including the preparation of Ecology Reports, Ecological Impact Assessments, Screenings for Appropriate Assessment, Natura Impact Statements and Environmental Impact Assessment Reports.

Peig Healy MSc BSc is an Assistant Ecologist and Report Writer with Inis Environmental Consultants Ltd. who is assisting in compiling this report. Peig was awarded a distinction MSc in Environmental Leadership and an Honours BSc in International Development and Food Policy. As part of her BSc and MSc, Peig has compiled two dissertation projects relating to sustainability and environmental research. In association with these projects, Peig has carried out policy analysis, case study review, and reporting in relation to Fisheries Policy and EIA respectively. Peig is also a Graduate Member of the Institute of Environmental Management and Assessment (IEMA). During her employment with Inis, Peig has been involved in conducting a range of reports, including AA Screenings, a Natura Impact Statement (NIS), and Environmental Impact Assessment (EIA) Screenings.

Howard Williams BSc CEnv MCIEEM CBiol MRSB MIFM (Principal Ecologist and CEO Inis Environmental Consultancy) - Howard is a Chartered Environmentalist and a Chartered Biologist and has written and managed many Construction Environmental Management Plans, Article 6 Appropriate Assessments and Ecological Impact Assessments for over 50 wind farm projects. Howard is an expert in the field of avian ecology in addition to having considerable knowledge and experience producing management strategies/prescriptions for a range of protected species, both terrestrial and aquatic.

Mr. Peter O Connor BA MSc is the lead GIS Specialist at INIS and will oversee the completion of all mapping associated with this project. He has conducted Viewshed Analysis in support of selected Vantage points for SNH based surveys. This involved the complex use of Digital Terrain Models, or Digital Elevations Models in addition to bespoke Viewshed Analysis plugins for QGIS. Peter was responsible for all data capture, and integration into project mapping of field data (habitats, Birds, Bats, Invasive Species, et c) for both the EIAR Biodiversity Chapter supporting Figures (Map books and Appendices) and Appropriate Assessment supporting maps.

Orla van der Noll BSc MSc is a Qualifying Member of the Chartered Institute of Ecology and Environmental Management and Assistant Ecologist at Inis Environmental Consultants Ltd. She was awarded with a distinction MSc in Marine Biology and an Honours BSc in Ecology and Environmental Biology. As INIS's Quality Control Team Leader/Data Manager, she is responsible for the oversight and quality assurance of all Inis ecological survey data. Ms van der Noll also has experience in training the Ecology Team on correct data related procedures. In addition to her data QC work, Orla also works in supporting the GIS team as well as engaging in various ecological field surveys in line with Best Practice (Biddy et al 2009, SNH 2017, Hardey et al 2013, Collins 2016). Her fieldwork experience includes standardised VP surveys, Kingfisher nest and habitat suitability surveys, CBS Transects and Wildfowl surveys. She is also experienced in carrying out bat transects, emergence/re-entry surveys and bat data analysis.

Emma Condron BSc is an Environmental Manager with Inis Environmental Consultants Ltd and was awarded an honours BSc degree in Wildlife Biology from the Institute Technology Tralee. This course provided her with the knowledge and understanding of Irish Wildlife and the environment. She has experience in bat emergence and re-entry surveys for various construction projects across Ireland. Ms Emma Condron has received training on bat ecology and bat call analysis.

Emer Hannon BSc is an Assistant Ecologist with Inis and has a BSc in Ecology and Environmental Biology. She has bat surveying experience including Preliminary Roost Assessments and bat activity surveys such as Emergence/Reentry. She has also worked with Bat Conservation Ireland as a volunteer for the All Ireland Daubenton's Bat Waterways Surveys. She is experienced in Ecological Bird Survey techniques, both in the field and with data management. She has taken part in CIEEM led report writing training. She is a Qualifying member of CIEEM.

Emily Kelly Leahy BSc MSc is a Project Coordinator with Inis Environmental Consultants Ltd since April 2021. Emily completed a Bachelors (Hons) in Environmental Science with National University of Ireland, Galway in 2018. Emily then completed a Masters Degree in Environmental Leadership in 2019. Since completing her degree she has undertaken work as an Environmental Scientist working in both the Environmental and Ecology Sectors. Emily has experience carrying out emergence/re-entry bat surveys for various construction projects across Ireland.

Megan Lee MSc BSc is an Ecologist with Inis Environmental Consultants Ltd. Megan was awarded a BSc (Hons) in Environmental Science from National University of Ireland Galway in 2018 and a MSc (Hons) in Biodiversity and Land-use Planning from University of Ireland Galway in 2020. Megan is a Qualifying member of the Chartered Institute of Ecology and Environmental Management. She has a wide range of experience in report writing in addition to surveying, with particular focus on bird, bat, and mammal surveys.

Emily Marsh BSc PGDip MSc is an Assistant Ecologist with Inis Environmental Consultants Ltd. She has undertaken a diverse range of ecological-based surveys, including habitats (using the Irish Habitat Classification System (Fossitt, 2000), bird surveys (following various Best Practice survey methods (e.g. SNH, 2017; Hardey *et al*., 2013, etc,), mammals (againm following Best Practice survey methods (e.g. TII, 2009) and Bats (SNH, 2021; Collins, 2016).

Darren McCartney BSc ACIEEM is an Ecologist who works within the field work and GIS teams at Inis Environmental Consultants Ltd . He has completed a BSc (Hons) in Applied Archaeology from IT Sligo, which involved several ecological and environmental modules. As well as experience working with ArcGIS and QGIS applications, he has completed several different survey types for birds, mammals, habitats and invertebrates. While working in the field, Darren has conducted surveys for Vantage Point counts, a number of raptor species in breeding and winter seasons, bat roost and transect surveys, general mammal surveys, habitat surveys in line with Fossitt and I-WeBs survey, among others, all to Best Practice standards. Darren is also a Qualifying member of CIEEM.

James O'Connell BSc is an Ecologist with INIS, holding a BSc (Hons) in Wildlife Biology, from IT Tralee. He started out his ecology career on Hen Harriers surveys, and in the following years expanded on his professional career by working on research projects with Estación Biológica de Doñana (EBD) and Inland

Fisheries Ireland (IFI). Currently, he is an Assistant Ecologist with Inis Environmental Consultants Ltd., carrying out ornithological field surveys on proposed and established windfarm sites around Ireland.

Molly O'Hare BSc MSc 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. Molly also has experience in the preparation and writing of reports, including Ecology Reports and screening for Appropriate Assessment.

Ms Laura Stenson BSc is an Ecologist with Inis Environmental Consultants Ltd**.** who **edited** the Aquatics Ecology Survey Results Appendix. Laura has an honours BSc in Earth and Ocean Sciences from University of Galway and has three years' experience working in consultancy. Laura has extensive report writing experience, which includes the production, review and editing of Appropriate Assessment Screening Reports (AA), Natura Impact Statements (NIS) and Ecological Impact Assessments (EcIA). She has experience in multi-disciplinary surveys, including habitat classification, mammal surveys, various bird surveys (e.g. Wintering and Breeding birds, I-WeBS, Adapted Brown & Shepherd), invasive species surveys, pre-construction mammal surveys, and bat surveys. She is a Qualifying member of CIEEM.

Mr Ross Macklin B.Sc. (Hons) MCIEEM 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. 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.

Mr 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. 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).

EIAR 13.1.2 Overview of Biodiversity in the Local Environment

Biodiversity is the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part. This includes diversity within and between species and ecosystems.

The proposed Ballynalacken Windfarm Project lies within a predominantly agricultural landscape with Improved Grassland and Coniferous woodland plantation comprising the dominant habitats within the area. Other habitats present include Buildings and Artificial Surfaces, Amenity Grassland and Wet Heath with small areas of other habitats present (see Section EIAR 13.3.1). The Natura 2000 sites - River Nore SPA, and the River Barrow and River Nore SAC, are located downstream of the Ballynalacken Windfarm Project.

In relation to Natura 2000 sites, the Ballynalacken Grid Connection works will be the closest works, with the road bridge crossing of the Rathduff_15 stream (at W3) c.90m upstream of the River Barrow and River Nore SAC, works at the blade transfer area at HR8 are c.215m from the boundary, while the works at Tinnalintan Substation are 600m from the site. The main construction works at the windfarm site are also upstream of the River Barrow and River Nore SAC, spread over a number of catchments. The SAC is designated for the protection of Otter (*Lutra lutra*), Freshwater Pearl Mussel (*Margaritifera margaritifera*) and Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*) along with 19 other aquatic habitats, salmonids and aquatic species. The SPA is designated for the protection of Kingfisher (*Alcedo atthis*). The River Nore SPA is c.690m from the Tinnalintan Substation site and 190m from Ballynalacken Grid Connection watercourse crossing works at W3. The SPA is also located downstream from the main windfarm works. Lisbigney Bog SAC, Cullahill Mountain SAC, Galmoy Fen SAC, The Loughans SAC, and other nationally designated NHAs and pNHAs are also found within the surrounding area.

EIAR 13.1.3 Sources of Information

Consultation, desktop studies and fieldwork were carried out in order to gather information on the baseline environment.

Table 13-1: Sources of Baseline Information for Biodiversity

Type	Source
Consultation	Feedback was received from: • An Bord Pleanála pre-application consultation • Kilkenny County Council pre-application consultation • National Parks and Wildlife Service: on 02/06/2022 INIS sent a sensitive data request to NPWS and received a response on 23/06/2022. The response can be found in Appendix 3.2 to Chapter 3: Consultation. • The NPWS Development Applications Unit (DAU) was contacted on 02/06/2022 with a request for recommendations or observations. A response was received on 17/08/2022. The DAU made no comment on that particular referral. • Inland Fisheries Ireland was contacted on 02/06/2022 and response was received on 15/06/2022. The response can be found in Appendix 3.2 to Chapter 3: Consultation. See Chapter 3: Consultation for further details.
Desktop	• National Parks and Wildlife Service website (www.npws.ie) • National Biodiversity Data Centre website (www.biodiversityireland.ie) • Kilkenny County Council (https://www.kilkennycoco.ie/eng/) • Transport Infrastructure Ireland (formerly NRA) (www.tii.ie) • European Union (www.europa.eu) • Water Framework Directive (www.wfireland.ie)

Type	Source
	• 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 (www.epa.ie) • Inland Fisheries Ireland (www.fisheriesireland.ie) • Birdwatch Ireland (www.birdwatchireland.ie) • Bat Conservation Ireland (www.batconservationireland.org) • Butterfly Ireland (www.butterflyconservation.ie) • Satellite imagery was reviewed to identify areas of potentially suitable breeding habitat • Chapter 6: Land • Chapter 7: Soils • Chapter 8: Water • Chapters 9: Air (Air Quality & EMF) • Chapter 10: Noise & Vibration
Fieldwork	<u>Terrestrial Habitats</u> • General site walkover • Habitat classification surveys within a 50m buffer of construction works areas (including haul route works locations) (included identification of invasive species) <u>Terrestrial Invertebrates</u> • General site walkover • Pollinator surveys in the style of Butterfly transects (using the 'Pollard Walk' method) <u>Amphibians and Reptiles</u> • General site walkover <u>Terrestrial Mammals</u> • Mammal surveys (general mammal walkover surveys, in addition to specific otter and badger surveys) • Camera trap deployment <u>Bats:</u> • Habitat assessment surveys, transect surveys, static detector deployments, preliminary roost assessments and emergence/re-entry (roost) surveys <u>Birds:</u> • Hen Harrier Roost surveys • Standardised Transect surveys and Vantage Point surveys (breeding and wintering seasons) • Breeding woodcock surveys • Breeding wader surveys • Wintering waterbird surveys (i-WeBS) in accordance with the relevant guidance (i-WeBS, 2008) • Raptor surveys: Raptor Hinterland surveys and Breeding Raptor surveys (Peregrine and Kestrel) • Watercourse Crossing surveys (Kingfisher, Grey Wagtail and Dipper) • Barn Owl surveys • Swan surveys (vantage point survey) <u>Aquatic Ecology Surveys</u> • Catchment wide electro-fishing surveys

Type	Source
	• Aquatic site survey • Broad aquatic & fisheries habitat assessment • White-clawed crayfish (sweep netting & hand searching) surveys • Biological water quality sampling and macrophyte and aquatic bryophyte surveys (Q-sampling)

EIAR 13.1.4 Legislation & Regulations

The following legislation and regulations are relevant to Biodiversity and have been taken into account in this EIA Report:

- Kilkenny County Development Plan 2021-2027
- Natura Impact Report in Support of the Appropriate Assessment for the Chief Executive's Draft Kilkenny City and County Development Plan 2021-2027
- National Biodiversity Action Plan (2017-2021)
- The All-Ireland Pollinator Plan 2021-2025
- EU Birds Directive (2009) Directive 2009/147/EC
- 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
- Irish Statute Book (various) European Communities (Natural Habitats) Regulations 1997 (S.I. 94/97) as amended

EIAR 13.1.5 Guidance Documents

The recommendations in the guidelines listed below, have been considered during the preparation of this chapter:

Ecological Evaluation

- National Roads Authority (2008) *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*
- Chartered Institute of Ecology and Environmental Management (2016 & 2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland*
- Environment Agency (2014) *UK Pollution Prevention Guidelines (PPG)*
- Environmental Protection Agency (2022) *Guidelines on the Information to be contained in EIA Reports*

General Breeding and Wintering Birds, and other Bird Species Groups

- Birdwatch Ireland (2010) *An assessment of the effects of Arterial Drainage Maintenance on Kingfisher and other riparian birds*
- Birdwatch Ireland (2012) *Guidelines for Countryside Bird Survey Participants*
- Gilbert *et al*. (2021) *Birds of Conservation Concern in Ireland 2020-2026*
- Cummins *et al.* (2010) *Assessment of the distribution and abundance of Kingfisher and other riparian birds on six SAC river systems in Ireland,* Birdwatch Ireland
- Crowe *et al*. (2017) *Countryside Bird Survey Report 1998-2013*, BirdWatch Ireland

- Bibby *et al.* (2000) *Bird Census Techniques*, 2nd Edition. Academic Press, London
- NatureScot (formerly SNH) (2017) *Recommended bird survey methods to inform impact assessment of onshore Wind Farms*. Version 2. SNH, Battleby

Raptors

- Gilbert *et al*. (2021) *Birds of Conservation Concern in Ireland 2020-2026*
- Hardey et al. (2013) *Raptors: a field guide to survey and monitoring,* (3rd Edition)
- Transport Infrastructure Ireland (2017) *Barn Owl Surveying Standards for National Road Projects,* TII Publications, Transport Infrastructure Ireland, Dublin
- Shawyer (2011) *Barn Owl Survey Methodology and Techniques for use in Ecological Assessment: developing best practice in survey and reporting*. IEEM,Winchester

Waders and Waterbirds

- O'Brien & Smith (1992) *Changes in the status of waders breeding on wet lowland grasslands in England and Wales between 1982 and 1989*
- Heward *et al*. (2015) *Current status and recent trend of the Eurasian Woodcock Scolopax rusticola as a breeding bird in Britain*, Bird Study, 62**:** 535-551.
- Hoodless *et al*. (2006*) Development of a survey method for breeding Woodcock and its application to assessing the status of the British population*
- National Roads Authority (2008) *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes,* National Roads Authority.
- I-WeBS (2008) *Counter Manual. Guidelines for Irish Wetland Bird Survey Counters*, BirdWatch Ireland & National Parks and Wildlife Service, Dublin

Terrestrial Habitats

- Fossitt, J. (2000) *A Guide to the Habitats of Ireland*
- Smith *et al.* (2011) *Best Practice Guidance for Habitat Survey and Mapping*, Heritage Council Ireland.
- National Parks and Wildlife Service (2019 *The Status of Protected EU Habitats and Species in Ireland. Volume 1: Summary Overview.* Unpublished NPWS Report (NPWS_2019_Vol1_Summary_Article17.pdf)

Bats

- Bat Conservation Ireland (2012) *Wind Turbine/Wind Farm Development Bat Survey Guidelines*, version 2.8, December 2012. Bat Conservation Ireland, www.batconservationireland.org
- Billington *et al*. (1997) *The Conservation of Bats in Bridges Project*. Natural England
- Collins (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd Ed.)
- National Road Authority (2006) *Guidelines for the treatment of bats during the construction of National Road scheme*
- Lundy *et al*. (2011) *Landscape conservation for Irish bats & species-specific roosting characteristics*, Bat Conservation Ireland
- Hundt (2012) *Bat Activity Index*
- Russ (2012) *British Bat Calls: A Guide to Species Identification*
- NatureScot (2021) *Bats and onshore wind turbines - survey, assessment and mitigation*
- Kelleher C., Marnell F. and Mullen E, (2022) *Bat Mitigation Guidelines for Ireland V2*, Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland
- Bat Conservation Ireland (2013) *Irish Bats in Flight*, Department of Environment, Heritage and Local Government

Terrestrial Mammals

- Marnell *et al.* (2019) *Red List No. 12: Terrestrial Mammals*, National Parks and Wildlife Service
- Lysaght and Marnell (2016) *Atlas of Mammals in Ireland 2010-2015*

- Lawton *et al*. (2020) *Irish Wildlife Manual 121*, All-Ireland Squirrel and Pine Marten Survey 2010
- National Roads Authority (2005) *Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes*
- Sleeman *et al.* (2009) *How many Eurasian 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 Design Manual for roads and Bridges* (DMRB Vol 10 S. 4 Part 4 HA 81/99)
- Reid *et al.* (2013) *Irish Wildlife Manuals No. 76*, National Otter Survey of Ireland 2010/12

<u>Reptiles & Amphibians</u>

- National Roads Authority (2008) *Ecological Surveying Techniques for Protected Flora and Fauna During the Planning of National Road Schemes*

<u>Aquatic Habitats & Species</u>

- 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*
- Eastern Regional Fisheries Board (n.d.) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites*
- Construction Industry Research and Information Association (2006) *Guidance on 'Control of Water Pollution from Linear Construction Projects'*
- Construction Industry Research and Information Association (2001) *Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors*
- Meehan (2013) *National Smooth Newt Survey 2013 Report*, Irish Wildlife Trust.
- National Biodiversity Data Centre (2021) *Data for records of Common Frog held by NDBC*.
- National Roads Authority (2008) *Ecological Surveying Techniques for Protected Flora and Fauna During the Planning of National Road Schemes* were followed when carrying out surveys.

<u>Invasive Species</u>

- Kelly *et al*. (2013a) *The economic cost of invasive species and non-native species in Ireland and Northern Ireland*, A report prepared for the N.I. Environment Agency and NPWS
- Kelly, *et al.* (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 *et al.* (2014) *Ireland's invasive and non-native species – trends in introductions*, NBDC Series No. 2.

<u>Terrestrial Invertebrates</u>

- National Biodiversity Data Centre (2015) *Marsh Fritillary Monitoring Scheme*
- Fowles & Smith (2006) *Mapping the habitat quality of patch networks for the marsh fritillary*

EIAR 13.1.6 Methodology Used

The evaluation for Biodiversity in Section EIAR 13.3 has been carried out in accordance with *Environmental Impact Assessment of Projects: Guidance of the preparation of Environmental Impact Assessment Report*, 2017; the National Roads Authority (2009) *Guidelines for Assessment of Ecological Impacts of National Road Schemes*; Percival (2007) *Predicting the effects of wind farms on birds in the UK: the development of an objective assessment method*; CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland*; EPA (2022) *Guidelines on the information to be contained in Environmental Impact Assessment Reports.*

This methodology has been used to determine the importance and sensitivity of receptors, and the magnitude and significance of potential impacts.

The methodology can be found in full in Appendix 13.8: Methodology for the evaluation of Biodiversity.

EIAR 13.2 BIODIVERSITY PART 1: SCOPING FOR SENSITIVE ASPECTS OF BIODIVERSITY

The assessment of significant effects (or impacts) is an essential concept of the EIA Directive, and the primary objective of this EIA Report is to identify and evaluate the significant effects of the Project. Scoping has been carried out in accordance with the *Guidance on Scoping* (EC 2017) in order to focus the consideration of the impacts the Ballynalacken Windfarm Project may have on the environment to those which are significant or important enough to merit assessment, review and decision-making.

Scoping for the Environmental Topic – Biodiversity has been carried out by the chapter authors, throughout the preparation of this Chapter, and includes scoping for the sensitive aspects of Biodiversity (this Section EIAR 13.2), and later in this Chapter - scoping of impacts (see Section EIAR 13.3).

EIAR 13.2.1 Introduction to Scoping for Sensitive Aspects of Biodiversity (Receptors)

The purpose of the scoping exercise, which comprises this Section EIAR 13.2, is to identify the relevant Sensitive Aspects (receptors) of Biodiversity. In order to identify the relevant Sensitive Aspects, the scoping exercise applies a Conceptual Site Model approach and covers the following matters:

1. An examination is carried out, in Section EIAR 13.2.2, of the potential Sources of Impacts resulting from the Project and the Pathways for Impacts which link the sources of impacts to the Receptors (Sensitive Aspects) of the impacts;

2. The Zone of Influence of the Project, within which the impacts of the Project could occur, is set out, with justification for same. The Zone of Influence is also called the 'Study Area' herein. The zones of influence are set out in Section EIAR 13.2.3 for the various Sensitive Aspects which occur in the environment.

3. A scoping examination of Sensitive Aspects which occur within the Study Area(s) is carried out in Section EIAR 13.2.4. The scoping examination results in a Sensitive Aspect being either scoped-in for detailed evaluation in **Part 2: Sensitive Aspect Evaluation Section (i.e. Section EIAR 13.3)** of this chapter or scoped-out from further consideration, for the following reasons:

   a) Scoped In: Where it is considered that a Sensitive Aspect is likely, or has potential, to be significantly affected by the Project, that Sensitive Aspect has been scoped in for detailed evaluation in Part 2 (Section EIAR 13.3).

   b) Scoped Out: Where it is considered that there is no potential for a Sensitive Aspect to be affected, or where the likely/potential impacts to that Sensitive Aspect will be Neutral (i.e. No impact/imperceptible impact) then that Sensitive Aspect has been scoped out from further consideration, and the rationale for scoping-out is provided in the table.

   c) Scoped In: An exception is made for Sensitive Aspects which are not likely to be significantly affected but may be of particular or local concern and merit a detailed examination, these Sensitive Aspects are also scoped in for detailed evaluation in Part 2 (Section EIAR 13.3).

EIAR 13.2.2 Identification of the Sources, Pathways and Receptors of Impacts

The evaluations within the EIAR utilize Conceptual Site Model methods to identify potential impact sources and pathways between the Project and receptors (Sensitive Aspects) of the environment.

EIAR 13.2.2.1 Identification of Impact Sources

The 'source' is an origin of an impact and is associated with the Project. In order to identify the potential 'sources' of impact, the characteristics of the Ballynalacken Windfarm Project, i.e. the size and design, works, activities, use of materials and natural resources, and the emissions and wastes, associated with the construction, operation and decommissioning of the Project, as described in Chapter 5 of this EIA Report, have been examined, and it is considered that the following Project characteristics have potential to act as a 'source' of impact to the sensitive aspects of Biodiversity:

<u>Construction Stage Sources of Impact</u>

- Works in close proximity to natural watercourses
- Trenching over/directional drilling under existing buried structures along the public road
- Works in wet drainage channels;
- New crossing structures;
- Movement of soils and machinery;
- Excavation works;
- Oils, fuels and chemicals;
- Cement-based compounds;
- Noise and visual intrusion;
- Presence of construction personnel;
- Tree felling;
- Storage of materials;
- Hedgerow trimming;
- Vegetation clearance;
- New hardstanding areas and access roads;
- Operating machinery;
- Artificial lighting;
- Land take;
- Delivery of materials

<u>Operational Stage Sources of Impact</u>

- Noise and human activity;
- New above ground structures;
- Electrical equipment;
- Land cover change;
- Reinstatement of vegetation;
- Replanting of trees/hedgerow
- Implementation of biodiversity protection area;
- EMF;
- Artificial lighting;
- Hedgerow trimming;

- Delivery of materials

Decommissioning Stage Sources of Impact

- Reinstatement works;
- Movement of soils and machinery;
- Noise and human activity;
- Artificial lighting

EIAR 13.2.2.2 Identification of Impact Pathways

The ‘pathway’ is the means by which an impact can reach and affect a receptor. The characteristics of the baseline environment have been examined and it is considered that the following pathways could form a link between the Project (sources of impact) and the Sensitive Aspects (receptors):

- Soil
- Surface water
- Groundwater
- Water flow paths
- Direct contact
- Air
- Ground
- Visibility
- Land cover

EIAR 13.2.2.3 Identification of Receptors

Any receptor in the environment which could be affected by a development is referred to as a ‘Sensitive Aspect’ in this EIA Report. The following Sensitive Aspects are relevant to the receiving environment and are subject to scoping in Section EIAR 13.2.3:

- Terrestrial Habitats
- Invertebrates
- Amphibians & Reptiles
- Terrestrial Mammals
- Bats
- Birds
- Aquatic Habitats & Species
- Designated Sites
- Local Water Dependent Habitats

The Zone of Influence in relation to these Sensitive Aspects is examined in Section EIAR 13.2.3 below, with a scoping exercise for each of the Sensitive Aspects presented in Section EIAR 13.2.4.

EIAR 13.2.3 Scoping of the Study Areas (Zone of Influence of the Project)

The scoping and evaluation focuses on the area or zone of influence around the Ballynalacken Windfarm Project within which the impacts of the Project could occur. This area/zone is referred to as the Study Area. The Study Areas for the Sensitive Aspects of the Biodiversity environment are set out in the table below.

Table 13-2: Study Area of the Project in relation to sensitive aspects of the Biodiversity environment

Sensitive Aspect	Ballynalacken Windfarm Project Zone of Influence/Study Area	Justification
Terrestrial Habitats	Construction works area boundary plus 100m in all directions	Professional judgement and as per Best Practice (CIEEM, 2018)
Invertebrates	Construction works area plus 100m in all directions	Professional judgement and as per Best Practice (CIEEM, 2018)
Amphibians & Reptiles	Construction works area plus 100m in all directions	Professional judgement and as per Best Practice (CIEEM, 2018)
Terrestrial Mammals	Otter: All watercourse crossing locations were surveyed for suitability, and where suitable habitat occurred these watercourses were surveyed 300m in both directions. Badger and Other Mammals: Construction works areas plus 100m in all directions.	Professional judgement and as pertinent: Otters: Best practice guidelines published by the Highways Agency (1999) Badgers: Best practice guidelines published by the NRA (2005) Other Mammal Species: Professional judgement and as per Best Practice (CIEEM, 2018)
Bats	Buildings within 250m of the construction works area boundary Mature trees within 50m of the construction works area boundary Linear vegetation features (e.g. hedgerows) of high suitability for foraging bats within the construction works area boundary Bridges within the construction works area boundary and along material haulage routes on the local road network between the concrete/stone suppliers and the works locations	Professional judgement as per best practice: Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016); The Conservation of Bats in Bridges Project – A Report on the Survey and Conservation of Bat Roosts in Bridges in Cumbria (Billington and Norman, 1997); Kelleher, C. and Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals No. 25, National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin Ireland.
Birds	2km from construction works areas	Professional judgement and as per Best Practice (CBS, 2012; CIEEM, 2018; NRA, 2008; Lusby *et al*., 2011; SNH, 2017; TII, 2017; EPA, 2006)
Aquatic Habitats & Species	Watercourses at crossing locations	As per Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2008); CIEEM, 2018; EPA, 2017; DHPLG, 2018; SEPA (2008) Engineering in the Water Environment: Good Practice Guide Construction of River Crossings. WAT-SG25. Scottish Environment Protection Agency, First Edition, April 2008; Mumane *et*

		al. (2006), CIRIA Technical Guidance C648: Control of water pollution from linear construction projects, CIRIA.
Designated Sites	All downstream protected aquatic/water dependant habitats and species and habitats of protected species in the following sub-catchments Nore_SC_060, Dinin[North]_SC_010, Nore_SC_080, and the Nore_SC_100, along with Nore_SC_040, Nore_SC_050, Nore_SC_070, Nore_SC_090 and Dinin[South]_SC_010.. The zone of impact extends to any designated sites downstream of the Project works or downstream of the Ballynalacken Windfarm Project via physical or hydrological pathways. In addition to the ZoI for Otter also includes areas 300m from any watercourse stream or river suitable to support couching or holt sites connected to the above mentioned sub-catchments and 50m from Project works areas for foraging/commuting habitat. In relation to Kingfisher (ex-situ effects), the zone of impact extends downstream of the Project works in suitable habitat for Kingfisher as far as the designated sites downstream of the Ballynalacken Windfarm Project within the Nore_SC_060, Dinin[North]_SC_010, Nore_SC_80 and Nore_SC_100 sub-catchments of the River Nore Catchment in which the Project is located. . In addition, any sites within the Nore_SC_060 or Dinin[North]_SC_010 were also considered based on the Windfarm Project overlapping with these Sub-catchments. This area was based on the reasonable consideration for potential pathways that could facilitate contaminants or pollutants to transfer via hydrogeological pathways to impact sensitive habitats or species.	The Zone of Impact for designated sites is based on the connectivity of impact sources via hydrological, hydrogeological or other pathways to a receptor listed as a QI or SCI.

Local Water Dependent Habitats	All areas present within subcatchment overlapping with 500m of project excavation works.	Water dependant habitats potentially affected by the project works have the potential to be impacted where any change to the water table or water quality can change the overall health of these type of habitats. Conservative distance which in excess of the GSI estimated groundwater flowpath distances for the area which is 300m.

EIAR 13.2.4 Scoping of Sensitive Aspects

Any receptor in the local environment which could be affected by a development is a Sensitive Aspect. The various sensitive aspects of the Biodiversity environment are scoped in the table below for potential to be affected by the Ballynalacken Windfarm Project. The scoping examination results in a Sensitive Aspect being either scoped-in for detailed evaluation in **Part 2: Sensitive Aspect Evaluation Section (i.e. Section EIAR 13.3)** of this chapter or scoped-out from further consideration, for the following reasons:

a) Where it is considered that a Sensitive Aspect is likely, or has potential, to be significantly affected by the Project, that Sensitive Aspect has been scoped in for detailed evaluation in Part 2 (Section EIAR 13.3).

b) Where it is considered that there is no potential for a Sensitive Aspect to be affected, or where the likely/potential impacts to that Sensitive Aspect will be Neutral (i.e. No impact/imperceptible impact) then that Sensitive Aspect has been scoped out from further consideration, and the rationale for scoping-out is provided in the table.

c) An exception is made for Sensitive Aspects which are not likely to be significantly affected but may be of particular or local concern and merit a detailed examination, these Sensitive Aspects are also scoped in for detailed evaluation in Part 2 (Section EIAR 13.3).

Table 13-3: Scoping of Sensitive Aspects

Sensitive Aspect	Is there a Pathway between the Project and the Sensitive Aspect?	Likely (or have potential) to be Significant?	Scope In/ Out	Scoping Result & Rationale *(scoped out only)*
Terrestrial Habitats	Yes	Not Significant – but of local importance	Scope In	See Section EIAR 13.3.1 Part 2 Evaluation
Invertebrates	Yes	Not Significant – but of local importance	Scope In	See Section EIAR 13.3.2 Part 2 Evaluation
Amphibians & Reptiles	Yes	Not Significant – but of local importance	Scope In	See Section EIAR 13.3.3 Part 2 Evaluation
Terrestrial Mammals	Yes	Yes, potential	Scope In	See Section EIAR 13.3.4 Part 2 Evaluation
Bats	Yes	Yes, potential	Scope In	See Section EIAR 13.3.5 Part 2 Evaluation

Sensitive Aspect	**Is there a Pathway between the Project and the Sensitive Aspect?**	**Likely (or have potential) to be Significant?**	**Scope In/ Out**	**Scoping Result & Rationale *(scoped out only)***
Birds	Yes	Yes, potential	Scope In	See Section EIAR 13.3.6 Part 2 Evaluation
Aquatic Habitats & Species	Yes	Yes, potential	Scope In	See Section EIAR 13.3.7 Part 2 Evaluation
Designated Sites	Yes	Yes, potential	Scope In	See Section EIAR 13.3.8 Part 2 Evaluation
Local Water Dependent Habitats	No	No	Scope Out	Scoped Out: Due to no likely impact. Wet Heath Habitat is upslope from the construction works areas, with an existing drainage channel between this habitat and the Project works. No additional drainage is expected as a result of the Project due to the location of the works downslope of the existing drainage and the shallow nature of works in proximity to the habitat.

EIAR 13.3 BIODIVERSITY PART 2: EVALUATION SECTION

This Evaluation Section examines the scoped-in Sensitive Aspects in greater detail, and comprises a baseline description and impact evaluation for each of the Sensitive Aspects, presented in the following order:

Section EIAR 13.3.1: Terrestrial Habitats

Section EIAR 13.3.2: Invertebrates

Section EIAR 13.3.3: Amphibians & Reptiles

Section EIAR 13.3.4: Terrestrial Mammals

Section EIAR 13.3.5: Bats

Section EIAR 13.3.6: Birds

Section EIAR 13.3.7: Aquatic Habitats & Species

Section EIAR 13.3.8: Designated Sites

EIAR 13.3.1 SENSITIVE ASPECT: TERRESTRIAL HABITATS

This detailed evaluation section for Terrestrial Habitats is presented as follows:

- Section EIAR 13.3.1.1 - description of the baseline environment of Terrestrial Habitats;
- Section EIAR 13.3.1.2 - evaluation of the impacts of Ballynalacken Windfarm Project on Terrestrial Habitats; and
- Section EIAR 13.3.1.3 – evaluation of cumulative impacts.

EIAR 13.3.1.1 Baseline Environment – Terrestrial Habitats

The context, characteristics, importance and sensitivity of *Terrestrial Habitats* are described in the subsections below. The trends and likely evolution (i.e. Do-Nothing scenario) for this Sensitive aspect are also considered.

The habitats recorded on-site in 2021, 2022, 2023 and 2024, as per Fossitt (2000), are dominated by improved agricultural grassland, wet grassland, coniferous plantation and buildings and artificial surfaces, with these four habitats making up approximately 93% of the total study area (Figure 13.1: Terrestrial Habitats). There are also other habitats that, although being less representative of the site, assume higher ecological importance in the local context. Habitats such as grasslands e.g. dry meadows and grassy verges (GS2), and Scrub (WS1) are associated with noteworthy ecological features within the local area which are important to the local biodiversity resource.

EIAR 13.3.1.1.1 Habitat Survey Results

Figure 13.1 displays habitat mapping for the Ballynalacken Windfarm Project planning boundary. Habitat surveys were carried out to identify and classify habitats based on Fossitt (2000) and were undertaken for the project in July 2021, July, November, December 2022, May, August 2023, January, May 2024 and January 2025.

In total, 18 habitat types, (including Buildings and Artificial surfaces) comprising of 212.08ha and 24,056m (for linear features), occur within the Ballynalacken Windfarm site.

The dominant habitats present are improved agricultural grassland GA1 (42.96%), conifer plantation WD4 (23.59%), wet grassland GS4 (19.52%) and buildings and artificial surfaces BL3 (8.36%).

Whole Project Baseline	
Fossitt_Co	**Area_ha**
BC1	0.78
BL3	17.73
ED3	0.55
FW1	0.95
FW2	0.09
GA1	91.12
GA2	5.15
GS2	1.16
GS4	41.4
HH3	0.57 5.51ha – within the Biodiversity Protection Area
WD4	50.03
WD5	0.42
WS1	2.13

Whole Project Linear Baseline	
Fossitt_Co	**Length (m)**
BL1	84
FW4	958
WL1	17237
WL2	5777

EIAR 13.3.1.1.1.1 Conifer Plantation (WD4)

Conifer plantation includes areas that support dense stands of planted conifers where the broadleaved component is less than 25% and the overriding interest is commercial timber production. Conifer plantations are characterised by even-aged stands of trees that are usually planted in regular rows, frequently within angular blocks. Species diversity is low and single species stands are common (Fossitt, 2000). This habitat was recorded in sections throughout the Ballynalacken Windfarm site. Sitka Spruce (*Picea sitchensis*), Norway Spruce *(Picea abies)* and Japanese Larch (*Larix kaempferi*) were recorded in this habitat type. The area of this habitat recorded is approx. 50.03ha within the 50m study area, and c.275ha of the total plantation, locally along the ridge. An additional 2.84ha of forestry was present within 70m of turbines that will be part of the bat buffer area requiring clear felling.

EIAR 13.3.1.1.1.2 Improved Agricultural Grassland (GA1)

Improved agricultural grassland habitat is 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 (Fossitt, 2000). This habitat was recorded throughout the Ballynalacken Windfarm Project site. Plants observed include Perennial Ryegrass, Annual Meadow Grass (*Poa annua*), Thistle, Clover (*Trifolium* spp.) and Foxglove. The total area of this habitat is 91.12ha.

EIAR 13.3.1.1.1.3 Amenity Grassland (Improved) (GA2)

This type of grassland is improved, or species-poor, and is managed for purposes other than grass production. It includes amenity, recreational or landscaped grasslands, but excludes farmland. Most areas of amenity grassland have been reseeded and are regularly mown to maintain very short swards. Fertilisers and herbicides are often applied but there is rarely any grazing by livestock (Fossitt, 2000). This habitat is located adjacent to the site entrance to Tinnalintan Substation, where a local soccer club maintains a pitch adjacent to the local road. Small patches are also located along the grid connection route but are mostly isolated to private gardens. This habitat also occurs approx. 4km east of the windfarm site, on the western boundary of Castlecomer in the vicinity of HR10. The total area of this habitat is 5.15ha.

EIAR 13.3.1.1.1.4 Dry Meadows and Grassy Verges (GS2)

Dry meadows that are rarely fertilised or grazed and are mowed 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 (Fossitt, 2000). This habitat type was recorded adjacent to T6, along the route of internal windfarm cabling. It was also recorded in small discrete locations along the turbine component haul route. The predominant plants observed within the redline boundary of the Proposed Ballynalacken Windfarm include Hogweed (*Heracleum*), Buttercup (*Ranunculus sp*.), Perennial Ryegrass (*Lolium perenne*), Ragwort (*Senecio vulgaris*), Red Clover (*Trifolium pratense*), White Clover (*T. repens*), Great Plantain (*Plantago major*), Meadow Thistle (*Cirsium dissectum*) and Bent Grass (*Agrostis* sp.). The plant species recorded from within these habitats suggest a degree of agricultural or other improvements or modifications such that they are not particularly valuable examples of such habitats. The total area of this habitat is 1.16ha.

EIAR 13.3.1.1.1.5 Wet Grassland (GS4)

This type of grassland can be found on flat or sloping ground in upland and lowland areas. It occurs on wet or waterlogged mineral or organic soils that are poorly drained or, in some cases, subjected to seasonal or periodic flooding. On sloping ground, wet grassland is mainly confined to clay-rich gleys and loams, or organic soils that are wet but not waterlogged (Fossitt, 2000). A number of turbines have this habitat within the footprint of the hardstand or along the proposed access road to these turbines. T4, T7, T8, T10 and T11 are all located within this habitat type. The proposed road to T1 and to T12 is comprised of this habitat type as well. Wet grassland was recorded along the internal windfarm cabling route between T10 and T11. Plants observed in this habitat include Rush *(Juncus sp.),* Gorse *(Ulex europaeus)* and Bramble. The total area of this habitat is 41.4ha.

EIAR 13.3.1.1.1.6 Wet Heath (HH3)

This habitat type consists of vegetation with at least 25% cover of dwarf shrubs on peaty soils and shallow wet peats that typically have an average depth of 15-50cm. Plants associated with this habitat include Ling (*Calluna vulgaris*), Cross-leaved Heath (*Erica tetralix*), Purple Moor-grass (*Molinia caerulea*) and sedges. Wet heath habitat was recorded in the area between T9 and T10, within the Biodiversity Protection Area. The only project element that occurs in close proximity to this habitat to any degree is the road widening works along the L-5840. The area of Wet Heath present with 50m of the proposed site boundary is 0.57Ha. The Biodiversity protection area contains 5.51Ha of this habitat.

EIAR 13.3.1.1.1.7 Scrub (WS1)

This broad category includes areas that are dominated by at least 50% cover of shrubs, stunted trees or brambles. Scrub can be either open, or dense and impenetrable, and it can occur on areas of dry, damp or waterlogged ground (Fossitt, 2000). Scrub habitat was recorded in small sections within the Ballynalacken Windfarm with the dominant plant species including Gorse, Hawthorn, Ash, Bramble, Thistle, Nettle (*Urtica dioica*), Hazel and Foxglove. The total area of this habitat is 2.13ha.

EIAR 13.3.1.1.1.8 Scattered trees and parkland (WD5)

This category is defined for habitats where scattered trees, standing alone or in small clusters, covering less than 30% of the total area under consideration but are a prominent structural or visual feature of the habitat. This habitat is isolated to two patches. One adjacent to the grid connection which is within the area of a private property. The other a small patch located West of T10, adjacent to the L-5840. The total area of this habitat is 0.42ha.

EIAR 13.3.1.1.1.9 Arable Crops (BC1)

Agricultural land that is cultivated and managed for the production of arable crops, including cereals (wheat, barley, oats, maize), and root, leaf, energy or fibre crops such as sugar beet, turnips, rape and flax. Fields of potatoes can be included here, but most other vegetable crops are excluded, as are market gardens. This habitat was recorded in this habitat type during the field survey along the grid connection. The total area of this habitat is 0.78ha. Both of these two patches are located outside the red line boundary of the development.

EIAR 13.3.1.1.1.10 Buildings and Artificial Surfaces (BL3)

Buildings and artificial surfaces include areas of built land such as buildings and areas of land covered by artificial surfaces such as concrete, tarmac, bricks and blocks, including general public roads and private roads that serve part of the existing farm and forestry access routes. Plant cover does not exceed 50%. Buildings and houses were recorded in this habitat type during the field survey. The total area of this habitat is 17.73ha. The majority of this habitat is scattered along the routes of the grid connection and at road widening and haul route works locations. This habitat also occurs along the Internal Cable Link and at existing farm and forestry roads within the windfarm site.

EIAR 13.3.1.1.1.11 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 weed plants (Fossitt, 2000). The habitat is located along an existing track to the West of the Tinnalintan Substation and along the southern access road toward T1. Species characteristic of this habitat that were identified include Nettle, Dandelion and Greater Plantain, other species found include Perennial ryegrass, Daisy, Creeping buttercup *(Ranunculus repens),* Ribwort Plantain *(Plantago lanceolata)* and Thistle. The total area of this habitat is 0.55ha.

EIAR 13.3.1.1.1.12 Hedgerows (WL1)

Hedgerows are linear strips of shrubs, often with occasional trees, that typically form field or property boundaries. Most hedgerows originate from planting and many occur on raised banks of earth that are derived from the excavation of associated drainage ditches. Linear strips of low scrub are included in this category if they occur as field boundaries (Fossitt, 2000). Hedgerow habitat was recorded throughout the Ballynalacken Windfarm Project site – within the Ballynalacken Windfarm site, at the Tinnalintan Substation, along the routes of the Internal Cable Link and the Ballynalacken Grid Connection and at Haul Route Works locations. Plants recorded in this habitat type include Hawthorn (*Crataegus monogyna*), Willow (*Salix* spp.), Bramble (*Rubus fruticous* agg.), Dog Rose (*Rosa canina*), Nettle (*Urtica dioica*), Thistle (*Cirsium* spp.), Foxglove (*Digitalis purpurea*), Hazel (*Corylus avellana*) and Ash (*Fraxinus excelsior*). The total length of this habitat is approx. 17,237m. This habitat is present across all elements of the proposed development including the windfarm site, grid connection, internal cable route, haul route works and blade transfer area.

EIAR 13.3.1.1.1.13 Treelines (WL2)

This habitat consists of a treeline, which is a narrow row or single line of trees that is greater than 5m in height and typically occurs along field or property boundaries. It includes tree-lined roads or avenues, narrow shelter belts with no more than a single line of trees, and overgrown hedgerows that are dominated by trees. Plants recorded in this habitat include Larch (*Larix*), Birch (*Betula pendula*), Ash (*Fraxinus excelsior*) and Hazel (*Corylus avellana*). The total length of this habitat is approx. 5,777m.

EIAR 13.3.1.1.1.14 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. This habitat is present at one location at the upper reaches of the Cloghnagh stream – where the proposed windfarm access road will cross the Cloghnagh at crossing W1. This habitat is also present south of water crossing W2 in agricultural grassland between the windfarm site and Tinnalintan Substation. The total area of this habitat within the study area is 0.95Ha

EIAR 13.3.1.1.1.15 Depositing/lowland rivers (FW2)

This category includes watercourses, or sections of these, where fine sediments are deposited on the riverbed. Depositing conditions are typical of lowland areas where gradients are low and water flow is slow and sluggish. These rivers vary in size but are usually larger and deeper than FW1 types, however at the Ballynalacken Windfarm Project site, this habitat type occurs at a small lowland 1st order/2nd order stream – the Rathduff_15, which is non-perennial in nature – i.e. it is dry for at least part of the year. This habitat interacts with the Project at one location, on the lower stretches of the Rathduff_15 where it is classified as a 2nd order stream, the Ballynalacken Grid Connection route crosses the stream at the existing bridge (W3) on the public road. The total area of this habitat within the study area is 0.09Ha.

EIAR 13.3.1.1.1.16 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. Drainage ditches either contain water (flowing or stagnant) or are wet enough to support wetland vegetation. Dry ditches that lack wetland plants are not included (Fossitt, 2000). This habitat type was recorded in the vicinity of T3/D1, along the existing road at D2, along the route of windfarm access road to T4 (D3), and between T9 and T10 (D4). The total length of this habitat is 958m.

EIAR 13.3.1.1.1.17 Stone walls and other stonework (BL1)

Stone walls and other stonework include This category incorporates stone walls and most other built stone structures in rural and urban situations, apart from intact buildings. The total area of this habitat is 84m. All of this habitat isolated along the R432 of the grid connection route.

EIAR 13.3.1.1.2 Occurrence of Flora Protection Order Species & QI Species

The proposed windfarm lies within Ordnance Survey National Grid 10km Square S47. Endangered plant species historically recorded within the Grid Square include; Smooth Cat's-ear (*Hypochaeris glabra*), Nettle-leaved Bellflower (*Campanula trachelium*), Common Feather-moss (*Eurhynchium praelongum*), Elegant Bristle-moss (*Orthotrichum pulchellum*), Fatfoot Pocket-moss (*Fissidens crassipes*), Flat Neckera (*Neckera complanata*), Fox-tail Feather-moss (*Thamnobryum alopecurum*), Kneiff's Feather-moss (*Leptodictyum riparium*), Many-fruited Thyme-moss (*Plagiomnium affine*), Neat Feather-moss (*Scleropodium purum*), Pointed Spear-moss (*Calliergonella cuspidata*), Shaw's Bristle-moss (*Orthotrichum striatum*) and Swartz's Feather-moss (*Oxyrrhynchium hians*).

No Flora Protection Order (FPO) species are present within, or in close proximity to, construction works areas.

There is Wet Grassland habitat within the wider receiving environment that may be suitable for orchid species. Only two orchids in Ireland are listed under the FPO 2022, neither were recorded during ecology surveys. No orchid rich habitats are present within the area of the construction works, operational works or the decommissioning works areas.

EIAR 13.3.1.1.3 Occurrence of Invasive Species

Only two Invasive Species plants are recorded in the NBDC records for OS Grid reference S47, within which the site of the Ballynalacken Windfarm, Internal Cable Link, Tinnalintan Substation and the Ballynalacken Grid Connection are located. These species are "High Impact Invasive Species" (Regulation S.I. 477). Only high impact invasive species are discussed in this section as lower impact invasive species are not expected to negatively impact on local biodiversity, for full list of NBDC records see Appendix 13.1. The species recorded on NBDC are: Japanese Knotweed (*Fallopia japonica*) and Cherry Laurel (*Prunus laurocerasus*).

Only one Invasive Alien Species was recorded during surveys undertaken at the Proposed Ballynalacken Windfarm Project site. Cherry Laurel was recorded at one location at the edge of a site access road junction within Ballynalacken Windfarm Project (ITM: 648284, 674062). This junction provides access from the main eastern access point to T4 and T3.

EIAR 13.3.1.1.4 Existing Sources of Impacts to Terrestrial Habitats

The occurrence of existing pollution or environmental damage in the areas on or around the location of the Project have also been considered. Although no existing pollution or damage to Terrestrial Habitats is taking place at the Project site, it is noted that agriculture is the primary landuse in the area and is considered to have influenced the composition and extent Terrestrial Habitats within both the study area and the wider surrounding area. In addition, it is considered that due to the proximity of the forestry plantation to wet grassland habitat also poses risks from nutrient run off and changes to surface water runoff rates during and following the removal and replanting of conifer trees as part of forest management.

EIAR Figures: (included at the end of this Chapter)

Figure 13.1: Terrestrial Habitats

EIAR Appendices: (included at the end of this Chapter)

Appendix 13.1: Species Records held by NBDC

EIAR 13.3.1.1.5 Importance of Terrestrial Habitats & Sensitivity to Change

Importance: Habitats of Local Importance (Higher Value) include:

- buildings and artificial surfaces (BL3) (based on possible importance of certain roadside buildings to bats/Barn Owl),

- scrub (WS1) (importance to local diversity),
- hedgerows (WL1) (level of maturity and value to birds and mammals),
- treelines (WL2) (value to bats as commuting pathways and possible day roosts),
- eroding/upland rivers (FW1) (value to bat, birds and mammals),
- depositing/lowland rivers (FW2) (value to aquatic invertebrates, bats, birds, mammals),
- drainage ditches (FW4) (importance to mammals/amphibians),
- wet grassland (GS4) (based on level of value to birds/mammals/amphibians) and
- wet heath (HH3) (based on level of value to birds/mammals/reptiles/amphibians).

The remaining habitats are evaluated as Local Importance (Lower Value) due to their importance in maintaining habitat links.

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.

EIAR 13.3.1.1.6 Evolution of the Baseline Environment (the ‘Do-Nothing’ scenario)

The present survey forms a baseline classification of habitats on or near the subject development. The majority of the proposed Ballynalacken Windfarm Project is improved agricultural grassland and conifer plantation. As such these habitats are expected to remain relatively unchanged in the ‘Do-Nothing’ scenario. 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 phase.

No thresholds/limits are applicable for the habitats present within the Windfarm site as none of them are of greater than Local Importance (Higher Value) or present as a significant resource in relation to County or National distribution.

The main drivers of change for Terrestrial Habitats result from agricultural improvements and habitat loss/change resulting in the loss of habitat both locally and within a wider landscape, and the felling of forestry plots as part of normal forestry operations, with the plots at the windfarm site scheduled to be felled between 2028 and 2045.

The exact application of the recently adopted (June 2024) EU Nature Restoration Law to Irish landscapes and developments is uncertain as the Irish government has yet to issue a draft of the law to implement within Ireland. The regulation contains targets for agricultural ecosystems to increase grassland butterflies and farmland birds, and the share of agricultural land with high-diversity landscape features, and includes targets for forest ecosystems to increase standing and lying deadwood, uneven aged forests, forest connectivity and abundance of common forest birds.

Climate change with potentially warmer wetter winters and/or drier and hotter springs and summers may result in droughts and potentially change the nature of semi-natural habitats, however, any such effects would be unlikely to occur prior to construction activities commencing. Wet grassland habitat is scattered across the area and borders forestry or is along the verges of improved agriculture grassland habitats within the footprint of the Windfarm site. This type of habitat is likely to deteriorate due to changes in rainfall and temperatures as a result of climate change over the longer term.

EIAR 13.3.1.2 Impact Evaluation – Terrestrial Habitats

This Section comprises an evaluation of the likely significant impacts of the proposed Ballynalacken Windfarm Project on the receiving environment. Moderate, Slight, Imperceptible and Neutral Impacts are also taken into consideration.

The impacts are presented/evaluated as follows:

a) Significant Impacts which are likely or have potential to occur, are subject to detailed evaluation;

b) Moderate or Slight Impacts, which are likely or have potential to occur, are subject to detailed evaluation;

c) Non-significant impacts of local concern or considered important enough to merit detailed evaluation;

d) Neutral or Imperceptible Impacts are scoped out from detailed evaluation, and a short evaluation is provided in the table below. Unlikely Impacts are also scoped out.

Table 13-4: Impacts to Terrestrial Habitats

Likely/Potential Impact	**Evaluation**	
Moderate or Slight Impacts, which are likely or have potential to occur - see detailed evaluation		
Construction, Operation & Decommissioning Phases: Introduction or spread of invasive species		*Section EIAR 13.3.1.2.1*
Construction & Operation Phases: Habitat enhancement and protection (positive impact)		*Section EIAR 13.3.1.2.2*
Neutral or Imperceptible Impacts, or where no impact is likely to occur – evaluation below		
Construction Phase: Direct loss of Flora Protection Order species	Neutral Impact: No Flora Protection Order (FPO) species have been recorded in the NBDC databases and no FPO species were recorded during habitat surveys within, or in close proximity to, construction works areas. Although this does not rule out the presence of FPO species entirely, it is unlikely that they are present on site. As a result, it is unlikely there will be a direct loss of FPO species.	
Construction Phase: Direct disturbance/reduction in Terrestrial Habitats (excluding hedgerows and treelines)	Not Significant: The vast majority (82.4%) of temporary and permanent habitat loss (total=25ha) as a result of the development of the Ballynalacken Windfarm Project relates to habitats of low intrinsic biodiversity value, mainly comprising Improved Agricultural Grassland GA1 6.9(ha), Conifer Plantation WD4 20.7ha (19.9Ha will be permanent). Loss of higher value habitats relates to habitats of Local Importance (higher value) comprising 3.65ha of semi-natural habitats; Wet Heath, Scrub, Wet Grassland. Due to the limited extent of semi-natural habitats lost in the context of abundance of these habitats in the wider landscape, the impact is evaluated as not significant. Artificial buildings and structures were identified as locally important high value to a limited extent based only on potential to provide suitable roost structures for bats and barn owls.	

Construction Phase: Hedgerow loss, severance and loss of trees	Imperceptible Impact: Construction stage works will cause both temporary and permanent loss of existing field boundaries. In total, 1544m of hedgerow and treeline and 12 no. trees will be removed during the construction of the project per: 0.24km of hedgerow will be removed to provide a bat buffer mitigation area around the turbines of between 65m and 90m from the turbine, depending on the height of the hedgerow/tree features, and 0.5km of hedgerow will also be removed to accommodate the construction works at site entrances, haul route works HR8 (15m). No hedgerow removal required for the met mast. Hedgerow and Treeline habitats have been evaluated as Local (higher value) importance. Hedgerow severance and the removal of trees on site will alter the habitat composition within the Ballynalacken Windfarm Project site, however the magnitude of impact will be Low due to the extent of habitat loss which will result in a very slight to minor changes from baseline conditions (<10%); individual severance locations will not result in any corridor fragmentation; and in the context the availability of this habitat in the wider area.
Construction Phase: Landscape level habitat fragmentation	Neutral Impact: Due to the linear nature of windfarm layout and cable routes, the relatively small areas at discrete locations associated with turbine hardstanding areas and access roads, and (except for T4 in Wet Grassland) the location of these hardstands within low value Improved Grassland, Wet Grassland and Conifer Plantation habitats and the fact that permanent loss of semi-natural habitats of Local Importance represents 41.31% of the total study area, no landscape level fragmentation is likely to occur.
Construction Phase: Surface or groundwater dependent habitat degradation	Neutral Impact: The Ballynalacken Windfarm Project site does not support extensive areas of habitat which are dependent on surface or groundwater. 5.51ha of wet heath occurs at the windfarm site – this habitat occurs entirely within the biodiversity protection area – the Project will not result in the loss of any of this habitat as no works will occur within this habitat, and furthermore the works will take place downslope of the existing drainage ditch and comprise shallow excavations, and therefore the development will not affect drainage regimes or groundwater levels within the wet heath habitat. Wet grassland (41.4ha) is spread throughout the T4, T7, T8, T10 and T11 and along the site, adjacent to roads to T12 and surrounding the roads connecting T4 and T7. Only 3.47Ha of this habitat will be lost as result of construction works. 958m of wet drainage ditches occur within the construction works area boundary, and the maintenance of drainage regimes through the use of cross drains and regular release of water from the windfarm drainage system, no impact on the availability of surface water or groundwater in wet grassland or existing wet drainage ditches is expected to occur.
Construction & Operational Phases: Change in composition of Terrestrial Habitats due to Bat Buffer zones	Not Significant: This impact is related to the mitigation measures planned as part of the proposed Ballynalacken Windfarm Project to mitigate the impacts to birds and bat species. The removal of the conifer forestry is of no significance due to the low ecological value of non-native conifer forest habitat. The maintenance of the rye grass to keep it short will minimise the use of the area by prey items for birds and bats and will facilitate a more accurate account of fatalities detected during the post-construction monitoring periods. Dense vegetation has shown to impact carcass detection efficiency for human and dog led searches (Stanhope, 2015). Given the current low ecological value of the baseline habitat effected by this impact and the purpose of this measure to reduce the presence of birds and bats flying through the rotor swept area, there is no significant negative change to baseline expected as a result of this impact. As such, it is scoped-out from further analysis.

EIAR 13.3.1.2.1 Introduction or spread of invasive species

Sensitive Aspect:	Terrestrial Habitats
Importance:	**Local (higher)** (as per Section EIAR 13.3.1.1)
Impact Source(s)	Excavation & relocation of soils, movement of machinery
Impact Pathway(s)	Soils
Project Stage	Construction, Operation & Decommissioning Phases

Overview of Impact (general):

Invasive Alien Plant Species (IAPS) include non-native, terrestrial invasive species such as Japanese knotweed or Himalayan balsam, invasive riparian vegetation (such as Himalayan balsam). Cherry Laurel was recorded at one location at the verge of the conifer forestry near a road junction present between T3 and T4.

IAPS could be introduced to a site through the movement of plant/machinery and delivery vehicles, and natural materials such as soil, fencing posts, hedging and trees onto the Project site. IAPS infestations could be spread through the disturbance of vegetation, groundworks and the movement of soils.

The introduction or spread of invasive species within the Project site could result in impacts of High magnitude, albeit on features of Low sensitivity within Project sire resulting in impacts of Low significance. The potential spread of invasive species outside of the Project site (as a result of Project activities) could result in impacts of High magnitude, on features of Very High sensitivity, given the pathways to Natura 2000 sites, resulting in impacts of Moderate significance.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Activities relating to the movement of machinery and groundworks/earthworks have the potential to introduce new infestations of Invasive Alien Plant Species (IAPS) to the site and/or spread existing IAPS infestation.

There is one invasive species recorded within these locations associated with the Ballynalacken Windfarm Project (Cherry Laurel). Therefore it is considered that there is a risk that IAPS could be spread at the site. There is also a risk that an infestation could be introduced during the lifecycle of the Project, and the risk presented by the movement of plant, machinery and natural materials onto the site is also a pathway for the introduction of invasive species onto the Project site. It is noted that no soils will be imported onto the Project site.

Should an infestation be established on the Project site, the effects could be result in aggressive spreading of the species into locally important habitats and pose dangers to the mammal and bird baselines. Cherry Laurel is a toxic plant to mammals, and should the infestation spread to Annex I habitat remote from the Project site – the effect (pre-mitigation) could be Significant.

The risk for the introduction/spread of IAPS is greatest during the construction phase due to the extent (51.1ha) of the construction works area boundary and the volumes of traffic and movement of machinery onsite. The risk of the introduction/spread of IAPS is considered to be lower during the operational and decommissioning phases of the Project due to the reduced extent of works (42ha, 15.6ha respectively) and the much reduced level of groundworks, and movement of machinery/vehicles onto the site.

Impact Magnitude	Moderate	**Impact Significance: *(pre-mitigation)***	**Moderate**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

SM03	No invasive species, other than Cherry Laurel, were recorded within the Construction Works Area Boundary during pre-planning surveys, however pre-construction surveys of the Construction Works Areas plus 7m will be carried out in order to determine if any new infestations have been established in the interim period. These pre-construction confirmatory surveys for invasive species will be carried out by the Project Ecologist to accurately determine the extent of new invasive species infestations. Mapping, showing the most up to date distribution and extent of each infestation, will be distributed to the Environmental Clerk of Works and to the Project Engineer.

SM20	The Project Ecologist will liaise with the Contractors on a weekly basis regarding the upcoming schedule of works and will advise the Contractors of any particular ecological protection requirements at specific locations on site.
SM21	No invasive species, other than Cherry Laurel, were recorded within the Construction Works Area Boundary during pre-planning surveys, however should a new infestation of invasive species be established in the interim period, any excavation works in close proximity (7m) to the new infestation location will be carried out under the direct supervision of an ecologist with prior experience of this type of work.
SM22	Visual inspections will be carried out by the Contractor on all machinery and equipment (particularly for machinery and equipment which has come into contact with water or soils) for evidence of attached plant or animal material, or adherent mud or debris. Any attached or adherent material will be removed before entering or leaving the site, securely stored away from traffic for removal to the waste storage area in the temporary construction compound at the Ballynalacken site.
MM02	Construction traffic, personnel and materials will be restricted to within the Construction Works Area Boundary fence. Machinery will be kept on the windfarm site roads and hardstanding areas, and, aside from advancing excavations, will avoid moving onto areas not delineated on the site drawings
MM29	The infestation of Cherry Laurel will be removed prior to the commencement of construction works. Any plant material and stems and roots treated with herbicide and any remains disposed of via biohazard best practice with regards to managing invasive plant species in accordance with Maguire *et al. (*2008).
MM30	No Japanese Knotweed was recorded within the Construction Works Area Boundary during pre-planning surveys, however, should a new infestation of Japanese knotweed within 7m of works, then the infestation will be covered with high density polyethylene grass carpet terram prior to any works commencing at the location. The covering of any new infestations will only be carried out under the direct supervision of an ecologist with prior experience of this type of work, and the works within 7m of the infestation will also be under the direct supervision of an ecologist with prior experience of invasive species.
OMM06	Prior to works along cable routes or public road works for turbine component transportation, the works locations will be surveyed for invasive plant species. Should a new infestation be identified, then the works within 7m of the infestation will also be under the direct supervision of an ecologist with prior experience of invasive species.
DMM02	Before any reopening/re-widening of site entrances, haul route works locations or turbine hardstands to accommodate the removal of large turbine components, the works locations will be surveyed for invasive plant species infestations and should any be present within 7m of the works, then the works within 7m of the infestation will be under the direct supervision of an ecologist with prior experience of invasive species.

Effectiveness of Mitigation:

The inspection of lands for the presence of invasive species prior to the carrying out of groundworks or vegetation removal (any phase of the Project) will avoid accidental spreading of invasive species, and will enable the appropriate removal of any infestations which are likely to be affected. The visual inspection and cleaning of all site machinery and equipment prior to its arrival on site, will prevent the introduction of invasive species.

Residual Impact Significance *(post-mitigation)*:	**Neutral**

EIAR 13.3.1.2.2 Habitat enhancement and protection	
Sensitive Aspect:	Terrestrial Habitats
Importance:	**Local (High)** (as per Section EIAR 13.3.1.1)
Impact Source(s)	Preservation of wet heath habitat, planting/establishment of new hedgerows, and enhancement of existing hedgerows.
Impact Pathway(s)	Land cover
Project Stage	Construction & Operation Phases

Overview of Impact (general):

The Ballynalacken Windfarm Project includes actions which will see the protection of existing semi-natural wet heath habitat and enhancement through the provision of new linear hedgerow habitat. The protection and enhancement of seminatural habitats and the provision of new linear habitat will contribute to the long-term protection of existing habitat and the provision of additional habitat over the long-term for birds, bats, other mammals and reptiles and amphibians as well as reduce the fragmentation of the wider landscape for species that require linear corridors for commuting and access to/between foraging and breeding/roosting features.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Impact characteristics: Indirect, Likely, long-term

Extent: Protection and conservation management of 5.51ha Wet Heath, 2.15ha Wet Grassland and planting/establishment of 1.5km of new hedgerows (which will include 43 trees), and the enhancement of 4.12km of existing hedgerow.

Biodiversity Protection Area: A localised area of Wet Heath, Wet Grassland and Scrub (8.1ha in area) will be protected for the operational lifetime of the Ballynalacken Windfarm through the management of the land under a lease agreement with the landowner for the duration of the operational phase of the windfarm. This area is located between T9 & T10 in Ballyouskill townland. This area of heath will be enhanced following construction to include controlled low intensity grazing and selective removal of encroaching scrub such as willow or gorse. The Biodiversity Protection Area will be fenced to ensure that it allows wildlife free passage (through the provision of wildlife-passage gates such as badger gates), but controls access by livestock.

New and enhanced hedgerows: 1.5km of new hedgerow (which will include c.43 No. new immature trees) will be planted and 4.12km of existing hedgerows will be enhanced by planting hedge species into gaps and thinner sections of the existing hedge. Native Irish provenance species will be used for this planting measure. This biodiversity action will restore and enhance foraging habitat for bat species, with the hedging located to improve connectivity for bat species onsite. This will also improve habitat connectivity for other species using the windfarm site.

Overall Rationale (Ballynalacken Windfarm Project): Although the formation of this Biodiversity Protection Area aims to preserve the existing habitat, the control of this area over the operational phase will have a long term, positive effect on this habitat type which is rare locally. The preservation of this habitat also has positive indirect impacts on mammals, birds and invertebrates which use it for foraging and refuge. While the changes to Wet Heath in the Area will be Neutral, the benefit to biodiversity will be Slight Positive.

The enhancement of 4.12km of existing Hedgerow habitat and the establishment of 1.5km of new Hedgerow habitat will have a Slight Positive effect within the local area. In addition, the indirect impact to bats will be Moderate Positive, while the impact on other species will be Slight Positive.

Impact Magnitude	Low	**Impact Significance:**	**Slight Positive**

EIAR 13.3.1.3 Cumulative Impact on Terrestrial Habitats with Other Projects

EIAR 13.3.1.3.1 Introduction to the Cumulative Evaluation for Terrestrial Habitats

The Ballynalacken Windfarm Project (*whose effects range from Neutral to Moderate (adverse) and Slight (positive), as per Section EIAR 13.3.1.2*) is examined hereunder for potential to have cumulative effects on Terrestrial Habitats with other existing and permitted projects, and projects advanced in the planning system. These projects are referred to as 'Other Projects' herein.

A Cumulative Study Area is set out below and Other Projects located within this Study Area are identified and examined for in-combination effects with the Ballynalacken Windfarm Project. The potential for off-site and secondary consequential development is also considered.

EIAR 13.3.1.3.2 Scoping of the Cumulative Study Areas

The Cumulative Study Area comprises the construction works areas associated with the Ballynalacken Windfarm Project plus an area of 100m extending around the construction works area. It is considered that this area is sufficient to identify those Other Project or Activities which may cause cumulative effects to Terrestrial Habitats with the Ballynalacken Windfarm Project.

EIAR 13.3.1.3.3 Evaluation of Cumulative Impacts

The Other Projects which occur within the Cumulative Study Area are identified in the table below and in Figure 13.9: Other Projects within the Cumulative Study Areas *(included at end of this chapter).*

The Ballynalacken Windfarm Project is examined below for cumulative effects with each of the Other Projects within the Cumulative Study Area. An evaluation of the collective cumulative impact of the Ballynalacken Windfarm Project in-combination with all the Other Projects then follows. The evaluation takes into account any existing sources of pollution or damage identified in Section EIAR 13.3.1.1.4.

Table 13-5: Evaluation of Ballynalacken Windfarm Project cumulatively with Other Projects

Other Project	Status	Evaluation of Cumulative Impact
Farranrory Wind Farm Grid Connection Ballyragget Solar Farm/Parksgrove Solar Farm Grid Connection Battery Energy Storage Developments, Moatpark	Consented	Neutral Cumulative Impact: While these grid connections connect into the existing EirGrid Ballyragget Substation, the closest Ballynalacken Windfarm Project works relate to the Grid Connection, which is routed along the public roads and in hardcore within the compound taking place within Buildings and Artificial Surfaces (BL1), and as such are of low value. Any changes to this habitat type will be of temporary duration with the reinstatement of the public road/compound yard following each of the grid connection works.
Laois-Kilkenny Grid Reinforcement Project (including recently consented extension to Ballyragget compound)	Under construction	Neutral Cumulative Impact: This Project overlaps with the Ballynalacken Project in the Tinnalintan area. The Ballynalacken Internal Cable Link is route close to this new tower and will pass under the new overhead line. No cumulative impacts are expected – as the construction works for this grid reinforcement project will be completed prior to the commencement of the Ballynalacken Windfarm Project. Effects to habitats at the Ballyragget Substation and at the Tinnalintan area will be negligible, due to the low intrinsic biodiversity value of habitats affected.
Moatpark-Loan 38kV Overhead Line Telecom Masts, Ballyouskill	Existing	Neutral Cumulative Impact: These developments are existing and no further loss of terrestrial habitats is expected to occur. Therefore, there is no potential for cumulative impacts with the Ballynalacken Windfarm Project.

Other Project	Status	Evaluation of Cumulative Impact
Existing Source of Impact; Agricultural Landuse	Primary landuse in the study area	Neutral Cumulative Impact: agriculture is the primary landuse in the area, and is considered to have influenced the baseline environment of the study area. No notable changes to this landuse activity are expected to occur in the short-term, including during the construction period associated with the Ballynalacken Windfarm Project. In the longer term, while land may be sympathetically managed for greater biodiversity, these changes are not expected to be sufficient to cause significant positive impacts with the Biodiversity Protection Area or hedgerow planting and enhancement associated with the Project.
Existing Source of Impact; Forestry Landuse	Secondary landuse in the study area	Neutral Cumulative Impact: commercial forestry is a notable landuse in elevated areas within the cumulative study area, and is considered to have influenced the baseline environment of the study area. No notable changes to this landuse activity are expected to occur in the short or longer term periods. It is noted that the proximity of the forestry plantation at the Ballynalacken Windfarm site to wet grassland habitat also poses risks from nutrient run off and changes to surface water runoff rates during and following the removal and replanting of conifer trees as part of forest management.
Forestry Replanting	Future activity	No Cumulative Impact: The afforestation lands associated with the felling at Ballynalacken will take place remote from the Project site, and therefore there is no potential for cumulative impacts to the terrestrial habitats at the Project site.
Secondary Project: Other Energy Projects connecting to Tinnalintan Substation	Future project, unknown	Imperceptible Cumulative Impacts: A future possible connection by another energy project into the Tinnalintan Substation might consist of a cable route/overhead line through lands within the Ballynalacken Windfarm Project, most likely along public roads or through agricultural lands in the vicinity of the Tinnalintan Substation compound. However, these possible future works (cable trench/pole sets) would likely relate to underground cable trenches or overhead lines, within habitats of low biodiversity value; i.e. Buildings and Artificial Surfaces (BL1) or Improved Agricultural Grassland (GA1). And any changes to these habitat types will be of temporary duration with the reinstatement of the public road/private road/grassland/compound yard following the Secondary Project grid connection works, therefore any cumulative impacts would be Imperceptible.

As detailed in the evaluations in the table above, the development of the Ballynalacken Windfarm Project will not result in significant cumulative impacts with any of the Other Projects within the Cumulative Study Area.

When the effects of the Ballynalacken Windfarm Project on Terrestrial Habitats, are considered collectively with all of the Other Projects and existing sources of impacts within the Cumulative Study Area, it is evaluated that due to:

(i) the existing status and minimal footprint of the overhead line projects;

(ii) the location of the grid connection projects within public roads and hardcore areas within the study area;

(iii) the locational context of the battery energy storage projects and potential future connections into the Tinnalintan Substation within low value habitats (improved agricultural grassland);

(iv) no notable changes to landuse within the study area are expected to occur;

(v) the separation distances to Forestry Replant lands which will be located outside of the River Nore and River Barrow catchments; and

(vi) the location context of the Ballynalacken Grid connection within the public road and within hardcore areas, and the separation distances between the projects around the EirGrid Moatpark Substation and the Tinnalintan Substation / windfarm site,

that **the collective cumulative impact on Terrestrial Habitats will not be significant.**

EIAR 13.3.2 SENSITIVE ASPECT: INVERTEBRATES

This detailed evaluation section for Invertebrates is presented as follows:

- Section EIAR 13.3.2.1 - description of the baseline environment of Invertebrates;
- Section EIAR 13.3.2.2 - evaluation of the impacts of Ballynalacken Windfarm Project on Invertebrates; and
- Section EIAR 13.3.2.3 – evaluation of cumulative impacts.

EIAR 13.3.2.1 Baseline Environment – Invertebrates

The context, characteristics, importance and sensitivity of *Invertebrates* are described in the subsections below. The trends and likely evolution (i.e. Do-Nothing scenario) for this Sensitive aspect are also considered.

Walkover surveys were conducted to determine the presence and suitability of habitats for invertebrates. Detailed walkover surveys of suitable habitat were also performed for the presence of Marsh Fritillary webs in September 2021.

General invertebrates, other than Marsh Fritillary butterfly (*Euphydryas aurinia*), are scoped out as the habitats recorded from the windfarm site are generally of low invertebrate potential.

EIAR 13.3.2.1.1 Survey Results & Occurrence of Suitable Habitat

General Invertebrates: With the exception of Marsh Fritillary, below, no Invertebrate surveys were undertaken for the Project and no incidental records were made.

Marsh Fritillary: No Marsh Fritillary were recorded within the study area.

Surveys carried out during 2021 outside the study area in Firoda recorded the presence of Marsh Fritillary, and a total of 62 Marsh Fritillary larval webs were recorded in an area of 6 hectares of suitable habitat in Ballynalacken Windfarm. The larval webs were recorded in a field 1.88km to the east of T11 and T12. Devil's-bit Scabious (*Succisa pratensis*), the larval food plant and therefore vital for the species, was recorded four times in the OS grid square S47. The most recent recording was 09/06/2020.

Marsh Fritillary is considered a key ecological receptor.

EIAR 13.3.2.1.2 Existing Sources of Impacts to Invertebrates

The occurrence of existing pollution or environmental damage in the areas on or around the location of the Project have also been considered, and no existing pollution or damage to Invertebrates is taking place at the Project site.

EIAR Figures: (included at the end of this Chapter)

Figure 13.2: Invertebrates

EIAR 13.3.2.1.3 Importance of Invertebrates & Sensitivity to Change

General invertebrates are sensitive to habitat loss and change, air and water pollution. General invertebrates are evaluated as of Local Importance (Lower Value), equivalent to a Low sensitivity rating, and as a consequence these species are scoped out from further evaluation.

Importance: The Marsh Fritillary butterfly is the only Irish insect legally protected and listed on Annex II of the EU Habitats Directive. Under the Red List of Irish Butterflies, the Marsh Fritillary is categorised as 'Vulnerable', 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 (Phelan *et al.*, 2021). Marsh Fritillary is evaluated as of International Importance, which is equivalent to a Very High sensitivity rating.

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 done on a landscape scale even if there are some areas that are not currently inhabited by the Marsh Fritillary (Phelan *et al.*, 2021).

Generally speaking, Marsh Fritillary is sensitive to habitat loss, directly through land take or indirectly through compaction from vehicular movement. 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).

As a result of its classification as vulnerable on the Irish Red List for Butterflies (Reagan *et al*., 2010) and its importance in a National and European context, the Marsh Fritillary is assessed as being of Very High Importance.

EIAR 13.3.2.1.4 Evolution of the Baseline Environment (the 'Do-Nothing' scenario)

Trends in Key Indicators over time: Marsh Fritillary 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 in the 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 project 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.

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.

Thresholds/Limits:

As no marsh Fritillary colonies or potentially suitable habitats were recorded from within the study area at the Ballynalacken Windfarm Project site, no thresholds/limits are applicable for this species.

Drivers of Change:

The main drivers of change for Marsh Fritillary result from agricultural improvements and habitat loss/change resulting in the loss of habitat both locally and within a wider landscape reducing the ability of the butterfly to colonise and recolonise sites which is feature of this butterflies ecology. There are no current policies or initiatives that are likely to result in significant land-use change and therefore habitats prior to and during construction, operation and decommissioning of the proposed Ballynalacken Windfarm Project. Climate change with potentially warmer wetter winters and/or drier and hotter spring and summers may result in droughts and potentially reduce the availability of suitable habitat for Marsh Fritillary, however, any such effects would be unlikely to occur prior to construction activities commencing.

EIAR 13.3.2.2 Impact Evaluation – Invertebrates

This Section comprises an evaluation of the likely significant impacts of the proposed Ballynalacken Windfarm Project on the receiving environment. Moderate, Slight, Imperceptible and Neutral Impacts are also taken into consideration.

The impacts are presented/evaluated as follows:

a) Significant Impacts which are likely or have potential to occur, are subject to detailed evaluation;

b) Moderate or Slight Impacts, which are likely or have potential to occur, are subject to detailed evaluation;

c) Non-significant impacts of local concern or considered important enough to merit detailed evaluation;

d) Neutral or Imperceptible Impacts are scoped out from detailed evaluation, and a short evaluation is provided in the table below. Unlikely Impacts are also scoped out.

Table 13-6: Impacts to Invertebrates

Likely/Potential Impact	Evaluation	
Neutral or Imperceptible Impacts, or where no impact is likely to occur – evaluation below		
Construction Phase: Marsh Fritillary - Habitat loss/degradation	No Likely Impact: Marsh Fritillary colonies can occur in a wide variety of habitats including sand dunes, calcareous grassland, fens, bogs and upland heaths and grasslands. The presence of its foodplant Devil's-bit Scabious, *Succisa pratensis* is an essential habitat component (Phelan *et al*., 2021). While suitable habitat does exist at the Project site, no Devils Bit Scabious or Marsh Fritillary were recorded during habitat or entomology surveys at the Project site. Therefore, it is considered unlikely that habitat containing Devils Bit Scabious will be affected by groundworks during the construction period.	
Construction Phase: Mortality of in-situ larvae, pupae or airborne individuals (due to groundworks, movement of vehicles and machinery)	No Likely Impact: While suitable habitat does exist at the Project site, no Devils Bit Scabious (DBS) or Marsh Fritillary larval webs/individuals were recorded during surveys at the Project site. The nearest Marsh Fritillary colony to construction works areas was recorded 1.87km to the east of the windfarm site. Therefore, due to the lack of DBS, lack of webs within the construction works area boundary, and the substantial distance of the nearest known colony, it is considered unlikely that mortality of any in-situ larvae or airborne individuals will occur as a result of groundworks or movement of machinery during the construction period.	
Construction Phase: Potential disturbance/ displacement from vibration	No Likely Impact: Marsh Fritillary (individuals or larval webs) were not recorded at the Ballynalacken Windfarm Project site during surveys. Furthermore, its foodplant, Devils Bit Scabious (DBS), is also not present at the Project site. The nearest Marsh Fritillary colony was recorded 1.88km to the east. Therefore it is unlikely that excavation works and the movement of machinery will result in disturbance or displacement of Marsh Fritillary.	
Operation Phase: Mortality of airborne individuals (due to operational turbines)	No Likely Impact: Marsh Fritillary are not expected to fly within the rotor zone of the turbines, and therefore mortality is unlikely to occur as a result of operating turbines.	
Operation Phase, Decommissioning Phase: Habitat loss or degradation, or mortality of in-situ larvae or airborne individuals	Neutral Impact: Notwithstanding the absence of Marsh Fritillary colonies and the absence of its foodplant Devil's Bit Scabious at the Project site, the possibility remains that patches of DBS could become established at the site during the operational lifetime of the windfarm. However, due to the small size of the areas which will be subject to groundworks during the operational phase, with additional relatively small areas (berms and overburden storage areas) subject to works during decommissioning, it is considered that the potential for significant habitat loss or degradation and the potential for significant mortality of in-situ larvae, pupae or airborne individuals can be excluded due to the small size of the areas subject to groundworks (where DBS could potentially be removed), and the isolated and discrete nature of the locations of these works.	

Operation Phase, Decommissioning Phase: Disturbance/displacement, or mortality due to moving machinery and vehicles	Neutral Impact: Notwithstanding the absence of Marsh Fritillary colonies and the absence of its foodplant Devil's Bit Scabious at the Project site, the possibility remains that patches of DBS could become established at the site during the operational lifetime of the windfarm. However, due to the very low levels of maintenance vehicles and use of machinery on site and the small size of the areas which will be subject to groundworks (re-widening entrances and junctions) during the operational phase, and due to the very low number of vehicles and machines required, and small size of the areas subject to groundworks (re-widening entrances and junctions, reinstating hardstands) during decommissioning combined with the short duration (4 months) of the decommissioning works, it is considered that the potential for significant disturbance/displacement or mortality due to moving machinery/vehicles can be excluded.

EIAR 13.3.2.3 Cumulative Impact on Invertebrates with Other Projects

EIAR 13.3.2.3.1 Introduction to the Cumulative Evaluation for Invertebrates

The Ballynalacken Windfarm Project (*whose effects range from Neutral to No Likely Impact as per Section EIAR 13.3.2.2*) is examined hereunder for potential to have cumulative effects on Invertebrates (including Marsh Fritillary) with other existing and permitted projects, and projects advanced in the planning system. These projects are referred to as 'Other Projects' herein.

A Cumulative Study Area is set out below and Other Projects located within this Study Area are identified and examined for in-combination effects with the Ballynalacken Windfarm Project. The potential for off-site and secondary consequential development is also considered.

EIAR 13.3.2.3.2 Scoping of the Cumulative Study Areas

The Cumulative Study Area comprises the construction works areas associated with the Ballynalacken Windfarm Project plus an area of 100m extending around the construction works area. It is considered that this area is sufficient to identify those Other Project or Activities which may cause cumulative effects to Marsh Fritillary with the Ballynalacken Windfarm Project.

EIAR 13.3.2.3.3 Evaluation of Cumulative Impacts

The Other Projects which occur within the Cumulative Study Area are identified in the table below and in Figure 13.9: Other Projects within the Cumulative Study Areas *(included at end of this chapter).*

The Ballynalacken Windfarm Project is examined below for cumulative effects with each of the Other Projects within the Cumulative Study Area. An evaluation of the collective cumulative impact of the Ballynalacken Windfarm Project in-combination with all the Other Projects then follows. The evaluation takes into account any existing sources of pollution or damage identified in Section EIAR 13.3.2.1.2.

Table 13-7: Evaluation of Ballynalacken Windfarm Project cumulatively with Other Projects

Other Project	Status	Evaluation of Cumulative Impact
Farranrory Wind Farm Grid Connection Ballyragget Solar Farm/Parksgrove Solar Farm Grid Connection Battery Energy Storage Developments, Moatpark	Consented	<u>No Cumulative Impacts</u>: While these grid connections are also expected to connect into the existing EirGrid Ballyragget Substation, the closest Ballynalacken Windfarm Project works relate to the Grid Connection, which is routed along the public roads and in hardcore compound and as such do not provide suitable habitat for Marsh Fritillary. Therefore, the potential for cumulative effects can be excluded.
Laois-Kilkenny Grid Reinforcement Project Moatpark-Loan 38kV Overhead Line Telecom Masts, Ballyouskill	Under construction Existing Existing	<u>No Cumulative Impact</u>: as the construction works for this grid reinforcement project will be completed prior to the commencement of the Ballynalacken Windfarm Project. In relation to the Moatpark-Loan 38kV Overhead Line and Telecom Masts in Ballyouskill, these developments already exist and no further loss of habitat is expected. Due to the small footprint of works, effects to invertebrates due to the extension of the Ballyragget Substation compound will be negligible.
Forestry Replanting	Future activity	<u>No Cumulative Impact</u>: The afforestation lands associated the felling at Ballynalacken will take place on agricultural lands remote from the Project site. It is considered that the potential for significant cumulative impacts can be excluded due to the likely separation distance between these lands and the windfarm site, and the

Other Project	**Status**	**Evaluation of Cumulative Impact**
		absence of the foodplant (DBS) for Marsh Fritillary at the Ballynalacken Windfarm Project site.
Secondary Project – Other Energy Projects connecting to Tinnalintan Substation	Future project, unknown	No Likely Cumulative Impact: No likely impacts due to the due to absence of Marsh Fritillary during surveys.

As detailed in the evaluations in the table above, the development of the Ballynalacken Windfarm Project is not likely to result in cumulative impacts with any of the Other Projects within the Cumulative Study Area. Therefore, it is evaluated that the potential for collective cumulative impacts to Invertebrates (including Marsh Fritillary) can be excluded

EIAR 13.3.3 SENSITIVE ASPECT: AMPHIBIANS & REPTILES

This detailed evaluation section for Amphibians & Reptiles is presented as follows:

- Section EIAR 13.3.3.1 - description of the baseline environment of Amphibians & Reptiles;
- Section EIAR 13.3.3.2 - evaluation of the impacts of Ballynalacken Windfarm Project on Amphibians & Reptiles;
- Section EIAR 13.3.3.3 – evaluation of cumulative impacts.

EIAR 13.3.3.1 Baseline Environment – Amphibians & Reptiles

The context, characteristics, importance and sensitivity of *Amphibians & Reptiles* are described in the subsections below. The trends and likely evolution (i.e. Do-Nothing scenario) for this Sensitive aspect are also considered.

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, Common Frog, and Common Lizard. Slow worm are not considered further here as they are a non-native species and their distribution is restricted to around the Burren with occasional records from County Galway. Likewise, Natterjack toad are not considered further due to their natural distribution restricted to a handful of coastal locations in Kerry and a few other populations as a result of deliberate introductions into suitable coastal habitats, none of which are present here.

EIAR 13.3.3.1.1 Survey Results & Occurrence of Suitable Habitat

The majority of the proposed windfarm site consists of highly modified habitat of improved agricultural grassland and non-native conifer plantation, limiting its potential suitability for Smooth Newt, Common Frog and Common Lizard. 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 2021, 2022, 2023 and 2024 resulted in no sightings of amphibians or reptiles at the proposed Ballynalacken Windfarm site. However, according to the NBDC records relating to OS grid S46, S47, S55, S56 and S57; 61 sightings for Common Frog (*Rana temporaria*) and 13 sightings of Smooth Newt (*Lissotriton vulgaris)* have been recorded. One sighting of Common Lizard *(Zootoca vivipara)* was recorded. The most recent record for Smooth Newt was recorded in 2023, the most recent sighting of Common Frog was recorded in 2023. The most recent sighting of Common Lizard was recorded in 2011.

Common Frog, Common Lizard and Common Newt are brought forward for further evaluation as key biodiversity receptors.

EIAR 13.3.3.1.2 Existing Sources of Impacts to Amphibians & Reptiles

The occurrence of existing pollution or environmental damage in the areas on or around the location of the Project have also been considered, and no existing pollution or damage to Amphibians & Reptiles is taking place at the Project site.

EIAR 13.3.3.1.3 Importance of Amphibians & Reptiles & Sensitivity to Change

Importance: All amphibian and reptile species in Ireland are protected under the Wildlife Act (1976, amended 2000). Due to the widespread distribution of these species where suitable habitat is available, all amphibians and reptiles present are evaluated as of Local Importance (Lower Value).

Smooth Newt is the only species of tailed amphibian found in Ireland. While commonly encountered near water bodies, adult newts are terrestrial, only returning to water bodies to breed. They tend to prefer habitats that offer protection from desiccation, such as long grass, woodland, and scrubland. Newts will over-winter in woodpiles or rotting logs, which offer them some protection from the elements. Smooth newts are protected in Ireland under Schedule 5 of the Wildlife Act, 1976. In addition to protection under the Wildlife Act, the species is also afforded additional protection under Appendix III of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1982).

Common Lizard is one of only three amphibians found in Ireland. It is protected under the Wildlife Act. They widespread throughout Ireland, with recent records from all counties, bar Laois and Westmeath (Meehan, 2013). The species is commonly associated with coastal and heathland habitats. Common Lizard require good habitat structure with open patches for basking and foraging and areas of cover for protection from predators (Beebee & Griffiths, 2000). They feed on a wide range of invertebrates (King *et al.* 2011).

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 on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC), meaning that the removal of this species from the wild is restricted by European law. It is a widespread and abundant species occurring in a broad range of habitats throughout the country. Adults congregate to spawn in ponds and ditches in the spring. Eggs develop into tadpoles as water temperature rises and following metamorphosis young froglets emerge onto land in early summer. These young animals are particularly vulnerable to predation. They spend 2-3 years on land, feeding on terrestrial invertebrates, before returning to freshwater to breed. A life expectancy of 3-4 years would be typical.

Sensitivity to Change: Generally, 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

Excluding habitat, the key factors affecting Newt presence appear to be the presence of fish, frogs and carnivorous birds. Suitable refuges are also important. Logs or tree stumps appear to be a highly significant factor in site preference (O’Neill *et al*., 2004), whilst the increasing percentage cover of submerged vegetation is associated with the declining probability of newt presence (O'Neil *et al*., 2004). Smooth newts will co-habit with the common frog and will predate tadpoles as a source of food. The presence of frogs may therefore be positively correlated with Newt presence. In contrast, fish predate Newt eggs and larvae, so their presence is likely to be inversely correlated with newt presence. However, Newts have been recorded in lakes which contain fish. One theory explaining their presence in lakes is that they use dense vegetation such as Reed Canary-grass (*Phalaris arundinacea*) and Bulrush (*Typha latifolia*) around lake margins to act as a refuge from predating fish (Meehan, 2013). 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 Lizard

Common Lizard are widely distributed across Europe with no evidence of a significant decline (King *et al.* 2011). Common Lizards have a long active season in Ireland, with emergence form hibernation in March and autumn records as late as October (Marnell, 2002; Meehan, 2013). Factors that may affect Common Lizards include habitat loss and fragmentation, and predation from many predators including Kestrels, stoats, foxes and cats (King *et al.* 2011).

Common Frog

The 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, 2019).

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*. 2013a). However, it should be noted that any area may be suitable for Frogs outside the breeding season as no habitats appear to be avoided. See Reid *et al*. (2013a) for more details. Reid *et al*., (2014) concluded that the Common Frog appears largely unaffected in Ireland by pollution and disturbance. They also noted that 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, 2019).

EIAR 13.3.3.1.4 Evolution of the Baseline Environment (the 'Do-Nothing' scenario)

Trends in Key Indicators over time: 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 the Irish Republic (Buckley, 2012).

Although locally distributed, the species can be abundant where it occurs (NPWS, 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 Lizard are widely distributed across Europe and are present throughout much of Ireland with no evidence of a significant decline (King *et al.* 2011). There is no population estimate available for Ireland and therefore, there is no evidence to illustrate the current population status.

The **Common Frog** is a widespread and very abundant species in Ireland. The number of adults (c. 165M) 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) (Reid *et al*. 2013a, 2013b, NPWS, 2019). 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 (Reid *et al*. 2013; NPWS, 2019). Its conservation status is classified as least concern in a European, Irish and Global context (King *et al*. 2011).

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 phase.

Thresholds/Limits: No thresholds/limits are applicable for these species as none of them are present as a significant population or numbers in relation to national distribution or population numbers.

Drivers of Change: The main drivers of change for Reptiles and Amphibians result from agricultural improvements and habitat loss/change resulting in the loss of habitat both locally and within a wider landscape. There are no current policies or initiatives that are likely to result in significant land-use change and therefore habitats prior to and during construction, operation and decommissioning of the proposed Ballynalacken Windfarm Project. Climate change with potentially warmer wetter winters and/or drier and hotter spring and summers may result in droughts and potentially reduce the availability of suitable habitat for Amphibians, with drier Spring/Summers potential favouring Reptiles, however, any such effects would be unlikely to occur prior to construction activities commencing.

EIAR 13.3.3.2 Impact Evaluation – Amphibians & Reptiles

This Section comprises an evaluation of the likely significant impacts of the proposed Ballynalacken Windfarm Project on the receiving environment. Moderate, Slight, Imperceptible and Neutral Impacts are also taken into consideration.

The impacts are presented/evaluated as follows:

a) Significant Impacts which are likely or have potential to occur, are subject to detailed evaluation;

b) Moderate or Slight Impacts, which are likely or have potential to occur, are subject to detailed evaluation;

c) Non-significant impacts of local concern or considered important enough to merit detailed evaluation;

d) Neutral or Imperceptible Impacts are scoped out from detailed evaluation, and a short evaluation is provided in the table below. Unlikely Impacts are also scoped out.

Table 13-8: Impacts to Amphibians & Reptiles

Likely/Potential Impact	Evaluation	
Neutral or Imperceptible Impacts, or where no impact is likely to occur – evaluation below		
Construction Phase: Loss, reduction or degradation of foraging and breeding habitat	Imperceptible: The habitats at the Ballynalacken Windfarm Project site are predominately of low suitability to amphibians and reptiles, and this is reflected in the absence of any records of these species during site surveys. Loss or reduction of suitable habitats such as scrub, and wet grassland relates to approximately 2.94ha or 5.6% of the footprint of the development. There will be no loss of wet heath habitat. Amphibians and reptiles are known to be adaptable to different habitats, and suitable habitat is abundant and widespread throughout the Ballynalacken Windfarm Project and wider area. No loss of suitable habitat at HR8. Overall, the impact to amphibians and reptiles as a result of the development will be imperceptible.	
Construction & Operation Phases: Habitat enhancement	Imperceptible (positive): The provision of new hedgerows is likely to provide habitat for Smooth Newt through the growth of long grass behind the fences, and the existing wet heath habitat will be preserved and protected during the lifetime of the windfarm and therefore will continue to provide suitable habitat for Common Lizard. The windfarm drainage network is likely to provide suitable habitat for the Common Frog. However, these measures are not likely to have a significant positive impact on local populations of amphibians and reptiles, given the absence of any records during surveys.	
Construction Phase: Physical injury/direct mortality	Imperceptible: The habitats at the Project site are predominantly of low value to amphibians and reptiles, and this is reflected in the absence of records of amphibians or reptiles during site surveys, and in the low number of records available through the NBDC historically. Therefore the potential for direct mortality or injury as a result of ground clearance and groundworks during construction are low.	
Construction Phase: Disturbance/displacement	Imperceptible: The species discussed are known to utilise a range of different habitats. As there a predicted low occurrence of species throughout the site of the Ballynalacken Windfarm Project, with most habitats at the Project site of low value to amphibians and reptiles, the potential for disturbance/displacement at construction works areas is low. Furthermore, the magnitude of disturbance or displacement effects is ameliorated by the availability of suitable habitat in the surrounding areas.	
Operation & Decommissioning Phases: Physical injury/direct mortality, disturbance or displacement	Neutral Impact: Given the predicted low occurrence of species throughout the site of the Ballynalacken Windfarm Project, the potential for mortality, injury, disturbance or displacement is low. The maintenance of the site drainage system at the windfarm site could potentially affect Common Frog, as these drains will provide suitable habitat for this species. However given that no frogs were recorded at the site during surveys, and the low number of NBDC records, numbers of frogs which may occur during the operational phase are expected to be Low. Furthermore, the management (grazing, mowing, scrub removal) of areas which may need to be re-widened during	

	the operational and decommissioning phases will prevent suitable habitat becoming established in these areas. Hardstands will be covered over during decommissioning using soils from the overburden storage areas. As these overburden storage areas occur within the bat buffer zones, their management will prevent suitable habitat becoming established in these areas. Therefore, it is unlikely that amphibians or reptiles will be significantly affected by any re-widening or decommissioning works. Displacement effects are ameliorated by the existence of suitable habitat in the surround areas.

EIAR 13.3.3.3 Cumulative Impact on Amphibians & Reptiles with Other Projects

EIAR 13.3.3.3.1 Introduction to the Cumulative Evaluation for Amphibians & Reptiles

The Ballynalacken Windfarm Project (*whose effects range from Neutral to Imperceptible (both adverse and positive), as per Section EIAR 13.3.3.2*) is examined hereunder for potential to have cumulative effects on Amphibians & Reptiles with other existing and permitted projects, and projects advanced in the planning system. These projects are referred to as 'Other Projects' herein.

A Cumulative Study Area is set out below and Other Projects located within this Study Area are identified and examined for in-combination effects with the Ballynalacken Windfarm Project. The potential for off-site and secondary consequential development is also considered.

EIAR 13.3.3.3.2 Scoping of the Cumulative Study Areas

The Cumulative Study Area comprises the construction works areas associated with the Ballynalacken Windfarm Project plus an area of 100m extending around the construction works area. It is considered that this area is sufficient to identify those Other Project or Activities which may cause cumulative effects to Amphibians & Reptiles with the Ballynalacken Windfarm Project.

EIAR 13.3.3.3.3 Evaluation of Cumulative Impacts

The Other Projects which occur within the Cumulative Study Area are identified in the table below and in Figure 13.9: Other Projects within the Cumulative Study Areas *(included at end of this chapter).*

The Ballynalacken Windfarm Project is examined below for cumulative effects with each of the Other Projects within the Cumulative Study Area. An evaluation of the collective cumulative impact of the Ballynalacken Windfarm Project in-combination with all the Other Projects then follows. The evaluation takes into account any existing sources of pollution or damage identified in Section EIAR 13.3.3.1.2.

Table 13-9: Evaluation of Ballynalacken Windfarm Project cumulatively with Other Projects

Other Project	Status	Evaluation of Cumulative impact
Farranrory Wind Farm Grid Connection Ballyragget Solar Farm/Parksgrove Solar Farm Grid Connection Battery Energy Storage Developments, Moatpark	Consented	No Cumulative Impact: While these grid connections are also expected to connect into the existing EirGrid Ballyragget Substation, the closest Ballynalacken Windfarm Project works relate to the Grid Connection, which is routed along the public roads and in hardcore compound and as such do not provide suitable habitat for amphibians or reptiles. Therefore, the potential for cumulative effects can be excluded.
Laois-Kilkenny Grid Reinforcement Project including recently consented extension to Ballyragget compound Telecom Masts, Ballyouskill Moatpark – Loan 38kV Overhead Line	Under construction Existing Existing	No Cumulative Impact as the construction works for this grid reinforcement project will be completed prior to the commencement of the Ballynalacken Windfarm Project, and the 38kV OHL and Telecom Masts already exist, and due to the negligible footprints of these utility projects.

Forestry Replanting	Future activity	No Cumulative Impact: due to the substantial separation distance between these lands and the windfarm site.
Secondary Project – Other Energy Projects connecting to Tinnalintan Substation	Potential future project	No Likely Cumulative Impacts: Possible future connections to the Tinnalintan Substation could include trench cabling or the installation of polesets in agricultural lands or under or alongside access roads. It is assumed that the construction works for the proposed Tinnalintan Substation would be completed and therefore cumulative construction impacts are not predicted. In the unlikely scenario where works do occur during the same period as the proposed development, Neutral cumulative impacts due to the scale, nature and location of the combined works in the cumulative study area.

As detailed in the evaluations in the table above, the development of the Ballynalacken Windfarm Project is not likely to result in cumulative impacts with any of the Other Projects within the Cumulative Study Area. Therefore, it is evaluated that the potential for collective cumulative impacts to Amphibians & Reptiles can be excluded.

EIAR 13.3.4 SENSITIVE ASPECT: TERRESTRIAL MAMMALS

This detailed evaluation section for Terrestrial Mammals is presented as follows:

- Section EIAR 13.3.4.1– description of the baseline environment of Terrestrial Mammals;
- Section EIAR 13.3.4.2– evaluation of the impacts of Ballynalacken Windfarm Project on Terrestrial Mammals; and
- Section EIAR 13.3.4.3 – evaluation of cumulative impacts.

EIAR 13.3.4.1 Baseline Environment – Terrestrial Mammals

The context, characteristics, importance and sensitivity of *Terrestrial Mammals* are described in the subsections below. The trends and likely evolution (i.e. Do-Nothing scenario) for this Sensitive aspect are also considered.

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

Mammal surveys were undertaken in June and December 2021 and January and November 2022 and August 2023 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 2005). Otter surveys were undertaken in April 2022 and August 2023 to assess for the presence of Otter while also recording secondary Otter evidence (e.g. holts) (NRA, 2005). Camera traps were also deployed throughout the site in June 2021 and January, November 2022.

Records from the National Biodiversity Database Centre show the presence of the following mammals recorded within the site of the proposed Ballynalacken Windfarm Project:

- S47: Otter (*Lutra lutra*) Pine Marten (*Martes martes*), Badger (*Meles meles*), Red Squirrel (*Sciurus vulgaris*), Irish Hare (*Lepus timidus* subsp. *hibernicus*), Red Fox (*Vulpes vulpes*), Wood Mouse (*Apodemus sylvaticus*), Hedgehog (*Erinaceus europaeus*) and Pygmy Shrew (*Sorex minutus*);
- S46: Otter, Pine Marten, Badger, Pygmy Shrew, Red Squirrel, Hedgehog, Irish Hare, Red Fox, Wood Mouse;
- S55: Otter, Pine Marten, Badger, Pygmy Shrew, Red Squirrel, Hedgehog, Irish Hare, Red Fox, Wood Mouse;
- S56: Otter, Badger, Pygmy Shrew, Red Squirrel, Pine Marten, Red Fox, Irish Hare, Hedgehog and Irish Stoat (*Mustela erminea* subsp. *hibernica*) and;
- S57: Otter, Pine Marten, Badger, Pygmy Shrew, Red Squirrel, Hedgehog, Irish Hare, Red Fox, Wood Mouse and Irish Stoat.

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 the following OS grids:

- S46: American Mink *(Mustela vison),* Brown Rat *(Rattus norvegicus)*, Sika Deer *(Cervus nippon),* Grey Squirrel *(Sciurus carolinensis)*;
- S47: American Mink;
- S55: Grey Squirrel, American Mink, Brown Rat;
- S56: American Mink, Grey Squirrel and Brown Rat and;
- S57: Grey Squirrel, American Mink, Brown Rat, Fallow Deer (*Dama dama*).

'Medium Impact Invasive Species' in the NBDC recorded in the following OS grids include:

- S46: Bank Vole*, European* Rabbit;
- S47: Greater White-toothed Shrew *(Crocidura russula),* European Rabbit (*Oryctolagus cuniculus*), Bank Vole (*Myodes glareolus*);
- S55: Feral Ferrett (*Mustela furo*), Bank Vole, European Rabbit*,* Greater White-toothed Shrew;
- S56: European Rabbit and;
- S57: Bank Vole, European Rabbit, Greater White-toothed Shrew, House Mouse (*Mus musculus*).

The River Barrow and River Nore SAC (site code: 002162), 1.6km from the nearest windfarm infrastructure, 74m from the nearest part of the grid connection, and c.215m from the Blade Transfer Area at HR8 is designated for Otter. While evidence of Otter was recorded during baseline surveys, no active breeding or resting sites for Otter (couches and/or holts) were recorded within the study area.

The haul route works at HR2, HR3 and HR4 and HR6 will take place within or in close proximity to the SAC boundary. However, all works will be on the public road corridor which is a national route. No works associated with HR2, HR3, HR4 or HR6 will occur on adjacent private lands.

Baseline surveys for the proposed Ballynalacken Windfarm Project also recorded evidence of Badger, Pine Marten, Stoat, Red Squirrel, Hedgehog and Red Fox within the study area.

EIAR 13.3.4.1.1 Survey Results & Occurrence of Suitable Habitat for Terrestrial Mammals

- **Otter (Lutra lutra):**

According to the 2009 NPWS ‘The Otter in Ireland’ information leaflet, Otters have two basic requirements: aquatic prey and safe refuges where they can rest. In general, healthy otter populations can be expected along clean rivers and lakes, where fish and other prey are abundant, and where the adjacent habitat offers plenty of cover. Otters maintain territories which vary in size from c.1-2km on lowland rivers and fish-rich lakes to 10-15km on smaller rivers and in upland areas, where food tends to be less abundant.

An otter usually maintains numerous couches and holts within its territory. Couches are above ground resting places, often on islands, or hidden in extensive reed beds, or in dense scrub, brambles or nettles. Holts are underground and can take many forms – among falls of rocks, in caves, excavated tunnels in peat banks, or within root systems of mature bank-side trees. Holts and couches may be found some distance from freshwater, but most are within the immediate area of riparian vegetation. In general, otters exploit a narrow strip of habitat at the aquatic – terrestrial interface. Otters are nocturnal carnivorous hunters remaining within a holt for most of the day. As the otter is quite elusive evidence of their droppings called spraints is one way of identifying their presence in an area. They will regularly use the same areas to deposit their spraint which will mark their territories or an area they regularly use for fishing, resting or grooming (Conserve Ireland, n.d. a).

Suitable habitat at the Ballynalacken Windfarm Project site: Areas of suitable habitat for Otter, i.e. watercourses with fisheries value, riparian habitats comprising vegetated river banks and terrestrial habitats such as broadleaved woodland which are used for foraging, breeding and resting occur in the area of the Project. The relevant habitats at the Ballynalacken Windfarm Project site are limited in terms of their size and proximity to significant watercourses and are therefore considered be of Local Importance (Higher value) to Otter, with habitats of greater value to Otter in the wider area – i.e. larger streams and rivers, including the Owveg River and Castlecomer Stream to the north and southeast of the windfarm site, and the River Nore to the west of the Project site. Areas of scrub and other riparian habitat are present within the wider area and are of potential value for Otter as well.

Fieldwork Results: The results of camera trap deployments in the Study Area returned no sightings of Otters, however secondary evidence was recorded during mammal and aquatic surveys; during the aquatic survey in September 2021, a couch and spraint, two regular spraint sites and crayfish remains were recorded during at the Kilcronan stream in Loughill c1.6km to the north of T12. These records were located just before the stream feeds into the River Barrow and River Nore SAC; during a mammal survey in December 2021, an Otter spraint was recorded within the Biodiversity Protection Area c.248m to the west of the windfarm access road between T9 and T10; during a mammal survey in January 2022 (two spraints were recorded to the west of the L5840 local road - one in a field 201m to the southwest of T12, while another was recorded in a field 292m to the northwest of T12.

Three watercourses were chosen for the Otter surveys based on their crossing with a project element (Cloghnagh (EPA Code: 15C04), Rathduff_15 (EPA Code: 15R24) two locations). **Otter Transects yielded no sightings along these watercourses from crossings W1, W2 or W3.** Based on the secondary evidence recorded, additional Otter surveys were carried out in March 2025 upstream and downstream of the crossing point of a wet drainage channel close to the Biodiversity Protection Area at D4 and along the Kilcronan stream c.320m to the east of T12 - no sightings or evidence of holts or couching sites were recorded.

NBDC Records: There are 53 records for Otter sightings in the National Biodiversity Data Centre's 10km square grid references (S47, S46, S55, S56 and S57) within which the works associated with the Ballynalacken Windfarm Project are located. The last recorded sighting from this record is from 11/01/23.

- **Badger (Meles meles):**

The Badger is relatively common and widespread throughout most of the country. Badgers are omnivorous, feeding on insects, small mammals, grains and wild fruits–- but the main component of their diet is earthworms. Consequently, their density is often higher in landscapes of agricultural pasturelands and lower in areas where habitats provide poorer food supply, such as bogs, moors and upland areas. Badgers live in social groups, usually comprised of between two and six adults and their young. Each group defends territory, which varies in size between 25 and 200ha (with mean territory size of c.80ha). The average density of Badgers in the country is one social group per 2km but in many lowland areas is often as much as one or more social groups per square kilometre.

Badgers create burrows (known as setts); larger setts may possess very extensive tunnel systems with many entrances and underground chambers. There may be a number of setts within a group's territory, varying in size, complexity and use. Usually, there is just one principal sett (the 'main' sett), which is generally used for breeding and is inhabited by Badgers throughout the year. The most frequent location of Badger setts in the Irish countryside is within or close to hedgerows and treelines, as these provide cover and safety from disturbance from agricultural and other activities. Setts are also frequently located in deciduous woodlands and areas of scrub, and they do occur in urban areas as well as in the open countryside. Cubs are born (litters consist of two to four cubs) towards the end of January and through February, emerging above ground in April or May.

Badgers are largely nocturnal, generally emerging at dusk and remaining active above ground until dawn. In summer time they occasionally become active before dark (Conserve Ireland, n.d. b).

Suitable habitat for Badger is abundant in the Study Area, this includes hedgerows and treelines (WL1 and WL2), and areas of mixed woodlands (e.g. WD3) present in the wider area but not within the Study Area, which are near farmland or open habitats (e.g. GA1, GS3). Areas of conifer plantation (WD4) are of lesser value to badgers, depending upon the density of the plantation and consequent presence or otherwise of an established woodland ground flora, due to providing limited foraging habitat but may be utilised for sett establishment. Although unlikely habitat for a Badger sett, Setts have been documented inside forestry plantations in Ireland and cannot be ruled out entirely.

The habitats at the Ballynalacken Windfarm Project site are considered be of Local Importance (Higher value) to Badger with habitats of similar, Local Importance (Higher value), in the wider area.

Fieldwork Results: Evidence of the presence of Badger was identified during the walkover survey. Badger droppings were recorded during the mammal survey in conifer plantation habitat (WD4) within the red line boundary of the Ballynalacken Windfarm. Badger hair was also recorded adjacent to a track leading to hedgerow/scrub habitat located ca1.7km to the northeast of T12 outside the forestry located North-East of the Met Mast location. No badger setts were recorded during the mammal walkover surveys in 2022 and 2023.

Camera traps were also deployed in 15 locations in June 2021 and January 2022 and November 2022. The results of these surveys and camera trap deployments returned one sighting of Badger. This was recorded by CT8 in November 2022. Secondary evidence was recorded offsite at two locations. One record of hair on barbed wire and slight track leading into forestry located over 1.7km Northeast of T12, and a scatt record was documented within the conifer forestry bordering the proposed Borrow Pit No.2 location.

NBDC Records: There are 581 records of Eurasian Badger in the NBDC OS grids within which the proposed Ballynalacken Windfarm Project is located (S46, S47, S55, S56, S57). The last recorded sighting was 17/06/2018 within S47 and 27/03/2023 for S55.

- **Irish Hare (Lepus timidus hibernicus):**

The Irish hare is a subspecies of mountain hare (*Lepus timidus*) which colonised Ireland during the last ice age (Montgomery *et al*. 2014; Reid, 2018). It is found from sea level, through lowland grasslands and forest, up to mountain summits covered by blanket bog. It feeds predominately on grasses, such as Italian rye-grass (*Lolium perenne*) in agricultural systems, or a range of native grasses in natural or unimproved grasslands but can also browse harder woody material such as heather (*Calluna*) species if grasses and herbs are limited. Irish hares are usually found in pastures (e.g. GA1) and peatland areas (e.g. PB2) (Reid *et al*. 2007). Irish hares do not use dens but will make forms in sheltered locations. Forms are shallow depressions, often in dense vegetation such as rushes, heather, tall grass and even marram grass, and occasionally in hedgerows. Leverets are born above ground and hidden in thick vegetation (Vincent Wildlife Trust, n.d. a).

The productivity of agricultural grasslands allows the Irish hare to have comparatively small home ranges (less than 50 hectares) compared to the other subspecies who range further (up to 200 hectares) in less productive environments. Irish Hare have a bimodal activity patter, being largely crepuscular (active at dawn and dusk) (McGowan *et al*., 2019).

Suitable habitats: Pastures comprise a large area of the site of the proposed Ballynalacken Windfarm, providing suitable habitat for the species. Agricultural grasslands also occur extensively within the wider surrounding area of the Project site. The habitats at the Ballynalacken Windfarm Project site are considered to be of Local Importance (Higher value) to Irish Hare with habitats of similar, Local Importance (Higher value), in the wider area.

Fieldwork Results: Irish Hare individuals were not identified during the field surveys and camera traps deployed throughout the site did not capture evidence of Irish Hare using the Study Area.

NBDC Records: There are 33 sightings of Irish Hare recorded in the NBDC OS grids within which the proposed Ballynalacken Windfarm Project is located. The most recent recorded sighting is from 11/06/2022.

- **Pine Marten (*Martes martes*):**

Pine marten utilise woodland habitats, preferably large-scale deciduous woodland, but they will also maintain populations in small pockets of deciduous woodland and are found in commercially managed coniferous plantations (pinemarten.ie, n.d.). They are also recorded in scrub, rocky areas and crags; in fact, any place that provides shelter and food. Pine martens prefer to rest and breed above ground, usually in tree cavities, but where these are not available, they will use a variety of sites such as rock crevices, burrows, buildings, nests, squirrel dreys and log piles. Although a carnivore, the pine marten has a varied diet and eats both animal and plant material, including small mammals, birds, eggs, amphibians, invertebrates, berries, fruits, fungi and carrion.

The pine marten is a territorial animal. The size of its territory can range from 50-400 hectares, with some overlap between neighbouring individuals. Pine martens are solitary animals and adult animals avoid contact with each other throughout most of the year. They are active during the daylight hours of spring and summer, when they breed. In autumn and winter they are mostly active at night, and in winter they spend most of their time in resting and den sites. Suitable habitat exists on Site for Pine Marten, i.e. forests of coniferous (WD4) or mixed tree species (e.g. WD3). The habitats at the Ballynalacken Windfarm Project site are considered to be of Local Importance (Higher value) to Pine Marten with habitats of similar, Local Importance (Higher value), in the wider area.

Fieldwork Results: Pine Marten activity was recorded by camera traps (CT2 2021; CT8 and CT9 2022) in the proposed Ballynalacken windfarm. No sightings or evidence of Pine Marten was recorded in August 2023.

There are 41 sightings of Pine Marten recorded in the NBDC OS grids within which the proposed Ballynalacken Windfarm Project is located. The most recent recorded sighting is from 26/04/2023.

- **Irish Stoat (Mustela erminea hibernica):**

Irish stoats have adapted to a large number of different habitat types but prefer an area that provides some cover. They can be found in woodlands, hedgerows, marsh, heather, lowland farms, moorland, coastal areas and on small mountains. They have a particular preference for open woodlands and rocky scrub covered areas or if found on agricultural lands they will be located near any stone walls, ditches or hedgerows. Stoat dens can be created in a number of different locations including abandoned rabbit burrows, hollows in large trees, rock crevices and even in unused buildings. Each stoat's home range will vary between 20ha and 100ha, depending on the availability of food sources. Each territory will have a number of different dens which will be visited regularly for rest and sleep as it may take a stoat several days to cover its entire range in search of food. Irish stoats generally prey on rodents, birds, rabbits and insects. While they are largely carnivorous, they will supplement their diets with berries and fruits depending on their seasonal availability. Stoats are not strictly nocturnal, but the majority of their hunting is carried out at night while they are more likely to be seen during the day in the summer months.

Suitable habitat within the Ballynalacken Windfarm Project site comprises hedgerows and treelines (WL1 and WL2) areas of mixed woodlands (e.g. WD3), farmland and open habitats (e.g. GA1, GS3). The habitats at the Ballynalacken Windfarm Project site are considered to be of Local Importance (Higher value) to Irish Stoat with habitats of similar, Local Importance (Higher value), in the wider area.

Fieldwork Results: Secondary evidence (scats) of Irish Stoat was recorded during the mammal survey undertaken in December 2021, three individual scats were recorded within the Site boundary, two scats were recorded 200m and 152m West of T8, and scat was recorded 105m Southwest of T10. Evidence of Stoat was also recorded in November 2022, a hole was recorded 216m south of the Cable Link.

NBDC Records: Stoat was recorded once in the NBDC OS grid S57 and twice in S56 within which the Ballynalacken Windfarm site is located. The most recent of these being 28/01/2014 in the S56 OS grid square.

- **Red Squirrel (*Sciurus vulgaris*):**

The Red Squirrel prefer coniferous forests but can utilise habitats comprising mixed deciduous and coniferous woodlands if these provide enough of their food source which is mainly composed of seeds (Conserve Ireland, n.d. d). Red squirrels will build nests attached to any tree species including Scots pine, spruce and fir in Irish woodlands. They may also use the hollows of older tree trunks and larger branches. The Red Squirrel requires a medium to large concentration of trees and It has been estimated that an individual red squirrel's requirements are in the order of three to fifty hectares depending on the forest type used.

Red squirrels are largely vegetarian feeding on a wide selection of fruits, seeds and berries which may be available in a forest. In particular they will consume large daily quantities of pine and spruce seeds, acorns, berries, fungi, tree sap and bark depending on their seasonal availability.

Suitable woodland habitat (e.g. WD4) occurs at the proposed Ballynalacken Windfarm site. The habitats at the Ballynalacken Windfarm Project site are considered to be of Local Importance (Higher value) to Red Squirrel with habitats of similar, Local Importance (Higher value), in the wider area.

Fieldwork Results: Potential secondary evidence (food signs) was recorded at one location during mammal surveys in December 2021, located 153m West of T8. No evidence of Red Squirrel was captured as a result of camera trap deployment.

NBDC Records: There are 41 sightings of Red Squirrel recorded in the NBDC OS grids within which the proposed Ballynalacken Windfarm Project is located. The most recent recorded sighting is from 18/01/2023.

- **Hedgehog (Erinaceous europapaeus):**

Hedgehogs are found all over the country except in wetlands, karst and mountain regions. They favour habitats that have plenty of diversity with mixtures of long and short grass, hedgerows, bushes and trees that provide food, shelter and wildlife corridors. Hedgehogs are solitary, nocturnal animals, emerging after dark to forage for food. The hedgehog diet is composed largely of insects, particularly beetles and caterpillars as well as other invertebrates such as millipedes, worms and slugs. They will opportunistically take eggs, frogs, lizards and carrion.

Hedgehog are not territorial but will forage within a large home range of approximately 10ha for females and 32ha for males. During the active season from spring to autumn, each one will keep several temporary nests where they rest during the day. When the temperatures drop from about November to March, they hibernate in nests carefully constructed of dead leaves under brambles, log piles or garden sheds. In mild winters, hedgehogs will wake up and look for food and may even move nests.

Suitable habitat for hedgehogs exists at the border areas of scrub (WS1), open grasslands (e.g. GA1) and hedgerows (WL1). The habitats at the Ballynalacken Windfarm Project site are considered to be of Local Importance (Higher value) to Hedgehog with habitats of similar, Local Importance (Higher value), in the wider area.

Fieldwork Results: Secondary evidence of hedgehog (scats) was recorded during mammal surveys in January 2022, located 186m west of T12 in the same field as two of the otter spraints. No evidence of Hedgehogs was captured as a result of camera trap deployment.

NBDC Records: According to the NBDC records, 152 hedgehog sightings have been recorded in the Study Area; the most recent being 20/09/2023.

- **Other Mammals**

Red Fox *(Vulpes vulpes)*:

Foxes are highly adaptive mammals that can inhabit any type of land area, from woodland (e.g. WD4) to urban areas (e.g. BL3). The red fox's success in spreading throughout Ireland is thanks partially to its diet – it is an omnivore, meaning it eats a wide variety of food including both plants and animals. Red foxes prey on small mammals like rabbits, mice and voles, birds and their eggs, and also invertebrates like worms and insects. In addition, they will eat grain, carrion (dead animals), and fruit where available. Suitable habitat therefore occurs throughout the Ballynalacken Windfarm Project site and the surrounding areas.

Secondary evidence of Red Fox was identified during the field surveys in the form of a mammal run in 2022, located 84m north of the Ballyragget substation and scat and carcass remains in 2021. Three sightings of Red Fox scat were recorded in 2021, located 184m north of T7, 232m southwest of T12 and within the Hardcore area located at the Met Mast compound to the east of the main Ballynalacken windfarm site. Camera traps deployed throughout the Site also captured evidence of Red Fox (CT1 2021, CT4 January 2022 and CT4, CT5, CT8 and CT9 November 2022). A possible Red Fox den was recorded 315m west of the Internal Windfarm Cabling between T9 and T10.

There are 37 sightings of Red Fox recorded in the NBDC OS grids within which the proposed Ballynalacken Windfarm Project is located. The most recent recorded sighting is from 01/04/2023.

Pygmy Shrew *(Sorex minutus):*

The pygmy shrew is common throughout mainland Ireland. It has a preference for habitat rich in ground cover, which offers ideal foraging grounds and protection from predators (mainly birds of prey). These habitats include hedgerows, grasslands, woodlands and peatlands. Pygmy shrew actively hunt invertebrates, predominantly beetles, day and night (Vincent Wildlife Trust, n.d. b).

Suitable habitat for Pygmy Shrew exists on Site, i.e. coniferous plantation (WD4) or mixed woodland (e.g. WD3) and open grasslands (e.g. GA1). No evidence of Pygmy Shrew was observed on the site nor were any captured as a result of camera trap deployment.

Pygmy Shrews were recorded 15 times within the NBDC 10km grid squares covering the Proposed Ballynalacken Windfarm site.

Red Deer *(Cervus elaphus)*:

Red deer are a herd deer but group size is influenced by habitat, they form larger herds when living in open country with smaller groups in woodland areas.

Suitable habitat for Red Deer exists at woodlands (e.g. WD3, WD4) and open grasslands (e.g. GA1). No evidence of Red Deer was observed on the site nor were any captured as a result of camera trap deployment. Red Deer were not recorded within the NBDC 10km grid square covering the Proposed Ballynalacken Windfarm site.

Invasive Mammal Species:

Rabbit was not sighted during mammal walkover surveys undertaken. Evidence of Rabbit was recorded in the form of burrows, one located 38m West of windfarm access road between T9 and T10, the second located to the Northeast of the windfarm site. Brown Rat was recorded on one date during camera trap surveys at one deployment location (CT4), located 200m south of proposed construction works for the substation internal cable link and 690m west of the control building. No other invasive mammal species were recorded during mammal surveys or on camera traps on site, however invasive mammal species such as American Mink, Bank Vole and Greater White-toothed Shrew have been recorded in the area of the proposed windfarm on the

NBDC database (see Appendix 13.1**)**. As the above are classified as invasive species no importance evaluation is assigned to this species and does not require further evaluation.

EIAR 13.3.4.1.2 Existing Sources of Impacts to Terrestrial Mammals

The occurrence of existing pollution or environmental damage in the areas on or around the location of the Project have also been considered, and it is considered that the perennial nature of the watercourses and drains on and in the vicinity of the windfarm site and along the Internal Cable Link reduce the value of habitats for Otter, while the intensity of agricultural landuse and management of the commercial forestry plantations is a source of habitat loss/deterioration, disturbance and displacement to Terrestrial Mammals in the area.

EIAR Figures: (included at the end of this Chapter)

Figure 13.3: Terrestrial Mammals

EIAR Appendices: (included at the end of this Chapter)

Appendix 13.2: Mammal Survey Results

EIAR 13.3.4.1.3 Importance of Terrestrial Mammals & Sensitivity to Change

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, 2019) Red List: Otter, Badger, Irish Hare, Pine Marten, Red Squirrel 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 on the IUCN Red List.

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) indicate 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.

Otters are protected under the Wildlife Acts (Wildlife Act 1976; Wildlife Amendment Act, 2000) and are listed on Annex II and IV of the EU Habitats Directive. Otter is also listed as a qualifying interest of the River Barrow and River Nore SAC and, hence, is evaluated as of International Importance, which is equivalent to a **Very High sensitivity** rating.

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 (NPWS, 2019b).

Badgers are legally protected under the Wildlife Acts (Wildlife Act 1976; Wildlife Amendment Act, 2000). Local populations of Badger are evaluated as Local Importance (Higher Value), which is equivalent to **Low sensitivity**.

Badgers are susceptible to anthropogenic threats, such as illegal persecution (snaring, hunting with dogs, disturbance of setts) and road casualties (NPWS, 2019). 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 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 30-50m of sett location due to the potential for inadvertent disturbance and/or mortality with distances increasing to 150m if activities such as piling or blasting are proposed. Habitat loss greater than 25% of any social group's territory size is deemed as significant. 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.

Irish hare are protected under the Wildlife Acts (Wildlife Act 1976; Wildlife Amendment Act, 2000). However, it is still considered to be widespread and common in Ireland. 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 (NPWS, 2005), aiming to maintain and increase the area and quality of suitable Hare habitat throughout the island (Reid & Montgomery, 2007). Local populations of Irish Hare are evaluated as of Local Importance (Higher Value), which is equivalent to **Low sensitivity**.

Agricultural intensification is leading to some reduction in habitat quality along with habitat loss and fragmentation leading to isolation and inbreeding, 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 mechanised grass cutting, invasive species (interbreeding with Brown Hare), roads and motorways, urbanised areas/human habitation, and hunting. Climate change is also identified as a threat, affecting competitive relationships between Irish Hare and Brown Hare species.

Pine Marten are protected under the Wildlife Acts (Wildlife Act 1976; Wildlife Amendment Act, 2000) 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.

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. Pine Marten are susceptible to habitat loss and human persecution in Ireland (O'Mahoney *et al*., 2012).

Irish Stoat are protected under the Wildlife Acts (Wildlife Act 1976; Wildlife Amendment Act, 2000). It is considered to be underrepresented in research to date (Marnell, 2019). Local populations of Irish Stoat are evaluated as Local Importance (Higher Value), which is equivalent to **Low sensitivity**, due to their protection under the Wildlife Act.

The main threat to Irish Stoat populations is local persecution by gamekeepers due to the perceived threat to game birds.

Red squirrels are protected under the Wildlife Acts (Wildlife Act 1976; Wildlife Amendment Act, 2000). 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.

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 (NPWS, 2019b).

West European Hedgehog are protected under Appendix III of The Berne Convention and under the Wildlife Act (1976) and Wildlife (Amendment) Act 2000. Local populations of Hedgehog are evaluated as Local Importance (Higher Value), which is equivalent to **Low sensitivity**, due to their protection under the Wildlife Act.

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).

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.

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

Pygmy Shrew is protected under the Wildlife Act (1976) and Wildlife (Amendment) Act 2000 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 is protected under the Wildlife Act (1976) and Wildlife (Amendment) Acts (2000) 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 Red Deer have been recorded as a result of surveys or on NBDC since one sighting in 2011, it is therefore evaluated as Local Importance (lower Value) and does not require further evaluation.

In summary, Terrestrial Mammals which are brought forward for further evaluation include Otter, Badger, Red Squirrel, Pine Marten, Irish Stoat, Irish Hare and Hedgehog.

EIAR 13.3.4.1.4 Evolution of the Baseline Environment (the 'Do-Nothing' scenario)

Trends in Key Indicators over time: 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'.

Otter:

Otters were 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*., 2013c).

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. A total of 44 SACs have been designated for otter comprising of river channels, coastline habitats, lakes and blanket bog systems (NPWS, 2019). The overall status of otter is considered to be favourable (NPWS, 2019).

Otter is dependant on healthy food supplies of fish and molluscs to survive, and as such the same threats to Otter can be inferred from the threats to the aquatics species (See Section EIAR 13.3.7.1.9); two of the main threats facing Otter relate to landuse management and climate change.

Agriculture and Commercial forestry landuse activities and management, including the various sources of fertilizers and other pollutants associated with these land uses in Ireland, are contributing to the decline in water quality and spawning habitat, which in turn can lead to a reduction of distribution and abundance of aquatic prey item species for Otter within downstream watercourses.

Climate change's primary impact on Otter is the increased draught and flood extremes which could result in bank erosion and vegetation loss, increasing the risk of loss of holts and foraging habitats, and reductions in the availability of their prey item species. Drivers of this threat are tied to greenhouse gas emissions and continued reliance on fossil fuels. These drivers are projected to remain sources for climate change pressures and threats to aquatics species for the foreseeable future as most developed nations are not on target to achieve their carbon emissions targets by 2030. The current projections of the climate emergency support the evaluation that Otter habitat is likely to be adversely affected by this driver in a 'Do-Nothing' Scenario.

Badger:

Badgers were previously assessed as 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 the Republic of Ireland as 84,000 (Sleeman *et al*. 2009) and in Northern Ireland as 33,500 (Reid *et al*. 2008).

The primary threat to Badger is the persecution regarding the spread of TB and poaching/Culls being conducted to manage their numbers. Badger will also utilize habitat within the conifer forestry to some extent. This forestry is scheduled for felling over the next 25 years. This habitat loss would impact this species at a Low magnitude and as such, at Low significance due to the low value of this habitat to Badger in the 'Do-Nothing' scenario.

Irish Hare:

Comprehensive distribution and abundance data is available for this species. The national Irish Hare population was estimated at 223,000 (111,000–449,000) individual hares (NPWS, 2019). Irish hare was previously assessed as least concern (Marnell *et al*. 2019). Its widespread distribution and large population justify retention of this assessment of least concern.

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).

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 (estimated at c. 3000 in 2016, O'Mahony, 2016) 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 Squirrel utilise suitable habitat within the conifer forestry. This forestry is scheduled for felling over the next 25 years. This habitat loss would impact these species of a moderate magnitude and as such, a low significance due to the low value of this habitat to Red Squirrel in the 'Do-Nothing' scenario.

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 hedgehog 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).

It is assumed in this report that the baseline environment in relation to Terrestrial 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 phase.

Thresholds/Limits: No thresholds/limits are applicable for these species as none are present as a significant population or numbers in relation to national distribution or population numbers.

The main **drivers of change** for mammals result from agricultural improvements and habitat loss/change as well as potential pollution events from agricultural activities and commercial forestry resulting in habitat loss. There are no current policies or initiatives that are likely to result in significant land-use change and therefore habitats prior to and during construction, operation and decommissioning of the proposed Ballynalacken Windfarm Project. The instigation of large scale felling of the commercial forestry in the area would, however, result in a significant change in habitat for species such as red squirrel and to a lesser extent pine marten and badger. Climate change with potentially warmer wetter winters and/or drier and hotter spring and summers may result in droughts and potentially reduce foraging habitat for otters, however, any such effects would be unlikely to occur prior to construction activities when impacts are Scoped in for this species and phase.

Otter, Badger and Hedgehog are regular victims of roadkill incidents.

EIAR 13.3.4.2 Impact Evaluation – Terrestrial Mammals

This Section comprises an evaluation of the likely significant impacts of the proposed Ballynalacken Windfarm Project on the receiving environment. Moderate, Slight, Imperceptible and Neutral Impacts are also taken into consideration.

The impacts are presented/evaluated as follows:

a) Significant Impacts which are likely or have potential to occur, are subject to detailed evaluation;

b) Moderate or Slight Impacts, which are likely or have potential to occur, are subject to detailed evaluation;

c) Non-significant impacts of local concern or considered important enough to merit detailed evaluation;

d) Neutral or Imperceptible Impacts are scoped out from detailed evaluation, and a short evaluation is provided in the table below. Unlikely Impacts are also scoped out.

Table 13-10: Impacts to Terrestrial Mammals

Likely/Potential Impact	**Evaluation**	
Moderate or Slight Impacts, which are likely or have potential to occur - see detailed evaluation		
Construction & Operational Phase: Physical Loss or degradation of suitable habitat for Otter		*Section EIAR 13.3.4.2.1*
Construction Phase: Reduction in aquatic habitat quality and availability of aquatic prey item species for Otter		*Section EIAR 13.3.4.2.2*
Construction: Mortality of Otter		*Section EIAR 13.3.4.2.3*
Construction: Disturbance or displacement of Otter		*Section EIAR 13.3.4.2.3*
Construction: Mortality, disturbance or displacement of Badger at Setts		*Section EIAR 13.3.4.2.4*
Neutral or Imperceptible Impacts, or where no impact is likely to occur – evaluation below		
Otter		
Operation and Decommissioning Phases: Loss or degradation of suitable habitat for Otter	Neutral Impact: Watercourses and drains with fisheries value, and adjacent habitat that offers plenty of cover provide suitable habitat for Otter at the Project site. However, these habitats are not extensive and are considered of low value to Otter, with more valuable habitat available in the local and wider area. No holts or couches were recorded within 300m of any of the watercourse crossing locations. No further works to watercourse or drain crossings are planned for the operational or decommissioning phases and therefore **no impacts to suitable watercourse/drain habitats will occur**. The **site drainage system will not provide fisheries habitat**, and while it may provide limited habitat for frogs, a prey item species for otter, it is considered that the windfarm site drainage network will not be an important foraging habitat for Otter in the local area –low numbers of frogs recorded during surveys and the expected predominantly dry state of the windfarm drainage network will be generally unsuitable for frogs. In addition, the bi-annual maintenance of the drainage network will involve the removal of any build-up of silt, clumps of grass or other materials such as scrub, which will consequently prevent cover establishing for Otter.	

	Therefore, it is considered that Otter are not likely to be affected by any habitat reduction/loss as a result of the management of the windfarm site drainage network. Other groundworks and vegetation management during the operational phase relates to (1) the bat buffer zones around the turbines and (2) the junctions and entrances may need to be rewidened for (infrequent) turbine component transport. These areas will be regularly maintained through scrub removal and the maintenance of a low grass sward either through mowing or grazing as appropriate to the location. These operational management practices will prevent the establishment of suitable habitat for otter, and therefore no loss of suitable habitat (i.e. cover) will occur during the operational phase. Re-widening of junctions and sites entrances and other haul route works and activities may be required during the operation (infrequently) and decommissioning phases to replace/remove turbine components. These works will occur at discrete locations, will be small scale and of brief duration, generally along or beside the public road network, no perceptible loss of habitat will occur. During the decommissioning phase, in addition to the rewidening works, the hardstands will be reinstated using soils from the overburden storage areas and adjacent drains will be filled in. As the turbine hardstands and the stored soils are located within the area of the bat buffer zones, these areas will be subject to grazing/mowing and scrub management and therefore will not provide suitable cover for otter. Therefore, therefore no loss of suitable habitat (i.e. cover) will occur during the decommissioning of the windfarm.
<u>Operation and Decommissioning Phases</u>: Mortality, disturbance or displacement of Otter	<u>No Likely Impact</u>: The presence of vehicles and personnel on the windfarm site, and therefore noise emissions, will be negligible during the operation and decommissioning phases with works mainly taking place at the turbine locations, and within bat buffer zones and at re-widening locations where suitable vegetative cover will not be allowed to establish. No works are expected to occur at the watercourse/drain crossing locations at the site. The internal windfarm cables and Internal Cable Link will be subject to annual visual inspections (by foot/vehicle), and the cables will be pulled from the ducts at cable jointing locations (all located at least 50m away from watercourse crossings) during decommissioning. In relation to the Ballynalacken Grid Connection access to joint bays along the grid connection route may be required, these joint bays are located at least 150m from the watercourse crossing along the grid connection route. Therefore, it is considered that mortality, disturbance or displacement of Otter is not likely to occur during the operation or decommissioning phases.
<u>Operation and Decommissioning Phases</u>: Reduction in Otter prey items (e.g. fish, crayfish, frogs)	<u>No Likely Impact</u>: The main source of water quality reduction relates to groundworks during the construction phase. During the operational and decommissioning phases, groundworks are limited to areas subject to rewidening, maintenance of the windfarm drainage network, and covering of hardstands and adjacent drains during decommissioning. No works will take place at watercourse crossings during the operational or decommissioning phases. As per Section EIAR 13.3.7.2, no significant impacts are likely to occur to downstream aquatic habitats or species during the operation or decommissioning phases. In addition, while there are some watercourses and drains on the windfarm site that offer suitable habitat for Otter, due to the small size of these watercourses/drains, the availability of prey item species is considered to be low (see Section EIAR 13.3.3.2). Furthermore, there is higher value habitat available for Otter in the surrounding area. Therefore, it is considered that Otter is not likely to be affected by a reduction in prey item species during the operational or decommissioning phases.
All Terrestrial Mammal Species	
<u>Construction & Operation Phases</u>: Habitat protection, creation and enhancement	<u>Not Significant (positive)</u>: The wet heath (5.51ha) at the Biodiversity Protection Area and the new and enhanced hedgerows at the windfarm site may provide suitable habitat for Otter in the form of cover/resting habitat, and suitable foraging and/or resting habitat for Badger, Irish Hare, Pine Marten, Irish Stoat and Hedgehog. This positive impact will be Not Significant to Otter, as the Biodiversity Protection Area will not provide significant cover for Otter, and will not provide a significant foraging resource.

	While these habitats may be of more value to Badger, Irish Hare, Pine Marten, Irish Stoat and Hedgehog, given their Low sensitivity and the abundance of suitable habitats on site and in the surrounding areas, this positive impact is evaluated as Not Significant. In relation to Red Squirrel, the habitat enhancements will be Neutral, given the absence of forestry or other woodland.
Badger, Irish Hare, Pine Marten, Irish Stoat, Red Squirrel, Hedgehog	
Construction Phase: Habitat loss or reduction – Badger, Irish Hare, Pine Marten, Irish Stoat, Red Squirrel, Hedgehog	Not Significant: Construction works will cause permanent and temporary losses of some suitable foraging, resting and/or breeding habitat for European Badger, Irish Hare, Pine Marten, Irish Stoat, Red Squirrel and European Hedgehog in the form of grassland GA1 (6.76ha), conifer plantation WD4 (20.7ha), scrub WS1 (0.5ha), and/or hedgerows WL1 (1.72km) and treelines WL2 (87m) under the footprint of permanent structures such as access roads, compounds, hardstanding areas, and the met mast. Additional temporary loss could also occur as a result of groundworks and temporary access roads within the construction works area boundary and at HR8. Permanent structures, such as fencing, may also dissect territories. Although suitable habitats will be lost as a result of construction, the magnitude of habitat loss will be low (1-5%) in the context of the availability of suitable habitat surrounding the works areas. The Conifer forestry which is suitable habitat but not of high value importance to any identified receptors will undergo a slightly higher magnitude (c.8%) permanent loss, in the context of c.275ha of conifer plantation along the ridgeline. It is considered that while the changes to suitable habitats will be discernible, the underlying character of suitable habitats at the site and in the immediate surrounding area will be similar to pre-development conditions. Due to the Low magnitude of habitat loss/reduction and the Low sensitivity of these mammal species, the impact is evaluated as Not Significant.
Construction Phase: Mortality, Disturbance or displacement of Irish Hare, Pine Marten, Irish Stoat, Red Squirrel or Hedgehog at breeding or resting sites	Not Significant: Due to the ephemeral/transitory use of breeding or resting sites (i.e. forms, dreys, dens, nests); with alternative sites available within a territory; and unlike Badger these species not living in large family groups any numbers of individuals affected will therefore be very small. It is expected that any impacts to Irish Hare, Pine Marten, Irish Stoat, Red Squirrel or Hedgehog will be Low. Combined with the Low Sensitivity of these species, the significance of impact will be Not Significant.
Construction Phase: Mortality, Disturbance or displacement of foraging Badger, Irish Hare, Pine Marten, Irish Stoat, Red Squirrel, Hedgehog	Neutral Impact: Baseline surveys for the proposed Ballynalacken Windfarm Project recorded low levels of evidence of Badger, Pine Marten, Irish Stoat, Red Squirrel and Hedgehog within the study area, and no evidence or sightings of Irish Hare. Furthermore, no setts, dreys, dens, nests, forms or other resting areas were recorded during the surveys. Given that (1) Badger, Irish Hare, Pine Marten, Irish Stoat, Red Squirrel and Hedgehog are expected to occur in low numbers at the Project site, (2) the fact that these species are mainly nocturnal and active and foraging at, and between, dusk and dawn, and construction phase groundworks, operating machinery, traffic and the presence of construction personnel will be mainly concentrated to daylight hours, (3) the duration of works (12-16months), and (4) taking into consideration the availability of suitable habitat in the area, combined with (5) the Low sensitivity of these species, and (6) the potential numbers of individuals affected compared to national populations, the magnitude of impact is expected to be Low. Therefore, any mortality, disturbance or displacement effects on foraging Badger, Irish Hare, Pine Marten, Irish Stoat, Red Squirrel or Hedgehog will be Not Significant. In relation to increased road traffic on the existing road network as a result of the Project, any increases in traffic during construction are not considered likely to result in increased traffic led mortality given the existing habituation of mammal species to traffic.
Operational and Decommissioning Phases: Habitat loss or reduction – Badger,	Neutral Impact: Operational phase groundworks and vegetation removal are limited to (1) site drainage network, (2) the bat buffer zones around the turbines and (3) the junctions and entrances may need to be rewidened for (infrequent) turbine component transport. During the decommissioning phase, in addition to the rewidening works, the hardstands will be

Irish Hare, Pine Marten, Irish Stoat, Red Squirrel, Hedgehog	reinstated using soils from the overburden storage areas and adjacent drains will be filled in, the decommissioning works at the turbine locations will be located within the operational-phase bat buffer zones. These areas will be regularly maintained through the removal of any build-up of silt or clumps of grass or other materials such as scrub from site drains; and through the regular removal of scrub and the maintenance of a low grass sward either through mowing or agricultural grazing as appropriate to the location within the bat buffer zones and the junction and entrance locations. These operational management practices will prevent the establishment of suitable habitat for Pine Marten, Irish Stoat, Red Squirrel and Hedgehog and consequently no habitat effects are expected to these species during the operational or decommissioning phases. In relation to Badger, Irish Hare and Hedgehog, who both utilize grassland as foraging habitat, temporary loss of habitat may occur at junction/entrance rewidening locations, while the management of the bat buffer zones will provide new foraging habitat within the forestry areas for Badger, Irish Hare and Hedgehog, however any habitat impacts (either positive or negative) will be negligible in the context of the small size of the habitats at these locations and the widespread availability of grassland habitats in the local and wider surrounding areas.
<u>Operational and Decommissioning Phases</u>: Mortality, Disturbance or displacement - Badger, Irish Hare, Pine Marten, Irish Stoat, Red Squirrel, Hedgehog	<u>Neutral Impact</u>: Given that Badger, Irish Hare, Pine Marten, Irish Stoat, Red Squirrel and Hedgehog are expected to occur in low numbers at the Project site, the fact that these species are mainly active and foraging between dusk and dawn, whereas operational and decommissioning phase works and activities will be mainly concentrated to daylight hours, with negligible levels of vehicles/personnel or machinery onsite, and taking place mainly at turbine hardstand locations, and also taking into consideration the brief duration of works at any particular location, the availability of suitable habitat in the surrounding area, combined with the Low sensitivity of these species, the magnitude of impact is expected to be Negligible. Therefore, it is considered that any mortality, disturbance or displacement effects will be Neutral.

EIAR 13.3.4.2.1 Physical Loss or degradation of suitable habitat for Otter	
Sensitive Aspect:	Terrestrial Mammals – Otter
Sensitivity:	**International Importance, Very High Sensitivity** (as per Section EIAR 13.3.4.1)
Impact Source(s)	Works in proximity to natural watercourses, works in wet drainage channels, groundworks, vegetation clearance, hedgerow removal, landuse change
Impact Pathway(s)	Land cover
Project Stage	Construction and Operation Phases

Overview of Impact (general):

All construction works and on-site watercourses and drainage features are upstream of the River Nore and Barrow SAC, with connectivity for Otter, which is a qualifying interest species of the SAC. As such, of primary concern for this impact is the loss or degradation of suitable habitat within watercourses and drainage channels.

Although not recorded within the Project construction works areas or within 300m of watercourse/drainage crossing points during mammal surveys or camera trap deployments, Otter do occur in the wider local area and there is potential for Otter to utilise habitats within and adjacent to the Ballynalacken Windfarm Project site. The nearest aquatic habitat with Otter presence was recorded within the Kilcronan stream, 1.6km North of from the closest Project element, with spraints also recorded across (west) the L5840 local road at the northern end of the windfarm site, 201m West and 292m Northwest, respectively, of T12.

Construction of windfarm roads, installation of underground cable, the construction of turbine foundation and hardstanding areas, and the implementation of bat buffer zones can cause permanent and temporary losses of suitable terrestrial and in-stream habitat at the Ballynalacken Windfarm Project site in the form of new crossing structures on headwater streams and wet drainage channels, works in wet drainage channels, removal of riparian habitat or adjacent areas of cover in woodland or along hedgerows. In addition, temporary loss could occur as a result of groundworks and the provision of temporary hardstanding areas such as at temporary construction compounds, temporary widening of junctions and entrances, although this will be insignificant as much of these temporary losses will be remote from watercourses. Permanent fencing around the above-ground operational footprint of the development may also dissect territories.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

The Cloghnagh 1st order stream rises on the windfarm site and a wet drainage channel which drains into this stream also interacts with windfarm infrastructure. A second wet channel drains into the Ballymartin_15 1st order stream which in turn drains into the Cloghnagh. The southern part of the windfarm site drains into the Cloghnagh catchment, which in turn drains into the Dinin River. Due to the small size of the watercourses and drainage features in the Cloghnagh catchment at the windfarm site, none were of high fisheries value to Otter.

Cloghnagh stream

W1 – Cloghnagh FW1, **1st order stream**

Description of Works: Bottomless precast concrete culvert to be installed in watercourse - Windfarm road and cables installed over culvert.

Suitability of adjacent landcover and description of cover loss: Forestry surrounding this water feature. 1.48km downstream was assessed as Moderate-quality salmonid habitat present (reduced by low flows); no suitability for lamprey; European eel & stone loach recorded via electro-fishing; Q3 (poor status) water quality; no other aquatic species or habitats of high conservation value. This crossing is significantly upstream of the River Nore and Barrow SAC (c. 5.67km). No value as foraging habitat or terrestrial habitat

Extent of habitat affected: Temporary loss of 5m of FW1 habitat.

Magnitude of Impact: Low

D1 - Drainage ditch FW4, upstream of Cloghnagh_010 1st order stream

Description of Works: New crossing structure (bottomless precast concrete) and instream works in the wet drainage channel to redirect drainage ditch around hardstand area.

Suitability of adjacent landcover and description of cover loss: Surrounding forestry on both sides. No value as foraging habitat or terrestrial habitat

Extent of habitat affected (Loss of area= FW4 5m). An additional 50m of this drainage ditch will be permanently diverted and is at risk of reduction in surface water quality (due to sediment and nutrient laden run-off) as a result of the bat buffer felling in the surrounding forestry.

Magnitude of Impact: Low

D2 - Drainage ditch FW4, upstream of the Ballymartin_15 1st order stream:

Description of Works: Culvert to be extended (instream works in wet drainage channel) north by 8m to allow for widening existing forestry road for turbine component haulage.

Suitability of adjacent landcover and description of cover loss: Drainage off forestry and Improved Grassland habitat. No value as foraging habitat and limited terrestrial habitat. No additional habitat loss/tree felling needed for these works existing culvert to be lengthened by 8m.

Extent of habitat affected: Loss of area=FW4 9m)

Magnitude of Impact: Low/Negligible

D3 – Drainage ditch FW4, upstream of the Ballymartin_15 1st order stream:

Description of works: Bottomless precast concrete culvert to be installed in watercourse – Windfarm road and cables installed over culvert.

Suitability of adjacent landcover and description of cover loss: Low suitability for otter. Hydrologically connected to Kilcronan stream but significantly upstream.

Extent of habitat affected: Nil loss of area (temporary works, no change to hydrological flow)

Magnitude of impact: Low/Negligible

Castlecomer Stream

The mid-eastern part of the windfarm site drains into the Castlecomer Stream, which drains into the Dinin River in Castlecomer town. No instream works are proposed in this stream or in any tributaries of this watercourse. The magnitude of impact to Otter habitat is evaluated as low due to absence of interaction of the project with pathways to this watercourse.

Kilcronan 1st order stream

The Kilcronan 1st order stream drains the northern part of the windfarm, this stream drains into the Owveg River, no works are proposed to the Kilcronan stream. A wet drain (D4) occurs to the east of T10, draining into the Kilcronan stream to the east, and there are works (new bottomless culvert/windfarm road and cable) proposed in this wet drainage channel as outlined below. No instream works. A drainage channel also occurs to the west of T11, draining north, to the west of T12, into the Kilcronan stream. No works are proposed to this drain.

D4 - Wet Drainage Ditch FW4, Ballyouskill (drains into the Kilcronan stream)

Description of Works: Bottomless precast concrete culvert to be installed in the wet drainage channel - Windfarm road and cables installed over culvert.

Suitability of adjacent landcover and description of cover loss: No fisheries or aquatic value. No value as foraging or terrestrial habitat.

Extent of habitat affected: Temporary loss of 5m of FW1 habitat

Magnitude of Impact: Low/Negligible

Rathduff_15

Away from the windfarm site, the Rathduff_15 stream crosses the Internal Cable Link, Tinnalintan Substation and sections of the Ballynalacken Grid Connection route. This is the closest watercourse to the main River Nore channel that interacts with an element of the Proposed Ballynalacken Windfarm Project. This stream is non-perennial in nature, being dry for parts of the year and is of negligible fisheries value to Otter.

W2 - Rathduff_15, FW1 1st order stream:

Description of Works: . Duration: 1 day. No instream works – the cables will be installed in the road surface over the existing masonry culvert.

Suitability of adjacent landcover and description of cover loss: No fisheries or aquatic value. Is c.3.4km upstream of the River Nore and Barrow SAC. No value as foraging habitat or terrestrial habitat

Extent of habitat affected: No loss of habitat.

Magnitude of Impact: Low/Negligible

W3 - Rathduff_15, FW2 2nd order stream:

Description of Works: Cables to be installed either in the deck of the Existing Bridge structure or by directional drill under the bridge. The installation of the cables in the deck of the bridge will require works to raise the height of the parapet walls.

No instream works at this crossing.

Suitability of adjacent landcover and description of cover loss: No fisheries or aquatic value due to non-perennial nature of stream (site 100% dry at time of survey); not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value. Is 98m upstream of the River Nore and Barrow SAC. No value as foraging habitat or terrestrial habitat

Extent of Habitat affected: No habitat loss is expected as a result of this watercourse crossing works.

Magnitude of Impact: Negligible – no instream works or works in adjacent habitats.

Rathduff_15, downstream of W3

Evaluation Summary of instream works/works in proximity to watercourses/drainage channels:

No instream works in natural watercourses are required, however works in close proximity and in adjacent habitats to natural watercourses, and works in wet drainage channels are planned in the Ballynalacken Windfarm Project site, loss or degradation of suitable habitat will occur to some degree as a result. However, the extent of works is generally limited to the crossing point, and existing crossing points have been utilised where feasible. Furthermore the morphology of the watercourse and the adjacent cover will be reinstated as a standard part of these works, and any permanent loss of habitat will be restricted to the locations of the new/extended culverts, and the footprint of immediately adjacent access roads and the area of adjacent permanent felling

The greatest extent of loss/deterioration relates to the drainage ditch at T3/ D1 where the development works will result in a loss of a short section of the drainage channel to install the new culvert, a redirection of a section of the drain and the loss of cover provided by the adjacent forestry which will be felled around the adjacent turbine. However, due to the low value of this drainage channel to otter, and the openness of the forestry around it, the magnitude of impacts is evaluated as very low.

At other crossing locations/ works in close proximity to watercourses/drainage channels, the extent of loss/reductions of suitable adjacent cover will be negligible/very low magnitude due to the small nature of the watercourses and the location of the crossing points within mature conifer plantation or within agricultural grassland.

Evaluation of barrier effects: Road widening will take place adjacent to where Otter spraint was recorded. The road widening will result in limited additional barrier effects separating this habitat from the Kilcronan stream located East of the site but not significantly more so than the road currently does. In addition, the windfarm infrastructure will be fenced with livestock proof fencing which will be erected around construction works areas and around the operational phase footprint. While this fence is expected to be electric fence wire during the construction phase, the operational phase fence may comprise sections of sheep wire/mesh fence which could cause a barrier effect, particularly in the southern part of the windfarm site in the vicinity of the Cloghnagh watercourses/drains and in the northern part of the windfarm site where the fencing could create a barrier between the drainage channels to the west of the turbines, and the upper reaches of the Kilcronan stream to the east of the windfarm site.

Due to the small size and characteristics of the watercourses onsite and the expected low usage of the Project site by Otter (based on the results of Otter transect surveys, mammal surveys, camera trap deployments which returned no sightings and one record of evidence of Otters within the Ballynalacken Windfarm Project site (redline boundary) or within the study area (300m upstream and downstream of watercourse crossing locations), it is considered that the habitats at the site are of lower value to Otter than suitable habitats which are available in the wider local area – particularly along larger rivers and streams (such as the Kilcronan stream).

Therefore, it is evaluated that the magnitude of any habitat loss or degradation to Otter will be Negligible.

Overall Rationale:

- The Very High sensitivity of Otter

- The Negligible magnitude of the habitat loss/degradation;
- The availability of higher value habitat in the wider surrounding area.

Impact Magnitude	Negligible	**Impact Significance: *(pre-mitigation)***	**Slight**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

Design	Avoidance of on-site sensitive hydrology features by constraints mapping (i.e. buffer zones)
MM01	The boundaries of the Construction Works Area will be fenced to prevent the encroachment of construction phase personnel, machinery or materials beyond this boundary. In agricultural lands, livestock proof fencing will be used, with landowner access maintained through the provision of gates along the boundary fences.
MM02	Construction traffic, personnel and materials will be restricted to within the Construction Works Area Boundary fence. Machinery will be kept on the windfarm site roads and hardstanding areas, and, aside from advancing excavations, will avoid moving onto areas not delineated on the site drawings
MM33	The construction phase and operational phase fencing will be designed to facilitate the passage of wildlife, including badgers and otters. This will be facilitated through the installation of wildlife-passage gates (e.g. badger gates) at regular intervals or at sensitive locations along the new fence line. The Site Ecologist will advise on the location and design of the wildlife-passage gates.
MM31	A buffer of at least 15m from the Construction Works Area boundary will be maintained to 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)
MM17	New culverts which will be installed at watercourses or wet drainage channels will be bottomless or clear spanning.
MM19	At wet drainage channels, instream works will be followed by site-specific reinstatement measures to ensure the restoration of flow character and morphology within the affected reach. Measures will include: bank stabilisation using boulder armour or willow/brush bank protection; reinstatement of bank slope and character, creation of compound channels where necessary; reinstatement of instream flow features such as boulder substrates, pool / riffle sequences, or spawning cobbles; and planting along the riparian margin to stabilise banks, add flood protection and provide riparian buffer.
SM04	No Otter holts were recorded within the Construction Works Area Boundary or within 150m upstream or downstream of watercourse crossing locations during pre-planning surveys, however pre-construction surveys will be carried out in order to determine if any new holts have been established in the interim period. These pre-construction confirmatory surveys for Otter holts and activity (particularly holts at which breeding females or cubs are present) will be carried out 150m upstream and downstream of watercourse crossing locations.
MM32	No Otter holts were recorded within 150m upstream or downstream of watercourse crossing locations during pre-planning surveys, however should a new holt be identified in the interim period during pre-construction surveys (*see SM04*), then all construction works within 150m of the active otter holt, will be carried out during daylight hours and outside of 2 hours after sunrise or before sunset during summer/outside of 1 hours after sunrise or before sunset during winter. If an active holt (particularly holts at which breeding females or cubs are present) is located within 150 meters of the watercourse crossing points, no works will be undertaken while cubs are present in the holt and NPWS will be notified immediately. Except under license, no wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding otter Holts, and light work, such as digging by hand or scrub clearance will not take place within 15m of such holts. The prohibited working area associated with otter holts will, where appropriate, be fenced with temporary fencing prior to any invasive works and declared as 'out of bounds'. Appropriate awareness of the purpose of the enclosure will be conveyed through toolbox talks with site personnel and sufficient signage will be placed on each exclusion fence. All contractors or operators on site will be made fully aware of the procedures pertaining to each affected holt and subject to audits and non-conformance records in the event of non-compliance, to be included in reports submitted to Local Authorities and relevant Statutory Consultees.

<u>Effectiveness of Mitigation</u>:

The site fencing will reduce any fragmentation of commuting Otter trails by allowing Otter and other mammals to travel through the site. Although unlikely due to the low value of habitat within the Proposed Development, the receiving environment will not undergo any significant separation as a result of the impact sources. 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 low/negligible significance.	
Residual Impact Significance *(post-mitigation)*:	**Slight**

EIAR 13.3.4.2.2	**Reduction in aquatic habitat quality and availability of aquatic prey item species**
Sensitive Aspect: Importance:	Terrestrial Mammals - Otter **International Importance, Very High Sensitivity** (as per Section EIAR 13.3.4.1)
Impact Source(s)	Reduction in water quality/quantity, construction works near and at watercourses, groundworks, forestry felling, excavation & relocation of soils
Impact Pathway(s)	Surface water runoff, instream works at wet drainage channels, watercourse crossing works (e.g. works on bridges/culverts, directional drilling)
Project Stage	Construction Phase

Overview of Impact (general):

This impact is an indirect impact on Otter arising from reductions in prey item fish species, as a result of reductions in habitat quality or availability, as a result of sediment release, contaminated run-off or the creation of instream barriers.

A decrease in prey item species could lead to Very significant effects on local Otter populations.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

There will be no instream works in natural watercourses. 'Instream' works are limited to works at existing wet drainage channel D1 (diversion of the drain) and D2 (installation of extension to existing culvert). New crossing structures (bottomless culverts) will be installed at W1, and existing wet drainage channels D3 and D4. A bottomless culvert will also be installed at D1. Works will also take place within or adjacent to dry drainage channels in farmland and in the forestry plots. The internal cable link will be installed in the public road over an existing culvert at W2, and the grid connection cables will be installed either in the deck or by directional drilling under an existing bridge on the regional road at W3. No instream works associated with W2 or W3, which both occur on the Rathduff_15 stream.

The extent of works at these water crossings has the potential to result in downstream water quality impacts due to the release of sediment during construction activities and after, in the case of D1 and D2, the removal of the temporary dam. Magnitude of impacts to sensitive receptors of importance to otter such as White-clayed crayfish, Atlantic salmon, brown trout and Lamprey species, are assessed as Medium to High.

In relation to the effects on aquatic species in proximity to the works locations, most of the watercourses and drainage channels on-site are dry for at least part of the year, and do not provide a valuable prey-item fish/crayfish resource for Otter. Taking into account the brief duration of any works, and the reinstatement of the morphology of the watercourse as part of the works, any effects to the availability of prey-item species at the watercourse/drainage channel crossing locations is evaluated as Negligible, i.e. very slight change from the baseline condition.

The availably of frogs at the windfarm site was considered, however given the low numbers of frogs expected to occur at the site, the watercourses and drains at the Project site do not provide an important prey resource for Otter, and the effects of any reductions in frog populations to Otter will be Negligible.

With regard to the availability of prey-item species in the larger downstream watercourses – such as the River Nore, significant reductions in downstream water quality are not expected to occur as a result of runoff from the Project construction site due to the separation distance of the construction works from watercourses (larger watercourses such as the River Nore are in excess of 90m from construction works areas), the small number of watercourses onsite, the installation of the windfarm site drainage network ahead of works, and the temporary duration (c.12 months) of the construction phase. As aquatic species (fish, crayfish) and other prey items have been identified to undergo only slight or neutral effects as result of the Ballynalacken Windfarm Project, based on the low Q-values and general riverine health at the watercourses connected to the Ballynalacken Windfarm Project indicate that that these reductions in water quality will not contribute to a significant change in the pre-existing baseline or differ from the receiving environment in a 'Do-Nothing' Scenario. It is therefore considered that any effects on prey item species availability will be Low. Therefore, secondary effects on local Otter populations are unlikely to occur.

Overall, impacts to Otter from a reduction in prey item species are Unlikely – Negligible.

Impact Magnitude	Negligible	**Impact Significance: *(pre-mitigation)***	**Slight**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

**See Chapter 19: Mitigation & Monitoring Arrangements for full wording of mitigation measure*

Design	Avoidance of on-site sensitive hydrology features by constraints mapping (i.e. buffer zones)
Design	Avoidance of areas of peat
Design	No temporary storage of overburden in the Owveg_Nore_040 Catchment
Design	Construction and installation of the site drainage network
Design	Implementation of the Surface Water Management Plan
Design	At D1, the existing wet drainage channel will be permanently diverted for a short distance so that it is at least 25m away from the turbine foundation, an interceptor drain will be constructed between the works area and the diverted section of the watercourse.
SM02*	Pre-construction confirmatory surface water quality monitoring and recording.
SM11	The construction Method Statements to be developed by the construction contractors will take full account of the EMP including the mitigation and monitoring measures and will be reviewed by the Environmental Manger prior to the commencement of construction works.
SM12	All construction works will be monitored for compliance with the Environmental Management Plan by the project Environmental Management Team which will include an Environmental Clerk of Works, the Project Ecologist and specialists such as a hydrologist, who are independent of the site contractors. The Environmental Management Team will report to the owner's Project Manager.
SM14	A suitably qualified engineer will supervise all windfarm site excavations and construction works.
SM15*	Regular inspection of the windfarm drainage network by the Contractor and Project Hydrologist.
SM16*	Regular surface water quality monitoring and recording during the Construction Phase in accordance with the Surface Water Management Plan
SM20	The Project Ecologist will liaise with the Contractors on a weekly basis regarding the upcoming schedule of works and will advise the Contractors of any particular ecological protection requirements at specific locations on site.
MM01	The boundaries of the Construction Works Area will be fenced to prevent the encroachment of construction phase personnel, machinery or materials beyond this boundary. In agricultural lands, livestock proof fencing will be used, with landowner access maintained through the provision of gates along the boundary fences.
MM02	Construction traffic, personnel and materials will be restricted to within the Construction Works Area Boundary fence. Machinery will be kept on the windfarm site roads and hardstanding areas, and, aside from advancing excavations, will avoid moving onto areas not delineated on the site drawings
MM03	Land reinstatement will not be carried out during very wet weather or when the soil is waterlogged. If any compaction has occurred along the construction works area, these areas will be ploughed with a sub-soiler to loosen the subsoil layer
MM05	During windfarm construction works, excavations will be backfilled as soon as is possible.
MM06*	Removal of excavated materials to designated berms more than 50m from watercourses or wet drainage features. Implementation of silt control measures and maintenance of vegetative buffers.
MM07*	Storage berms will be graded, sod to be retained and placed on berms and berms re-seeded, measures incorporated to prevent dust and soil erosion.
MM08	Along the cable route on the public road, there will be no storage of overburden and all excavations from road trenches will be removed to licensed waste facilities in accordance with the Waste Management Plan. The excavated material will be covered during transportation to prevent spillages and reduce dust.

MM09	All excavations which are unsuitable for use as construction/reinstatement material which arise within the catchment of the Owenbeg River (T9, T10, T11 and T12 and associated Windfarm Site Roads) will not be stored within the catchment, instead these arisings will be transported to the temporary deposition area at Borrow Pit No.2 and at Turbine T7 (both located outside of the Owenbeg River catchment). In addition, a Siltbuster or other suitable treatment train will be used to remove fine silt particles from site runoff in this catchment. The Siltbuster will be set up at works locations and used during groundworks and earthmoving activities.
MM10	At the windfarm site, at works locations within 50m of watercourses or existing drainage features there will be additional mitigation measures deployed including double silt fencing prior to the commencement of the works, temporary drain blocking in existing drains, placement of silt trapping arrangements along preferential surface water flowpaths and, where necessary, the use of matting to prevent ground erosion and rutting. Works will not take place within this zone during prolonged heavy or exceptional rainfall events.
MM11	Weather forecasts will be consulted in advance of works. If there is heavy prolonged rainfall or if an exceptional rainfall event occurs, then construction works will cease until peak flows have subsided.
MM12*	Site roads and hardstanding areas have a permanent surface water drainage network, the borrow pits will have a temporary surface water drainage network in place during works. The site drainage network will include check dam, settlement ponds and buffered outfall weirs.
MM13*	Site roads and hardstanding areas will be capped with clean high-grade bedrock, such as limestone
MM14*	At the windfarm site, there will be no direct discharge into any watercourses or drains or onto adjacent habitat. All pumped water from excavations will be treated prior to discharge.
MM15	Along the cable routes, where dewatering of trenches or excavations is required, there will be no direct discharge of treated water into any watercourse or drain. Rather, all pumped water will be discharged via a silt bag.
MM17	New culverts which will be installed at watercourses or wet drainage channels will be bottomless or clear spanning.
MM18*	In-stream works will not be undertaken without isolation of flow within the watercourse. The water will be isolated from the works by over pumping, flume (pipe) or channel diversion methods.
MM19*	At wet drainage channels, instream works will be followed by site-specific reinstatement measures to ensure the restoration of flow character and morphology within the affected reach.
MM20	Only precast concrete culverts will be used for new watercourse crossing structures on the windfarm site. Only precast concrete chambers will be used at Joint Bay locations.
SM18	The plant and machinery will be regularly inspected for leaks and maintained in good working order for the duration of the works.
SM19	Fuel, oil and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage.
MM21*	Concrete control procedures will be implemented including no batching; ready mixed concrete will be used for all foundations; work scheduled for dry days; experienced operators; run-off will be settled out and no concrete truck washing on-site.
MM22*	Fuel/oil control procedures will be implemented including control of on-site refuelling of plant and machinery; provision of spill kits. trained operatives, use of double-skinned mobile bowsers. Emergency Response Plan in place.
MM23	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse or wet drainage channel or local spring/well.
MM24*	All fuels or oils, will be stored in designated, bunded, locked storage areas and fitted with a storm drainage system and an appropriate oil interceptor. Emergency Response Plan in place.
MM25	Overnight parking of plant and machinery will only be permitted at locations which are greater than 50m from watercourse/drainage features and at an existing hard-core surface. Drip trays and fuel traps will be used under and around parked plant and machinery to contain any leaks.
MM26	All associated tree felling will be undertaken using good working practices as outlined by the Forest Service in their 'Forestry Harvesting and Environment Guidelines' (2000) and the 'Forestry and Water Quality Guidelines '(2000). Measures will include the protection of the riparian zones, installation of buffered drainage outfalls, installation of drains and silt traps as soon as possible once felling has

	been completed, and a regime of continued monitoring of silt traps and drainage outfalls will be implemented. All excess felled brash will be removed off site to avoid release and runoff of phosphorous into sensitive watercourses.
MM27	In-stream works in wet drainage channels (D1, D2) will only be undertaken during the IFI specified period (July, August and September) and will be carried out in accordance with the *Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters* (IFI, 2016).
MM28	Works at W2 and W3 will take place when the Rathduff_15 is in its dry state and the works at W2 or W3 will be planned for periods of dry weather.
SM17	At D1 and D2, monitoring of Q values and sediment build up will be carried out immediately downstream of the dam locations at D1 and D2. This monitoring will be conducted throughout the construction works at D1 and D2, and also conducted as part of surface water monitoring in order to confirm that the Q values and sediment levels return to baseline levels. Prior to dam being removed at D1 or D2, where sediment build up poses significant downstream effects on the watercourse, this sediment will be removed.

Effectiveness of Mitigation:

The above measures are proven and effective best practice measures which will avoid and minimise the risk of sediment or contaminant release by:

- reducing the potential for sediment/contaminant release (limestone capping, weather related restrictions, management of overburden, no temporary storage of overburden in Owveg catchment, concrete controls, refuelling controls, containment bunds, use of shuttering at foundations, design of culverts, removal of brash),
- capturing and treating any sediment/fuel spills that are released (silt fencing, Siltbuster, drainage system, wheel washes),
- thereby breaking the pathway between the potential sources and the receptor.

Furthermore, the ongoing monitoring of water quality in downstream watercourses and the inspection of drainage systems and of the construction works by an Environmental Manager (with 'stop works' authority) will ensure that any decreases in water quality are identified and rectified at an early stage, and as a result would likely be short-term, temporary and reversible in nature.

Following the implementation of mitigation measures, minimal sediment or contaminants will enter downslope watercourses, habitats will be maintained through restoration and the construction and design of new culverts will ensure free passage of fish and aquatic species. Therefore, any potential negative impacts on downstream waterbodies, aquatic habitats or species will be Negligible

Residual Impact Significance *(post-mitigation)*:	**Neutral – Not significant**

EIAR 13.3.4.2.3	**Mortality, injury, disturbance or displacement of Otter**
Sensitive Aspect:	Terrestrial Mammals–- Otter
Importance:	**International Importance, Very High Sensitivity** (as per Section EIAR 13.3.4.1)
Impact Source(s)	Noise and visual intrusion, movement of machinery, groundworks, vegetation clearance
Impact Pathway(s)	Air and visibility, physical contact
Project Stage	Construction Phase

Overview of Impact (general):

Otters are rated as a very high sensitivity receptor and do not tolerate disturbance at or near holts (breeding dens) that are in active use (breeding may occur at any time of the year, but most likely during the Summer/early Autumn period). When Otters are not breeding, records suggest that Otters are less sensitive to human disturbance (Chanin, 2013). Disturbance to Otters can occur via noise and visual intrusion associated with Construction Phase activities.

Whilst Otter may occasionally traverse bogs or upland areas, it generally confines its movements close to waterways, lakes or wetlands (NRA, 2006b).

It is also noted that watercourses are present which form part of or are hydrologically connected to Natura 2000 sites (SAC's) which include Otter as a Qualifying Interest.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Suitable habitat does occur at the Ballynalacken Windfarm Project, with three small 1st order upland streams rising on the ridge at/near the windfarm site – Cloghnagh stream, Castlecomer Stream and the Kilcronan stream, and the small 1st order stream, Rathduff_15, occurring along the downslope cable routes. Some wet drains with low fisheries value also occur at the Project site, and drain into the Cloghnagh, Castlecomer Stream and Kilcronan streams. Although not recorded within the Project site or within 300m of watercourse W1, W2 or W3 crossing points or the D1 crossing point, secondary evidence (Spraints) during mammal surveys was recorded within 201m of T12 Otter does occur in the wider local area within a watercourse (evidence recorded in Kilcronan Stream - 1.68km North of the windfarm site), with spraints recorded 188m West of T12 hardstand as well, and therefore, there is potential for Otter to utilise habitats within and adjacent to the Ballynalacken Windfarm Project site. Due to the separation distance of works from the Damerstown West stream (c.115m), the location of works immediately adjacent to a busy public road, and the small extent and nature of the works, no effect to Otter are likely to occur at HR8. Regarding the other haul route works (HR1 to HR7 and HR9 to HR11) - due to the minor nature of works which will also be carried out within the national/regional road corridor, it is considered that these works are unlikely to effect Otter.

As **no holts or couches were located on site or within 300m** (upstream or downstream) of works locations in proximity to suitable Otter habitat (i.e., at watercourse crossing locations) then **mortality, injury, disturbance or displacement of Otter resting or breeding in holts or couches as a result of work in close proximity (300m) is considered unlikely to occur**. However, albeit unlikely given the character of the watercourses onsite, the potential exists for a new holt to be established within 300m of watercourse crossing works in the intervening periods between the preparation of the planning application and the commencement of construction works, and mitigation measures are required to avoid potential significant effects to Otters at any such new holt. Should these effects occur they would be of low to medium magnitude depending on the extent of the Holt use and importance to the Ex-situ distribution which would differ from the existing baseline data.

In relation to mortality on the existing road network from increased road traffic as a result of the Project, any increases in traffic during construction are considered to have the potential to result in increased traffic led mortality given the assumed presence of Otter within the surrounding environment near road widening and material / component haul routes (NIEA, 2019). Evidence of Otter Spraint on East and West side of the L5840. One within the Wet Heath habitat within the biodiversity protection area and the other two in an area West and Northwest of T12. There is potential that this road is occasionally crossed by Otter. It is not possible to fully remove the risk of mortality or injury effects from vehicle collisions along the L5840. As this road will undergo road widening works and be part of the turbine delivery and machinery site access routes, there is potential for mortality or injury to occur. The magnitude of this effect is Low due to the scarce presence of Otter within the area, and that construction activities will be largely confined to daytime hours.

Otter may also pass through the red line boundary of the Ballynalacken Windfarm Project as evidenced by the spraints near T12, and there is potential for mortality or injury to occur as a result of vehicles and machinery moving along windfarm access roads. Due to the expected low occurrence of Otter at the Project site, the absence of holts or regularly used couches within 300m of watercourse crossing locations onsite, and the predominantly nocturnal foraging habitats of Otter (whereas construction works will predominantly be carried out during daylight hours), mortality or injury is unlikely to occur as a result of contact with operating plant or moving machinery or vehicles onsite.

Any disturbance or displacement of Otter primarily relates to foraging Otter within aquatic habitats but also within adjacent riparian corridors, within close proximity (300m) of construction works at watercourse crossings locations. The works at the watercourse crossing locations will be of brief duration and are expected to be completed within 1-2 weeks. Following the construction of the watercourse crossings and access roads travelling over them, disturbance or displacement from construction works will relate to the movement of construction traffic and machinery, to which Otter have become habituated.

Fencing will be erected around the construction and operational work boundaries. These fences will create permanent obstacles to mammals traversing the habitats surrounding the windfarm site. Although Otter has low commuter use for the area, this impact has the potential to discourage commuting otters between the Kilcronan stream to the east and the Ballynalacken_15 and Ballyoskill streams to the west. There are far more suitable habitats for commuting across the wider environment, as such this effect would be a permanent but Low/negligible magnitude effect on Otter.

Overall, the magnitude of impacts is medium/low for mortality or injury effects – although there is a low likelihood for this effect to occur, and Low/Negligible for Disturbance or Displacement effects.

Overall Significance Rationale:

- The very high sensitivity rating of the species;
- No holts occur in close proximity to works;
- Foraging/commuting areas occur within proximity to works;
- The brief-temporary duration of disturbance events and any corresponding effect;
- Disturbance or Displacement effects expected to be reversible; and the abundance of suitable habitats in the surrounding area.

Impact Magnitude	Medium (mortality) – Negligible (disturbance/displacement)	**Impact Significance: *(pre-mitigation)***	**Moderate (mortality) – Slight (disturbance, displacement)**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

Design	Otter friendly/mammal gates will be installed along points of fencing once any invasive works related to construction phase are complete to facilitate Otter commuting between the watercourses and drains within the receiving environment during the operational phase of the project.
MM34	Road traffic speed limits of 30km/hr along the local roads L5840 and L5845 at the windfarm site and along the L58442 in Tinnalintan and of 15km/hr along on-site roads throughout project site during the construction and decommissioning phases. Should an Otter fatality occur, then the Project Ecologist will identify appropriate additional measures which will be implemented in areas that show to be high activity road crossing points for Otter.
SM04	No Otter holts were recorded within the Construction Works Area Boundary or within 150m upstream or downstream of watercourse crossing locations during pre-planning surveys, however pre-construction surveys will be carried out in order to determine if any new holts have been established in the interim period. These pre-construction confirmatory surveys for Otter holts and activity (particularly holts at which breeding females or cubs are present) will be carried out 150m upstream and downstream of watercourse crossing locations.
MM32	No Otter holts were recorded within 150m upstream or downstream of watercourse crossing locations during pre-planning surveys, however should a new holt be identified in the interim period

	during pre-construction surveys (*see SM04*), then all construction works within 150m of the active otter holt, will be carried out during daylight hours and outside of 2 hours after sunrise or before sunset during summer/outside of 1 hours after sunrise or before sunset during winter. If an active holt (particularly holts at which breeding females or cubs are present) is located within 150 meters of the watercourse crossing points, no works will be undertaken while cubs are present in the holt and NPWS will be notified immediately. Except under license, no wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding otter Holts, and light work, such as digging by hand or scrub clearance will not take place within 15m of such holts. The prohibited working area associated with otter holts will, where appropriate, be fenced with temporary fencing prior to any invasive works and declared as 'out of bounds'. Appropriate awareness of the purpose of the enclosure will be conveyed through toolbox talks with site personnel and sufficient signage will be placed on each exclusion fence. All contractors or operators on site will be made fully aware of the procedures pertaining to each affected holt and subject to audits and non-conformance records in the event of non-compliance, to be included in reports submitted to Local Authorities and relevant Statutory Consultees.

Effectiveness of Mitigation:

The control of construction traffic speeds provide a precautionary measure to reduce the likelihood of impact on Otter and other mammals crossing these road paths to Negligible. As such, with these mitigation measures this impact source is likely to have only a very low significant effect on Otter and other Mammal receptors.

Pre-construction surveys will verify any changes to the baseline presence of Otter prior to work taking place to ensure any increased likelihood of disturbance will be identified prior to works occurring, with the appropriate buffer distances implemented in line with NRA guidance and consultation with NPWS.

These measures are sufficient to alleviate any likelihood of disturbance causing a greater than slight/not significant effect as a result of the proposed Ballynalacken Windfarm Project.

The mammal gates are an accepted measure to remove any obstruction to wildlife commuting through a development where fencing is required for security, safety or environmental mitigation measures. This will remove any effect related to disturbance/displacement from project fencing erected around the works boundary area for the operational phase and make any effects arising from the construction phase temporary/short-term in duration and negligible/not significant in nature.

Residual Impact Significance *(post-mitigation)*:	**Slight (Mortality) –** **Not Significant *(disturbance, displacement)***

EIAR 13.3.4.2.4	**Mortality, Disturbance or Displacement of Badger at Setts**
Sensitive Aspect:	Terrestrial Mammals–- Badger
Importance:	**Local (higher) Importance, Low Sensitivity** (as per Section EIAR 13.3.4.1)
Impact Source(s)	Excavation of soils, groundworks, vegetation clearance, noise and visual intrusion
Impact Pathway(s)	Physical contact, Air and visibility
Project Stage	Construction Phase

Overview of Impact (general):

Mortality or injury to Badger at a sett could occur as a result of excavation works to remove soils under the footprint of the development. As Badgers live in social groups, usually comprised of between two and six adults and their young, there may be multiple individuals injured/killed should a Sett be inadvertently excavated during construction works.

Disturbance to or displacement of Badgers could occur where construction works are in close proximity to occupied Badger Setts. Serious disturbance may cause an avoidance response and result in the mortality of cubs, which are typically underground during the months of January through to February prior to emergence in April.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

According to habitat surveys, there is suitable habitat for Badgers throughout the Ballynalacken Windfarm Project, and furthermore secondary Badger evidence from site surveys (droppings, hair), along with NBDC records, show that badger occur at the Ballynalacken Windfarm Project site. However, **no Badger setts were recorded within the study area** *(construction works areas plus 100m in all directions).* As a result there is a low probability of a sett being damaged or works occurring in close proximity, however the potential exists for a sett to be established either inside, or in close proximity to the construction works areas in the intervening periods between the preparation of the planning application and the commencement of construction works. Mitigation measures are therefore required to ensure that no significant impacts occur to Badger at any such new sett.

Without mitigation in place, it is considered that, potentially, an entire family group could be affected, however when considered against the context of the widespread occurrence of badger with national populations estimated at 84,000 individuals (Sleeman *et al*.2009), the magnitude is reduced to potentially High (in the worst case scenario).

Impact Magnitude	High	**Impact Significance: *(pre-mitigation)***	**Slight**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

SM06	No Badger setts were recorded within the Construction Works Area (CWA) Boundary or within 50m of the CWA Boundary during pre-planning surveys, however pre-construction surveys will be carried out in order to determine if any new setts have been established in the interim period. These pre-construction confirmatory surveys will be carried out by the Project Ecologist within the Construction Works Area (CWA) boundary and within 50m of either side of the CWA Boundary and carried out no more than 10-12 months in advance of proposed construction activities.
MM33	The construction phase and operational phase fencing will be designed to facilitate the passage of wildlife, including badgers and otters. This will be facilitated through the installation of wildlife-passage gates (e.g. badger gates) at regular intervals or at sensitive locations along the new fence line. The Site Ecologist will advise on the location and design of the wildlife-passage gates.
MM34	Road traffic speed limits of 30km/hr along the local roads L5840 and L5845 at the windfarm site and along the L58442 in Tinnalintan and of 15km/hr along on-site roads throughout project site during the construction and decommissioning phases. Should an Otter fatality occur, then the Project Ecologist will identify appropriate additional measures which will be implemented in areas that show to be high activity road crossing points for Otter.

MM35	No Badger setts were recorded within the Construction Works Area (CWA) Boundary or within 50m of the CWA Boundary during pre-planning surveys, however should a new sett be identified in the interim period during pre-construction surveys (*see SM06*), then NWPS will be notified immediately and derogation licenses will be secured in consultation with NPWS to ensure the proposed works cause as limited an effect as possible.

Effectiveness of Mitigation:

These measures are accepted best practice to remove the sources of disturbance to the Sett based on NRA guidance and the nature of the works affiliated with this impact.

Residual Impact Significance *(post-mitigation)*:	**Neutral – not significant**

EIAR 13.3.4.3 Cumulative Impact on Terrestrial Mammals with Other Projects

EIAR 13.3.4.3.1 Introduction to the Cumulative Evaluation for Terrestrial Mammals

The Ballynalacken Windfarm Project (*whose effects range from Neutral to Moderate, as per Section EIAR 13.3.4.2*) is examined hereunder for potential to have cumulative effects on Terrestrial Mammals with other existing and permitted projects, and projects advanced in the planning system. These projects are referred to as 'Other Projects' herein.

A Cumulative Study Area is set out below and Other Projects located within this Study Area are identified and examined for in-combination effects with the Ballynalacken Windfarm Project. The potential for off-site and secondary consequential development is also considered.

EIAR 13.3.4.3.2 Scoping of the Cumulative Study Areas

The Cumulative Study Area comprises 600m upstream and downstream of watercourse crossing locations *(in* including the adjacent riparian areas *relation to Otter only)*, and the construction works areas associated with the Ballynalacken Windfarm Project plus an area of 200m extending around the construction works areas. It is considered that this area is sufficient to identify those Other Project or Activities which may cause cumulative effects to Terrestrial Mammals (Otter, Badger, Irish Hare, Pine Marten, Irish Stoat, Red Squirrel and Hedgehog) with the Ballynalacken Windfarm Project.

EIAR 13.3.4.3.3 Evaluation of Cumulative Impacts

The Other Projects which occur within the Cumulative Study Area are identified in the table below and in Figure 13.9: Other Projects within the Cumulative Study Areas *(included at end of this chapter).*

The Ballynalacken Windfarm Project is examined below for cumulative effects with each of the Other Projects within the Cumulative Study Area. An evaluation of the collective cumulative impact of the Ballynalacken Windfarm Project in-combination with all the Other Projects then follows. The evaluation takes into account any existing sources of pollution or damage identified in Section EIAR 13.3.4.1.2.

Table 13-11: Evaluation of Ballynalacken Windfarm Project cumulatively with Other Projects

Other Project	Status	Evaluation of Cumulative impact
Farranrory Wind Farm Grid Connection Ballyragget Solar Farm/Parksgrove Solar Farm Grid Connection Battery Energy Storage Developments, Moatpark	Consented	<u>Neutral Cumulative Impact</u>: While these grid connections are also expected to connect into the existing EirGrid Ballyragget Substation, the closest Ballynalacken Windfarm Project works relate to the Grid Connection, which is routed along the public roads and in hardcore compound and as such do not provide suitable habitat for terrestrial mammals. Therefore, the potential for cumulative effects can be excluded.
Tirlán and Ballyragget Wastewater Treatment Plants	Existing	<u>Neutral Cumulative Impact</u>: The upgrade of the Tirlán and Ballyragget WWTPs has already been completed at both plants. According to Chapter 8: Water, when the separation distances (dilution factor) between the subject development and these WWTPs and the water quality protection which would form part of their discharge licenses, are taken into account, it is considered that the potential for perceptible cumulative impacts with the Ballynalacken Windfarm Project can be excluded. Therefore, the potential for significant cumulative impacts to Otter can be excluded.

Tirlán Anaerobic Digester Plant	Consented	No Cumulative Impact: This project is consented on the site of the Tirlán WWTP, and works associated with the anaerobic digester development will not contribute to significant cumulative effects due to the relatively localised nature of the works within the confines of the existing Tirlán Milk WWTP and Milk Processing sites. There will be no interaction of this project with any element of the proposed development to increase its effect on Otter.
Laois-Kilkenny Grid Reinforcement Project Moatpark-Loan 38kV Overhead Line Telecom Masts, Ballyouskill	Currently under construction / Existing	No Cumulative Impact: No cumulative impacts are expected – as the construction works for this grid reinforcement project will be completed prior to the commencement of the Ballynalacken Windfarm Project, and the 38kV OHL and telecom masts are already existing. In addition, due to the location of works, effects to terrestrial mammals due to the extension of the Ballyragget Substation compound will be negligible.
Mixed Use Development, Castlecomer Hebron House Hotel, Kilkenny	Consented	No Cumulative Impact: The closest Ballynalacken Windfarm Project works relate to haul route works HR2 (c.140m from Hebron House Development, Kilkenny) and HR9 and HR10 (c.20m and c.100m from Mixed Use Development, Castlecomer respectively). These works include the temporary removal of street furniture and overhead lines and poles, temporary removal of vegetation, and the construction of a hardcore areas, all within or immediately adjacent to the public road corridor. No works are proposed to areas of suitable habitat for Terrestrial Mammals.
Forestry Replanting	Future activity	No Cumulative Impact: The afforestation lands associated with the felling at Ballynalacken will take place on agricultural lands remote from the Project site substantially outside the cumulative study area.
Secondary Projects / Consequential Developments – Other Energy Projects connecting to Tinnalintan Substation	Potential future project	No Likely Cumulative Impact: Future connections of other energy projects, which may arise due to the existence of the Ballynalacken Tinnalintan Substation (if built), are currently not known/planned and in any case are likely to be constructed after the Tinnalintan Substation exists – i.e. during the operational phase of the Ballynalacken Windfarm Project, therefore it is considered that there will be no overlap of construction periods, and the potential for cumulative construction phase effects to Terrestrial Mammals can be excluded. In the unlikely scenario where such a connection takes place during the construction phase of the Ballynalacken Project, the other connection would likely involve the installation of underground cabling - either trenching across agricultural lands or under or alongside public and/or private access roads, or overhead line mounted on wooden poles. These other works would likely be small scale and short duration, and it is evaluated that when considered together with the proposed works at the Tinnalintan Substation or along the Ballynalacken Grid Connection route, that cumulative impacts will be Neutral and not significant.

As detailed in the evaluations in the table above, the development of the Ballynalacken Windfarm Project will not result in cumulative impacts with any of the Other Projects within the Cumulative Study Area. Therefore, it is evaluated that the potential for collective cumulative impacts to Terrestrial Mammals (Otter, Badger, Irish Hare, Pine Marten, Irish Stoat, Red Squirrel or Hedgehog) can be excluded.

EIAR 13.3.5 SENSITIVE ASPECT: BATS

This detailed evaluation section for Bats is presented as follows:

- Section EIAR 13.3.5.1 - description of the baseline environment of Bats;
- Section EIAR 13.3.5.2 - evaluation of the impacts of Ballynalacken Windfarm Project on Bats; and
- Section EIAR 13.3.5.3 – evaluation of cumulative impacts.

EIAR 13.3.5.1 Baseline Environment – Bats

The context, characteristics, importance and sensitivity of *Bats* are described in the subsections below. The trends and likely evolution (i.e. Do-Nothing scenario) for this Sensitive aspect are also considered.

There are eleven recorded bat species in Ireland, nine of which are considered resident –

- Common pipistrelle *Pipistrellus pipistrellus*
- Soprano pipistrelle *Pipistrellus pygmaeus*
- Nathusius' pipistrelle *Pipistrellus nathusii*
- Leisler's bat *Nyctalus leisleri*
- Daubenton's bat *Myotis daubentonii*
- Whiskered bat *Myotis mystacinus*
- Natterer's bat *Myotis nattereri*
- Brown long-eared bat *Plecotus auritus*
- Lesser horseshoe bat *Rhinolophus hipposideros*

Brandt's bat (*Myotis brandtii*) and the Greater horseshoe bat (*Rhinolophus ferrumequinum)* are considered to be vagrant species.

EIAR 13.3.5.1.1 National Biodiversity Data Centre Records

The proposed Ballynalacken Windfarm Project is located in OS grid square S47. 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 2024, the species recorded on the NBDC database were: Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Brown Long-eared Bat, Natterer's Bat and Daubenton's Bat.

EIAR 13.3.5.1.2 Landscape Suitability

Bat landscape mapping was reviewed for grid square S47 which provides an indication of the suitability of each 10km square for bat species. The proposed turbines are located within the Grid Square S47.

Grid square S47 has a suitability of 26 out of 100 for T1 to T7 and 27 out of 100 for T8 to T12. The suitability at the internal cable link is lower average suitability (26 out of 100) while the substation and grid connection had higher average suitability (36 out of 100).

On a species level, Common Pipistrelle has moderate suitability at T1 to T7 (45), high suitability (48 out of 100) at T8 to T12 and high suitability (56 out of 100) along the internal cable link, substation and grid connection. Soprano Pipistrelle has high suitability (46 out of 100) along the internal cable link, substation and grid connection. Leisler's Bat has moderate suitability (35 out of 100) at the turbines and high suitability (51 out of 100) along the grid connection and substation. Daubenton's Bat suitability was low (20 out of 100) at the turbines and moderate (36 out of 100) at the internal cable link, substation and grid connection. Brown long-eared bat had a high suitability (51 out of 100) at the internal cable link, substation and grid connection. See Figure 13.4: Bats, which shows the Bat Habitat Suitability Index for the site area.

EIAR 13.3.5.1.3 Roost Surveys

Crevices and cavities in mature trees can provide roosting opportunities for bats, and some species (e.g. Leisler's bat) are thought to favour roosting sites in trees. Recent research has demonstrated that the use of roosts in trees can be highly transitory, with frequent roost switching between nights and across the season, although some large cavities can be used as maternity or hibernation roosts for longer periods of time. Almost all records to date have been from broadleaf trees (particularly oaks), with only a very small number from specimen conifers, and none from conifer plantations (Andrews *et al.* 2006).

With the loss of natural roost sites such as veteran trees, bats have had to find alternative roosts in buildings, ideally with suitable foraging habitat nearby, such as parkland, gardens, farms, waterways and woodlands. Bats may also use buildings because they are more thermally stable and safer environments, and there is less competition from birds and other mammals. As long-lived animals, bats get to know a large number of suitable roosting structures over the areas they need for their exacting life cycle requirements. Different species of bat at different times of their annual cycle will make use of a variety of building 'habitats'. In summer they need stable, warm, dry roosting environments to give birth and raise their young. In the winter they need stable, cold and humid roosts to hibernate. Depending on the number of microclimates and size of internal spaces, a building may have the potential to accommodate just one or a number of different species and types of roost. Bats may visit these roosting sites occasionally or frequently, however some buildings have records of continuous use by bats for decades.

The landscape surrounding the proposed Ballynalacken Windfarm Project is predominantly improved agricultural landscapes and forestry, with hedgerows / treelines along field boundaries and roadsides, in addition to low-density houses and farm buildings. The aims of the bat roost surveys carried out on site were to identify any important roosts, commuting / foraging routes, migration routes and swarming areas within the project area. The bat roost suitability of buildings, mature trees and bridges were assessed in areas that could be affected by the development. The importance of these features as roosts to bats in the area was determined based on the species observed emerging or re-entering the structure and the number of individuals doing so, following the reasonings as set out in Methodology Section A13.8.3.3 in Appendix 13.8. This was carried out through preliminary roost assessments in a 500m buffer zone around the proposed development location for buildings, suitable trees and watercourse crossing structures such as bridges and culverts.

EIAR 13.3.5.1.3.1 Review of Aerial Mapping

Aerial mapping was reviewed to identify potential important roosting locations as well as foraging and commuting habitat within the site boundary and in the local surrounding landscape. This included using satellite imagery and reviewing bat species suitability mapping from the National Biodiversity Data Centre.

EIAR 13.3.5.1.3.2 Preliminary Roost Assessment

A preliminary roost assessment (PRA) is a detailed inspection of the exterior and interior of a structure to look for features that bats could use for entry/exit and roosting and to search for signs of bats. The aim of this survey is to determine the actual or potential presence of bats and the need for further survey and/or mitigation. In many situations it is not possible to inspect all locations where bats may be present and therefore an absence of bat evidence does not equate to evidence of bat absence (Collins, 2016).

Preliminary roost assessments were carried out within a 500m buffer zone around the proposed development boundary for the Ballynalacken Windfarm Project to assess the likelihood of bats being present at various features such as trees, buildings and bridges and to evaluate their suitability as roosting sites. Forestry and wooded habitat was evaluated for roosting potential for bats to determine the suitability of the area for roosting bats. Five sites (three trees and two buildings) were identified in the vicinity of the

Ballynalacken Windfarm Project site. Watercourse crossings along the grid connection route were also surveyed for potential roost suitability in 2021. One bridge was identified on the grid connection route (W3), this bridge was evaluated as having low/negligible suitability due to the covering of the underneath of the bridge arch with concrete screen/plaster.

The results of the PRA undertaken in the proposed Ballynalacken Windfarm site can be found below in **Table 13-12.**

Table 13-12: Preliminary Roost Assessment results of buildings in the Ballynalacken Windfarm Project 2021

Code	ITM Grid Ref		Description	Suitability Rating
Buildings				
BL1	647691	675288	Derelict cottages	Low
BL2	647848	676712	Cottage (derelict) complex	High
Trees				
TR1	647486	676421	Mature ash tree	High
TR2	647508	676334	Mature ash tree	Moderate
TR3	647493	676359	Mature ash tree	Low
Watercourse Crossing Roosts				
W2	645934	673603	Bottomless Masoned Culvert bridge/crossing	Low/Negligible
W3	644511	672752	Stone Arch Bridge, with concrete plaster covering the underneath of the arch	Low/Negligible

These sites were surveyed in 2021 to establish the presence or absence of the bat roosts and evaluate their importance (if present). No further surveys were carried out at TR3, W2 and W3 as low suitability trees and poor suitability bridges/culverts are not required to have a follow up roost survey (Collins, 2023). Dusk surveys were prioritized over dawn surveys for each location as dawn surveys are not recommended due to the high likelihood of missing returning bats (Collins, 2023). The results of these surveys are summarised below in Table 13-13.

Table 13-13: Roost Survey Results 2021

Location Code	Dawn/Dusk Survey (Dates/Use of Feature/Bat Activity)	Importance Evaluation	Closest Turbine
BL1	**Survey:** Dusk 15/09/21, Dusk 23/09/21 <u>Bat species recorded/survey</u>: Common Pipistrelle: 0, 8 (total: 8) Soprano Pipistrelle: 111, 0 (total: 111) Total recorded (all species): 111, 8 (total 119) <u>Behaviour Recorded</u>: Entering or exiting BL1: None Foraging: 100, 4 Commuting: 11, 2 Unknown: 2	Local (lower value)	T8 (145m)
BL2	**Survey:** Dusk 25/08/21, Dusk 02/09/21, Dusk 20/09/21, Dusk 30/09/21 <u>Bat species recorded/survey</u>: Common Pipistrelle: 16, 11, 13, 16 (total: 56) Soprano Pipistrelle: 1, 1, 17, 1 (total: 20) Leisler's Bat: 1, 0, 0, 9 (total: 10)	Local (Higher value) – due to High Suitability and the	T11 (323m)

	Natterer's Bat: 1, 1, 6, 17 (total: 25) Pipistrelle species: 1, 0, 0, 0 (total: 1) Total recorded (all species): 20, 13, 36, 43 (total:112) <u>Behaviour Recorded/survey</u>: Entering or exiting BL2: 4, 6, 0, 26 Foraging: 8, 3, 11, 17 Commuting: 3, 3, 9, 0 Unknown: 5, 1, 16, 0	presence of roosting bats	
TR1	**Survey:** Dusk 23/08/2021, Dusk 06/09/2021, Dusk 09/09/2021, Dusk 20/09/2021, Dawn 14/09/2021 <u>Bat species recorded/survey</u>: Common Pipistrelle: 21, 1, 22, 16, 31 (total: 91) Soprano Pipistrelle: 28, 22, 54, 15, 36 (total: 155) Leisler's Bat: 6, 0, 0, 0, 0 (total: 6) Natterer's Bat: 0, 21, 0, 0, 0 (total: 21) Myotis species: 3, 0, 0, 0, 0 (total: 3) Total recorded (all species): 58, 44, 76, 31, 67 (total:276) <u>Behaviour Recorded/survey</u>: Entering or exiting TR1: 3, 0, 0, 0, 0 Foraging: 55, 42, 76, 31, 67 Commuting: 0, 2, 0, 0, 0 Unknown: 0, 0, 0, 0, 0	Local (Higher value) – due to High Suitability and the presence of roosting bats	T10 (134m)
TR2	**Survey:** Dusk 06/09/21, Dusk 28/09/21 <u>Bat species recorded/survey</u>: Common Pipistrelle: 141, 4 (total: 145) Soprano Pipistrelle: 0,1 (total: 1) <u>Behaviour Recorded</u>: Entering or exiting this Tree: None Foraging: 141, 3 Commuting: 0, 2	Local (lower)	T10 (143m)

EIAR 13.3.5.1.3.3 Presence of maternity/hibernation roosts

A high number of emerging bats were recorded at BL2, with 26 bats emerging on one survey. This roost could be categorized as a hibernation roost due to high numbers using the roost and the timing of the survey in late September, when bats are looking for hibernation sites. This roost is located 323m South-East of the T11. The nearest project element is the windfarm road between T11 and T12, located 104m South-East of these elements.

No further potential maternity or hibernation roosts were identified within the development site or surrounding landscape.

TR1 was observed to be of use as a roost, but only 6 individuals were recorded emerging/entering this roost. It is 134m West of T10. The two other candidate tree roosts (TR2 & TR3) are present along the same linear treeline feature. None of these roosts showed above low roost activity. The activity correlated more with foraging activity surrounding TR1 and TR2.

EIAR 13.3.5.1.3.4 Core Sustenance Zones

A Core Sustenance Zone (CSZ) refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost (Collins 2023). This indicates the area within which development work may impact the commuting and foraging habitat of bats using that roost.

At BL2, emerging Common pipistrelle and Natterer's bat were recorded. The CSZ for Common pipistrelle is a 2km radius around the roost and for Natterer's bat is a 4km radius around the roost.

At TR1, which is 134m West of T10, emerging Common pipistrelle and Soprano pipistrelle were recorded which have a CSZ of 2km and 3km respectively. TR2 and TR3 are both along the same treeline. All three are located between T10 and the L5840 road which will undergo road widening works as part of the construction phase.

EIAR 13.3.5.1.4 Bat Activity Survey Results

Bat Activity Surveys at the site of the Ballynalacken Windfarm Project were undertaken using automated Anabat Express bat detectors which recorded bat calls in a zero crossing format and 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. Vantage point bat surveys have limited usefulness for later emerging bats so were not carried out.

EIAR 13.3.5.1.4.1 Fieldwork – Passive Static Survey Results

Between six and eight locations were chosen for 2021 passive surveys, covering the northern section of the 11 turbine locations and the habitats in the surrounding areas. Seven static detectors were deployed in spring, six in summer and eight in autumn for between 9 and 14 nights per available season. The southern section of the Ballynalacken Windfarm site was not subject to passive surveys in 2021 due to a change in the turbine layout which came into effect in 2022.

In order to accommodate a change in the turbine layout of the Ballynalacken Windfarm project, a total of five detectors were deployed each season for the Spring, Summer and Autumn 2022 passive surveys for between 12 and 17 nights per available season (spring, summer and autumn). These five detectors covered turbines in the southern section of the Ballynalacken Windfarm site which is mostly forestry. This included habitats in the wider area, in both forested areas and open areas. A map depicting Static Detector Deployment locations can be seen in Figure 13.4: Bats. A summary of the results of the Passive Bat Activity surveys are presented in Tables 13-14 and 13-15. For detailed results, see Appendix 13.3.

Table 13-14: Bat Activity Passive Survey Results 2021

Season	Turbine Location	Habitat type surrounding detector	Bat species	Average Bat activity levels
Spring Deployment	T6	Conifer plantation, wet grassland and agricultural grassland	Leisler's Bat	Low
			Common Pipistrelle	Low
			Soprano Pipistrelle	Negligible
			Natterer's Bat	Negligible
	T7	Conifer plantation	Leisler's bat	High
			Common Pipistrelle	Low
			Soprano Pipistrelle	Negligible
			Natterer's Bat	Low
	T8	Conifer plantation, agricultural grassland and hedgerows	Leisler's Bat	High
			Common Pipistrelle	Moderate
			Soprano Pipistrelle	Low
	T9	Conifer plantation, agricultural grassland and hedgerows	Leisler's Bat	High
			Common Pipistrelle	Low
			Soprano Pipistrelle	Negligible

Season	Turbine Location	Habitat type surrounding detector	Bat species	Average Bat activity levels
			Natterer's Bat	Low
			Brown Long-Eared Bat	Negligible
	T10	Agricultural grassland, wet grassland, scrub	Leisler's Bat	Moderate
			Common Pipistrelle	High
			Soprano Pipistrelle	High
			Myotis Species	Moderate
			Nathusius' Pipistrelle	Negligible
	T11	Agricultural grassland and hedgerows	Leisler's Bat	High
			Common Pipistrelle	High
			Soprano Pipistrelle	Moderate
			Brown Long-Eared Bat	Negligible
			Natterer's Bat	Negligible
			Daubenton's Bat	Negligible
			Myotis Species	Low
	T12	Conifer plantation, agricultural grassland and recolonising bare ground	Leisler's Bat	High
			Common Pipistrelle	High
			Soprano Pipistrelle	High
			Nathusius' Pipistrelle	Negligible
			Myotis Species	Low
			Brown Long-Eared Bat	Negligible
Summer Deployment	T7	Conifer plantation and wet grassland	Leisler's Bat	High
			Common Pipistrelle	High
			Soprano Pipistrelle	Low
			Myotis Species	Negligible
	T8	Conifer plantation, agricultural grassland and hedgerows	Leisler's Bat	High
			Common Pipistrelle	High
			Soprano Pipistrelle	Low
			Nathusius' Pipistrelle	Negligible
			Myotis Species	Low
			Brown Long-Eared Bat	Negligible
	T9	Conifer plantation and agricultural grassland	Leisler's Bat	High
			Common Pipistrelle	Low
			Soprano Pipistrelle	High
			Myotis Species	Negligible
			Brown Long Eared Bat	Negligible
	T10/T9	Wet grassland and hedgerows	Leisler's Bat	Low
			Common Pipistrelle	High
			Soprano Pipistrelle	Negligible
			Myotis Species	Low
	T11	Wet grassland, hedgerows and agricultural grassland	Leisler's Bat	Moderate
			Common Pipistrelle	Low
			Soprano Pipistrelle	Negligible
	T12	Conifer plantation, agricultural grassland and recolonising bare ground	Leisler's Bat	High
			Common Pipistrelle	High
			Soprano Pipistrelle	High
			Myotis Species	Low
			Brown Long-Eared Bat	Negligible
Autu mn Deplo	T2	Conifer plantation	Leisler's Bat	Negligible
			Common Pipistrelle	High
			Soprano Pipistrelle	Low

Season	Turbine Location	Habitat type surrounding detector	Bat species	Average Bat activity levels
	T2	Conifer plantation	4096 unknown flights	
	T5	Clearfell areas of conifer plantation	Leisler's Bat	Negligible
			Common Pipistrelle	Negligible
			Myotis species	Negligible
	T6	Clearfell areas of conifer plantation, scrub and agricultural grassland	Soprano Pipistrelle	Negligible
			Myotis Species	Negligible
	T7	Conifer plantation and agricultural grassland	Common Pipistrelle	Negligible
	T8	Conifer plantation and agricultural grassland	Leisler's Bat	Negligible
			Common Pipistrelle	Moderate
			Soprano Pipistrelle	High
			Brown Long Eared Bat	High
	T9	Conifer plantation and agricultural grassland	Leisler's Bat	Negligible
			Soprano Pipistrelle	Negligible
			Myotis species	Low
	T10	Conifer plantation and agricultural grassland	Common Pipistrelle	High
			Soprano Pipistrelle	Low
			Brown Long Eared Bat	Negligible
	T10	Conifer plantation and agricultural grassland	Common Pipistrelle	Low
			Soprano Pipistrelle	Negligible
			Leisler's Bat	Negligible

Table 13-15: Bat Activity Passive Survey Results 2022

Season	Turbine Location	Habitat type surrounding detector	Bat Species	Average Bat activity levels
Spring Deployment	T1 / T2	Conifer plantation	Leisler's Bat	Negligible
	T5	Clearfell section of conifer plantation	Leisler's Bat	Low
			Soprano Pipistrelle	Negligible
			Myotis Species	Negligible
	T5	Clearfell section of conifer plantation	Leisler's Bat	Low
			Common Pipistrelle	Low
			Soprano Pipistrelle	Low
			Brown Long-Eared Bat	Low
			Myotis Species	Negligible
			Nathusius' Pipistrelle	Negligible
	T6	Clearfell section of conifer plantation and agricultural grassland	Leisler's bat	High
			Common Pipistrelle	High
			Soprano Pipistrelle	High
			Nathusius' Pipistrelle	Low
			Myotis species	Moderate
	T8	Conifer plantation and agricultural grassland	Leisler's bat	Low
			Common Pipistrelle	Low
			Soprano Pipistrelle	Low
			Myotis species	Low
			Nathusius' Pipistrelle	Negligible
Summ er Deplo	T1 / T2	Conifer plantation	Leisler's bat	High
			Common Pipistrelle	High
			Soprano Pipistrelle	High

Season	**Turbine Location**	**Habitat type surrounding detector**	**Bat Species**	**Average Bat activity levels**
			Brown Long-eared bat	Low
			Nathusius' Pipistrelle	Negligible
	T5	Clearfell section of conifer plantation	Leisler's bat	Low
			Common Pipistrelle	High
			Soprano Pipistrelle	High
			Nathusius' Pipistrelle	Negligible
			Myotis species	Negligible
			Brown Long-eared bat	Negligible
	T5	Clearfell section of conifer plantation	Leisler's bat	Low
			Common Pipistrelle	High
			Soprano Pipistrelle	High
			Nathusius' Pipistrelle	Negligible
			Myotis species	Low
			Brown Long-eared bat	Negligible
	T6	Clearfell section of conifer plantation and agricultural grassland	Leisler's bat	Moderate
			Common Pipistrelle	High
			Soprano Pipistrelle	High
			Nathusius' Pipistrelle	Negligible
			Brown Long-eared bat	Negligible
	T8	Conifer plantation, agricultural grassland	No data recorded	
Autumn Deployment	T2	Conifer plantation	Leisler's bat	High
			Common Pipistrelle	High
			Soprano Pipistrelle	High
			Nathusius' Pipistrelle	Negligible
			Myotis species	Negligible
			Brown Long-eared bat	Low
	T3/T4/T5	Clearfell section of conifer plantation	Leisler's bat	Low
			Common Pipistrelle	High
			Soprano Pipistrelle	High
			Nathusius' Pipistrelle	Negligible
			Myotis species	Low
			Brown Long-eared bat	Negligible
	T5	Clearfell section of conifer plantation	Leisler's bat	Moderate
			Common Pipistrelle	High
			Soprano Pipistrelle	Low
			Nathusius' Pipistrelle	Negligible
			Myotis species	Negligible
			Brown Long-eared bat	Negligible
	T6	Clearfell section of conifer plantation and agricultural grassland	Leisler's bat	Moderate
			Common Pipistrelle	High
			Soprano Pipistrelle	High
			Myotis species	Low
			Nathusius' Pipistrelle	Low
			Brown Long-eared bat	Low
	T8	Conifer plantation and agricultural grassland	Leisler's bat	Moderate
			Common Pipistrelle	High
			Soprano Pipistrelle	High
			Myotis species	Low
			Brown Long-eared bat	Negligible

EIAR 13.3.5.1.4.2 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 2021. The locations of the transect surveys varied- the surveys took place on public roads and in varied agricultural habitats adjacent to the proposed Ballynalacken Turbines. Transect survey results can be found below in Table 13-16. The locations of the transect surveys are illustrated on Figure 13.4: Bats.

Table 13-16: Transect Survey Results 2021

Transect survey results at Ballynalacken			
Species Recorded	**Spring** **4 No. transects** **4.03km of transects total**	**Summer** **4 no. transects** **4.03km of transects total**	**Autumn** **4 no. transects** **4.03km of transects total**
Common pipistrelle (*Pipistrellus pipistrellus*)	Frequency: at 2 transects (total of 18 calls)	Frequency: at 2 transects (total of 28 calls)	Frequency: at 3 transects (total of 16 calls)
Soprano pipistrelle (*Pipistrellus pygmaeus*)	Frequency: at 2 transects (total of 3 calls)	Frequency: at 1 transects (total of 2 calls)	None
Leisler's bat (*Nyctalus leisleri*)	Frequency: at 2 transects (total of 11 calls)	Frequency: at 2 transects (total of 4 calls)	None

EIAR 13.3.5.1.4.3 Summary of Bat Activity from Passive and Transect Surveys

The level of bat calls recorded during the 2021 and 2022 (combined) passive surveys was spread across several species. The bat calls recorded during the static detector deployments were identified to a species level using Kaleidoscope software with the auto-ID function. Common Pipistrelle was recorded the most (22.03%) followed by Soprano Pipistrelle (8.67%) and Leisler's Bat (3.6%). Nathusius' Pipistrelle (0.09%) *Myotis* spp. (0.3%), Natterer's Bat (0.12%), Daubenton's Bat (0.014%) and Brown Long-eared Bat (0.65%) 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* records from automated detectors were identified only to genus level. level. When the data was processed, 66% of recordings were unidentifiable for 2021 and 2022 combined. This includes all recorded noise interference such as bird calls, insect noises and wind. Studies on the accuracy of Kaleidoscope auto-ID software indicate an average success rate of 71% in correctly identifying species (Brabant *et al.*, 2018). The majority of these records were located within the Southern half of the site across the conifer plantation habitat areas.

Moderate and High levels of bat activity were recorded from across the Ballynalacken Windfarm study area for Leisler's bat, Common and Soprano pipistrelle. Natterer's Bat were recorded in Moderate numbers in the vicinity of T10 during Spring 2011, however Negligible numbers were recorded at this turbine location during the Summer and Autumn periods. Brown Long Eared Bat was recorded in High numbers at T8 in Autumn 2021, and in Moderate numbers at T2 in Spring 2022, otherwise numbers were Low to Negligible throughout the site. Nathusius' Pipistrelle and Myotis species were recorded at Negligible levels with occasional Low levels of activity recorded, while Daubenton's Bat was rarely recorded at the windfarm site.

The transect surveys identified commuting Leisler's bat, Common and Soprano pipistrelle along the treelines beside the forestry at the centre of the site. Commuting Common pipistrelle was recorded along the hedgerows to the north of the site. Foraging Common and Soprano pipistrelle were recorded to the north-east of the site, outside the site boundary. No swarming areas or migration routes were found onsite or in the surrounding area.

EIAR 13.3.5.1.5 Existing Sources of Impacts to Bats

The occurrence of existing pollution or environmental damage in the areas on or around the location of the Project have also been considered, and the following existing sources of impacts to Bats have been considered herein:

- One of the predominant landuses in the immediate area is conifer plantation, the felling and management of which can have an effect on bat activity and roost occupation due to noise disturbance.
- Where felling has occurred, wider spaces with linear tree features can be created, providing suitable foraging and commuting habitat to bats. The majority of the felling of most of the forestry present within and surrounding the proposed Ballynalacken windfarm red line boundary is scheduled to be conducted between 2028 and 2045.
- Ash dieback is posing a threat to ash trees across the country. Measures to cure or treat dieback successfully have not been developed yet. The TR1 roost is an Ash tree. No signs of dieback were present.
- According to the Forest Statistics Ireland 2023 report, ash dieback has been reported throughout the island of Ireland, including Co. Kilkenny. NBDC data has a record of Ash dieback within a 1kmx1km square North of Castlecomer Town. There are Ash trees in close proximity to TR1 which show signs of dieback, and therefore there is a risk that the dieback may spread to the TR1 tree in the future.
- Ash dieback may have both positive (increased roosting cavities) or negative impacts (loss of roosting cavities if a tree/branch falls); (BCT n.d) assesses the impact of Ash dieback to be positive where trees are left standing or negative if trees are felled but there is no clear indication on overall or longer term impacts.

<u>EIAR Figures: (included at the end of this Chapter)</u>

Figure 13.4: Bats

<u>EIAR Appendices: (included at the end of this Chapter)</u>

Appendix 13.3: Bat Survey Results

EIAR 13.3.5.1.6 Importance of Bats & Sensitivity to Change

<u>Importance</u>:

All bat species, and their breeding / resting places, are legally protected in Ireland under the Wildlife Act 1976 (as amended in 2000), are listed on the Red List as Annex IV of the EU Habitats Directive 92/43/EEC, and further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983).

The IUCN Red List categories and criteria are used to assess the conservation status of these species in Ireland. Ireland's resident bat species were assessed as least concern in the most recent IUCN Red List publication by NPWS (Marnell *et al*., 2019). Lesser Horseshoe Bat is the only Annex II listed species under the EU Habitats Directive present in Ireland. As such, where present, it is considered of county importance. No SACs listing this species are within 5km of the Ballynalacken Windfarm. **All other Bat species are considered to be of Local (higher value) importance, and are considered a key ecological feature**.

Two bat roosts were identified within the survey area – one at a derelict building, BL2 and one at a mature ash tree (TR1). Due to the High suitability for roosting bats and species present and numbers associated with these roosts, these are assessed as being of Local Importance (Higher Value). Both of these bat roosts, **BL2 and TR1 are considered key ecological features**.

The levels of recorded activity of common and widespread species, aligned with the habitat suitability being assessed as Medium (generally low intrinsic value habitats but good connection for commuting within the landscape) results in **the area being assessed as of Local Importance (Higher Value) for bat species**.

As a result of bat activity surveys, the site of the proposed Ballynalacken Windfarm Project is identified as being used regularly (High Activity) by Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*) and Leisler's Bat (*Nyctalus leisleri*).

Due to the frequency of records, **Common Pipistrelle, Soprano Pipistrelle and Leisler's 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.**

<u>Sensitivity to Change</u>:

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 2019, 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.

Bat Foraging and Flight Behaviour

To facilitate the evaluation of collision risk to the various bat species as a result of the Proposed Ballynalacken Windfarm, an overview of the typical flight behaviour of each of the bat species recorded is provided in Table 13-17. 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, along with evidence of casualty rates (NatureScot, 2021).

Table 13-17: Abundance & Typical Flight Behaviour of Bat Species recorded at the Proposed Ballynalacken Windfarm

Bat Species	Abundance at the windfarm site	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
Natterers Bat	Less common and more localised	Low flying species within 10 to 15m of foliage forages along woodland, mature hedgerow and pastureland	Low
Brown Long-Eared Bat	Less common and widely distributed	Forage in woodland flying amongst the foliage, picking moths and other insects off leaves	Low
Nathusius' Pipistrelle	Least common and more localised	Forages over water and along forest tracks.	High
Daubenton's Bat	Rarely recorded at the windfarm site	Strongly associated within watercourses; low, level flight a few centimetres above the surface of the water	Low

EIAR 13.3.5.1.7 Evolution of the Baseline Environment (the 'Do-Nothing' scenario)

Trends in Key Indicators over time: Under Article 17 of the EC Habitats Directive (European Commission Directive 92/43/EEC), 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 projects 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 (Roche & Langton, 2024). If the 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.

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 project.

Thresholds/Limits:

The thresholds of importance set out below follows the importance criteria as set in the methodology in section A13.8.3.3 in Appendix 13.8 (NRA, 2009). The population estimates are based on the most recent monitoring reports for the bat species within the Island of Ireland.

Leisler's Bat population in Ireland is considered stable/increasing and is relatively common in Ireland but due to its rarity throughout the rest of Europe is considered as being of international importance. Where the impact on the population affects the national scale of this species it may have international level effects. Roche & Langfort (2024) determined the national population to be between 112,800 - 202,300. As such, an impact of 1,128 individuals would equate the minimum threshold for a Nationally important population.

Common Pipistrelle has been estimated to have a population of 1,872,500-4,229,800 within the republic of Ireland. As such, the minimum threshold for a Nationally important population equates to 18,725 individuals.

Soprano Pipistrelle has been estimated to have a population of 1,204,800-2,709,600 within the republic of Ireland. As such, the minimum threshold for a Nationally important population equates to 12,048 individuals.

Nathusius' Pipistrelle has a population of only 22,200 based on hedgerow car surveys as of 2023. This is higher than the general estimate of 4,100-6,900. This low estimate is related to the detection confidence for this species being low. As such, a density of over 220 individuals may indicate locally important area of County or potentially National Importance if a roost is present.

Brown Long-eared Bat has a population trend of 65,000-102,000 individuals. This species has undergone a positive increase since 2007. As such, a density of over 650 individuals may indicate a locally important area of county or potentially National Importance if a roost is present with such numbers.

None of these species activity levels from static detectors exceeded nationally important thresholds at any point of the Spring, Summer or Autumn seasons. One season in 2022 (Autumn) yielded almost sufficient records to achieve National important threshold (Leisler's Bat, 1062 calls). The majority of these calls were at the T2 location. However, these calls are not indicative of how many individuals are present but rather how often they fly through the potential Turbine location. As such, no populations of county importance or higher are present within the receiving environment of the proposed Ballynalacken Windfarm project.

Drivers of Change: The increased incentive and demand for housing in Ireland has resulted in previously derelict and old stone house ruins to be renovated and rebuilt for human habitation, removing suitable roost habitat across the country in areas previously of low disturbance for bats. The felling of Ash trees which have succumbed to Dieback is on-going throughout Ireland, and likely to continue for a number of years. Where mature and rotting trees are being removed, this also removes potential roost options for bat species in the area.

Climate change is having an effect on bat behavior and physiology, with studies showing a decrease in accumulated fat reserves at the start of the hibernation and potential effects on breeding success.

These drivers are likely to continue. Derogation licenses and mitigation to replace bat roosts when removal or destruction is unavoidable and in areas suitable to encourage roost re-founding away from impact sources such as windfarm turbines are essential measures to reduce the impact on bat populations in Ireland.

Key areas that may be particularly adversely affected: Ash die back is currently affecting the availability of roosts in mature trees. The tree TR1 identified as a roost could potentially be affected by this disease, although it currently shows no signs of the disease. It is noted though, that other Ash trees in the vicinity of TR1 show various stages of dieback.

EIAR 13.3.5.2 Impact Evaluation – Bats

This Section comprises an evaluation of the likely significant impacts of the proposed Ballynalacken Windfarm Project on the receiving environment. Moderate, Slight, Imperceptible and Neutral Impacts are also taken into consideration.

The impacts are presented/evaluated as follows:

a) Significant Impacts which are likely or have potential to occur, are subject to detailed evaluation;

b) Moderate or Slight Impacts, which are likely or have potential to occur, are subject to detailed evaluation;

c) Non-significant impacts of local concern or considered important enough to merit detailed evaluation;

d) Neutral or Imperceptible Impacts are scoped out from detailed evaluation, and a short evaluation is provided in the table below. Unlikely Impacts are also scoped out.

Table 13-18: Impacts to Bats

Likely/Potential Impact	**Evaluation**	
Significant Impacts which are likely or have potential to occur – see detailed evaluation		
Operational Phase: Mortality of bats due to collision or barotrauma		*Section EIAR 13.3.5.2.1*
Moderate or Slight Impacts, which are likely or have potential to occur - see detailed evaluation		
Construction, Operational & Decommissioning Phases: Loss, Reduction of feeding areas, Severance of commuting routes		*Section EIAR 13.3.5.2.2*
Construction Phase: Disturbance or displacement of bats		*Section EIAR 13.3.5.2.3*
Operational Phases: Disturbance of roosting bats as a result of operating turbines		*Section EIAR 13.3.5.2.4*
Neutral or Imperceptible Impacts, or where no impact is likely to occur – evaluation below		
Construction: Destruction of bat roosts	No Likely Impact: No demolition of buildings required, no felling of trees with Moderate/High suitability for roosting bats along hedgerows or treelines to be removed at the windfarm site, along cables routes or at haul route works locations, and no works within the root protection zone of mature trees along the cable routes to construct, operate or decommission the Ballynalacken Windfarm Project. Therefore it is considered that destruction of bat roosts and potential mortality of roosting bats is not likely to occur.	
Operational/Decommissioning Phases: Disturbance of roosting bats during operational phase maintenance and decommissioning works	Not Significant/No Likely Impact: During the operational and decommissioning phases due to low level of impact sources (noise, vibration, lighting, presence of people) arising from very low, infrequent use of heavy machinery, the small number of personnel and vehicles on site, with works of short duration and at discrete works locations - c. once per week at a turbine location during operation, typically 4-5 days for turbine component replacement works, and for a period of c.2 weeks per turbine during the decommissioning phase, it is evaluated that any disturbance effects at bat roosts will be Neutral. Tinnalintan Substation will be maintained by ESB Networks/EirGrid, and typically involve a monthly visit. Lighting at substation uses motion detection lights to ensure lights are not turned on continuously. Maintenance of the Internal Cable Link or Ballynalacken Grid Connection will involve yearly inspections. Therefore, the potential for significant impacts as a result of maintenance or decommissioning works can be excluded. Any requirements for haul route works or activities during the operational or decommissioning phase will be carried out along or immediately adjacent to the public road corridor (which is a continuous source of disturbance and displacement to bats). Due to the minor nature and of brief duration of the haul route works and activities, and the	

	location on or adjacent to the public road network, no further disturbance/displacement of foraging or roosting bats would be expected to occur.
Operational/Decommissioning Phases: Disturbance of foraging bats	Imperceptible Impact: the magnitude of any disturbance of foraging bats will be Low to Negligible during the operational and decommissioning phases due to low level of impact sources (noise, vibration, lighting, presence of people) arising from the very low and infrequent use of heavy machinery, the small number of personnel and vehicles on site, with works generally taking place during daylight hours and infrequently. It is evaluated that any disturbance effects will be Imperceptible.
Operation Phase: Avoidance of roosting/foraging areas due to increased EMF	Imperceptible Impact: There will be no increase in electric fields as a result of EMF from underground cables due to the screening of these fields by the metallic sheath surrounding the cables and the backfill materials above the cables, the screening by the steel turbine towers and the steelwork/metalwork at the substations. While there will be some increase in ambient magnetic field levels, these levels will be substantially below EU EMF Limits. Due to the implementation of bat buffer zones, and the extent of hedgerow in close proximity to cables or the substations in the context of the extent of available foraging habitat in the area, with any exposure momentary and reversible as a bat passes over/close by the location of electrical equipment, it is considered that any impacts will be Imperceptible.

EIAR 13.3.5.2.1 Mortality of bats due to collision or barotrauma

Sensitive Aspect:	Bats
Importance:	**Local (High)** (as per Section EIAR 13.3.5.1)
Impact Source(s)	Operating turbines
Impact Pathway(s)	Direct contact, air
Project Stage	Operation Phase

<u>Overview of Impact (general):</u>

The rotation of wind turbine blades has the potential to result in direct contact with bat species resulting in physical injury and/or mortality of individual bats. Due to the stationary nature of the met mast, collision related effects are not likely to occur.

When wind speeds are insufficient for power generation, the blades of wind turbines continue to rotate slowly, which is referred to as 'idling'. It is understood that a significant number of bat fatalities can occur when turbines are idling, because these low-wind scenarios often correspond to optimum foraging periods and because the tips of blades can maintain relatively high speeds even when the turbine blade itself, is rotating slowly.

An indication of potential vulnerability of bat species as a function of turbine collision risk is provided below with respect to the species recorded at Ballynalacken Windfarm:

- Low vulnerability – Brown long-eared bat, Daubenton's bat, Natterers bat, Whiskered bat.
- High vulnerability - Common Pipistrelle, Soprano Pipistrelle, Leisler's bat, Nathusius' Pipistrelle.

<u>Examination of the Impact of the Proposed Ballynalacken Windfarm Project:</u>

The levels of recorded activity of common and widespread species, aligned with the habitat suitability being assessed as Medium (generally low intrinsic value habitats but good connection for commuting within the landscape) results in the area of the Ballynalacken Windfarm being assessed as of Local Importance (Higher Value).

Common Pipistrelle, Soprano Pipistrelle and Leisler's Bat were the three commonest species identified and as all three are considered as High Risk from collision, albeit two of the species are assessed as being of Low sensitivity due to their wide distribution, the risk collision for these species was evaluated and for all three Peak Risk is assessed as **High** without mitigation.

High activity levels for Common Pipistrelle, Soprano Pipistrelle and Leisler's Bat at each turbine location were recorded at least once during the 2021 and 2022 deployments.

The other species are assessed as Low Risk from collision or are present at low numbers (e.g. Nathusius pipistrelle) and potential impacts are assessed as Low/Unlikely.

Impact Magnitude	Low to High	**Impact Significance: *(pre-mitigation)***	**Slight** *(Low Risk species)* **to Significant** *(High Risk species)*

Mitigation and Monitoring Measures which will be implemented are presented along with a brief description of their effectiveness in avoiding, reducing or otherwise ameliorating the Slight and Significant impacts.

MM38	A buffer area of 50m from the tips of Turbine blades to any trees or hedgerows, will be created through the felling of forestry and the removal of hedgerows and trees during the construction phase.
MM39	Forestry felling will be completed at least 6 months prior to the commencement of operation of the wind turbines.
OMM13	The bat buffer zone will be maintained during operation by trimming existing trees and hedgerows, removing any scrub and additionally no new trees or hedgerows will be planted within the buffer zones. In the buffer zones in forestry areas, following the forestry felling and removal of the brash, the ground surface will be levelled, and the buffer zone will be sown with grass species. A low grass sward will be maintained within this zone to minimise its value as

	hunting habitat for Kestrel and other birds of prey. This will also minimise the value of these buffer zones to foraging bat species.
MM41	1.5km of new hedgerows will be planted during the construction phase. These new hedgerows will include c.43 no. trees (i.e. a new tree will be planted at 35-40m intervals in new hedges). 4.1km of existing hedgerow will be improved by interplanting new hedging into gaps in existing field boundaries. All new hedgerows and enhancement of hedgerows will take place outside of bat buffer zones. Hedgerows will be located to encourage bats to commute away from the turbines. A mix of native fruiting hedge species will be used for any new hedgerows and will comprise of hawthorn, along with blackthorn, holly, hazel, guelder rose, spindle, crab apple, and bird cherry. New trees will comprise a mix of native species such as oak, alder, birch, crab apple bird cherry and rowan. Hedging and trees will be of Irish provenance. Hedging plants will be sourced from Department of Agriculture approved nurseries.
OMM03	Post-construction bat activity and roost surveys will be carried out during the Operational Years 1, 2, 3, 5 and 10 to record any change to baseline roosting and activity trends.
OMM04	Operational Phase bat surveys will include carcass searches at the turbine locations. Carcass search methodology will involve searching a 100m^2 grid square for each turbine. Surveyors will walk a transect path every 5-10m within the square searching visually for carcasses. Due to the difficulty in locating smaller remains such as bats and taking into account the rotor diameter of the turbine blades, where available, specially trained detection dog teams will be used to conduct searches within a 60m radius of each turbine tower instead of visual searches. Detection dog teams have been shown to detect 70-100% of carcasses present where dogs and handlers are proficiently trained and experienced compared to visual searches being only 10-70% efficient depending on searcher expertise and terrain factors (McKeague et al., 2024; Paule et al., 2011). Both carcass search methods will be conducted with efficiency trials and carcass removal rate surveys on site to inform the collision rate estimates based on the number of carcasses found. The results of the operational phase bat surveys will inform further mitigation where the collision rate proves to be higher than predicted based on the field study data presented in this EIAR 2024. These measures are in line with the best practice guidance for post-construction monitoring of onshore windfarms for Bat species (NatureScot, 2021).
OMM14	The rotational speed of the turbine blades when idling during low wind speeds will be reduced by 'feathering' the turbine blades, which means turning the turbine blades parallel to the wind. With feathering in place, the turbines can continue to rotate slowly, but at speeds that pose much less of a risk to bats (Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation - SNH 2019). The feathering will reduce the rotational speed of the turbine blades when idling so they do not exceed 2RPM.
OMM15	Operational monitoring (targeting Leisler's Bat and other bat species activity) will be undertaken at each turbine, using automated detectors at ground level, for periods of at least ten nights, during spring (April, May), mid-summer (June, July) and autumn (August, September). Prevailing on-site weather data (temperature, wind speeds and rainfall) will be recorded concurrently with the bat activity monitoring, in order to identify conditions associated with high levels of Leisler's Bat activity. This comprehensive monitoring will be carried out in order to collect sufficient data to inform the development of an effective curtailment strategy for the protection of Leisler's Bat, while avoiding curtailment of operating turbines unnecessarily. The monitoring will identify the periods in which there is risk to Leisler's Bat and will also identify periods where there is little or no risk to Leisler's Bat. For example, a curtailment strategy could comprise the following parameters: If the bats are only active in significant numbers between sunset and sunrise, then curtailment would be targeted only on these periods. Or where bat activity is strongly influenced by weather conditions such as temperature, wind speeds and rainfall, curtailment would reflect the suitable or unsuitable conditions. Where high Leisler's Bat activity is recorded during monitoring, curtailment would be deployed on turbines where the activity occurs when ALL of the following parameters are met:

	- when wind speeds are below 6 m/s, and - when air temperatures are above 9°C and - between 1st April and 30th September throughout the night (starting 15 minutes prior to sunset and ending 30 minutes after sunrise). If the monitoring indicates that curtailment is required, then the relevant turbines will be curtailed similar to the parameters listed above and will be informed by the data gathered during monitoring. Annual reports on the curtailment strategy will be provided to relevant statutory bodies (where required), detailing the Leisler's Bat activity on-site and the efficacy of the curtailment strategy. The report will also consider the latest bat monitoring and deterrent systems

Effectiveness of Mitigation: 50m buffer from blade tip to trees and hedgerows, and the maintenance of low grass sward within these zones, will significantly reduce bat activity within the zone of influence of the turbine rotor. Similarly, the planting of new hedgerow outside of the zone of influence of the rotor, will encourage connectivity for bats in a safer area elsewhere.

During low wind conditions, the feathering of the blades when turbines are idling so they do not exceed 2RPM has been shown to significantly reduce collision risk to bats (Arnett *et al*. 2011, 2013; NatureScot, 2021).

The development and implementation of a smart curtailment strategy for Leisler bats based on activity monitoring results along with weather conditions and time of year/day, and the refining of this strategy based on operation phase bat surveys will decrease the likelihood of high levels of Leisler bat activity at turbine locations when the blades are in operation.

Post-construction monitoring surveys, including carcass searches, will be carried out to track the effectiveness of implemented mitigation measures and will provide a means to respond to changes and effects to the ecological baseline as a result of the project as soon as they arise, should they occur.

Residual Impact Significance *(post-mitigation)*:	**Imperceptible (***Low Risk)* **to Slight** *(High Risk)*

EIAR 13.3.5.2.2 Loss, Reduction of feeding areas and/or Severance of commuting routes

Sensitive Aspect:	Bats
Importance:	**Local (High), Low sensitivity** (as per Section EIAR 13.5.5.1)
Impact Source(s)	Site clearance, hedgerow removal
Impact Pathway(s)	Land cover
Project Stage	All Phases

Overview of Impact (general):

Bats forage for insect prey along hedgerows, treelines and other linear habitat features, and can be affected by the removal or modification of these features. Treelines and hedgerows are also very important linear landscape features for commuting bats in the countryside as bats prefer to travel in the shelter of such features to reduce predation.

Loss of such habitats will not kill or injure bats, but losses of linear features can disrupt their behaviour, reducing the value of regular feeding areas, may affect the ability of bats to travel safely from roosting sites to foraging areas and where longer lengths of hedgerow or linear features are removed, this may force some species to seek an alternative commuting route, and where there are few acceptable alternative features, the loss may cause bats to change roosting sites or abandon an area as a foraging resource.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Suitable foraging habitat occurs throughout the Ballynalacken Windfarm site and along the Internal Cable Link to the Tinnalintan Substation with semi-natural habitat recorded in the study area (Improved Grassland, Wet Grassland, Scrub) 134.33ha, Coniferous Plantation 50.03ha, and Hedgerows and Treelines 23.18km. In addition, there are two confirmed bat roosts (both Local Importance (Higher Value) in the vicinity of the Ballynalacken Windfarm site - a derelict cottage complex BL2 which is 323m from Turbine T11; and a mature ash tree TR1 which is 134m from Turbine T10. Both BL2 and TR1 are located within agricultural grassland where the surrounding fields are generally bounded by hedgerows, earthen banks, and post and wire fences. As suitable foraging habitat and confirmed roosts occur in the study area, any loss or degradation of habitat has the potential to affect the use of the area by bats.

The majority of hedgerow loss will occur at site entrances and along windfarm site roads to facilitate access to the turbines, and along cable routes. These losses, are not likely to sever commuting or foraging resources due to the prevalence of a network of such features in the adjacent and surrounding area – for example the loss of hedgerow along the Windfarm Site Road to T1 in Byrnesgrove will involve the removal of hedgerow on one side of the existing laneway only, leaving the hedgerow on the other side intact. Where cable link routes and Windfarm Site Roads pass through field boundaries, the extent of loss is c.4 – 7m, which is not likely to have any noticeable impact on commuting or foraging activity, as bat species, including the most commonly occurring at the windfarm site - Pipistrelles, can adapt to relatively small changes in linear habitats and will readily cross gaps of 5 – 10m. A short length of hedgerow (15m) will be temporarily lost at HR8 at the existing field access point, this hedgerow will be replaced following works, any effects will be negligible. Although there will be losses to the hedgerow network as a result of the development, there is an extensive hedgerow network in the area, and the Bat species which occur at the Ballynalacken Windfarm Project site are known to be adaptable to different habitats and suitable habitat is abundant and widespread throughout the study area.

Hedgerow removal will also be required to implement bat buffer mitigation at turbine location T11 where, c.211m of hedgerow will be removed on the existing boundary to the south of the turbine. See Figure 13.4: Bats for locations of hedgerow removal. Due to numbers of emerging bats (4 and 6 bats) recorded over 3 survey periods, with frequent emergence numbers (26) recorded during one dusk survey at a derelict building complex BL2, c. 323m to the east of T11 this roost is categorised as occasional. Leisler's Bat, Common Pipistrelle & Soprano Pipistrelle were all recorded at high/moderate levels over 2021 static detector surveys. The removal of hedgerow in the vicinity of BL2 and in the vicinity of T11 has the potential to reduce foraging areas and disrupt commuting behaviour of bats using these roosts, and foraging in the general areas around the turbines. Overall, in relation to the hedgerow felling at the turbine T11 location, it is evaluated that given the low number of bats utilising roost at BL2, and the availability of alternative commuting routes in the areas around the turbines, that the magnitude of impact will be Low.

<table>
<tr><td colspan="4">No additional hedgerow removal or loss of semi-natural habitat will occur during the operation or decommissioning phases of the Project.</td></tr>
<tr><td>Impact Magnitude</td><td>Low</td><td>Impact Significance: (pre-mitigation)</td><td>Slight (adverse)</td></tr>
<tr><td colspan="4">Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.</td></tr>
<tr><td>Design</td><td colspan="3">Minimising hedgerow removal – retention of hedgerow along one side of the widened/upgraded site access road from Site Entrance No.1 to T1; minimising gap created in hedgerows as a result of cable trench construction.</td></tr>
<tr><td>MM41</td><td colspan="3">1.5km of new hedgerows will be planted during the construction phase. These new hedgerows will include c.43 no. trees (i.e. a new tree will be planted at 35-40m intervals in new hedges). 4.1km of existing hedgerow will be improved by interplanting new hedging into gaps in existing field boundaries. All new hedgerows and enhancement of hedgerows will take place outside of bat buffer zones. Hedgerows will be located to encourage bats to commute away from the turbines.

A mix of native fruiting hedge species will be used for any new hedgerows and will comprise of hawthorn, along with blackthorn, holly, hazel, guelder rose, spindle, crab apple, and bird cherry. New trees will comprise a mix of native species such as oak, alder, birch, crab apple bird cherry and rowan. Hedging and trees will be of Irish provenance. Hedging plants will be sourced from Department of Agriculture approved nurseries.</td></tr>
<tr><td>OMM03</td><td colspan="3">Post-construction bat activity and roost surveys will be carried out during the Operational Years 1, 2, 3, 5 and 10 to record any change to baseline roosting and activity trends.</td></tr>
<tr><td colspan="4"><u>Effectiveness of Mitigation</u>:
The mitigation measure will compensate loss of bat foraging habitat through the planting of new hedgerows and the enhancement of existing hedgerows will result in no net loss of foraging habitat, while the planned location of new hedgerows will provide suitable alternative foraging routes in the vicinity of the identified roosts.

Following the establishment of new hedgerows, it is expected that Medium positive magnitude impacts will be created in relation to the existing hedgerow at the windfarm site (currently 23km), with the compensation of 1.5km hedgerow loss with 1.5km new hedgerows planted, and in addition 4km of existing field boundary hedgerows will be improved through the planting of hedgerow plants into any gaps, these actions will improve the overall quality and connectivity of habitats for Bats at the Ballynalacken Windfarm site. When the Local (Higher) value importance (Low) of habitats in the area, and the higher Medium importance of foraging habitats in the vicinity of the roosts are considered with the Medium positive magnitude impact, the significance of residual impact will be positive Slight to Not Significant.</td></tr>
<tr><td colspan="3">Residual Impact Significance (post-mitigation):</td><td>Slight (positive)
to Not Significant (positive)</td></tr>
</table>

EIAR 13.3.5.2.3 Disturbance or displacement of bats

Sensitive Aspect:	Bats
Importance:	**Local (High), Low Sensitivity** (as per Section EIAR 13.3.5.1)
Impact Source(s)	Landuse change, physical disturbance, hedgerow/tree removal, noise, vibration, lighting, forestry felling
Impact Pathway(s)	Direct contact, air and visibility
Project Stage	Construction Phase

<u>Overview of Impact (general):</u>

Construction works and activity in close proximity (i.e. 200m) to roosts can disturb bats, through noise and vibration, and can cause them to emerge during daylight, thus exposing them to diurnal predators. Sources of light close to, or shining on, roosts may affect emergence or re-entry. Sustained disturbance may also cause bats to abandon a roost.

Construction works or operating turbines may disturb and/or displace bats foraging in the area. This in turn may affect roost success and population levels locally.

The loss of a roost or foraging resource may have an effect on a local bat population, particularly if alternative roosts and foraging resources are not present in the area.

<u>Examination of the Impact of the Proposed Ballynalacken Windfarm Project:</u>

Surveys for suitable roosting features within, and 500m surrounding, construction works areas identified two buildings and three trees with suitability as roosting sites at the windfarm site. Of these features, one building (BL2) of Local (Higher) value and one tree (TR1) of Local (Higher) value were identified as Key Ecological Receptors as bats were observed entering and leaving the features and are therefore identified as likely/confirmed roosts.

BL2 is located c. 104m south-east of the nearest component of the Ballynalacken Windfarm Project, comprising the Windfarm Site Road between T11 and T12, and approximately 323m from works at the closest turbine, T11. For BL2, it is considered that the distance of the identified bat roost from the main works at the turbine, the carrying out of works generally during daylight hours, the presence of intervening hedgerows and trees, and the fact that no works are proposed to these derelict buildings or within the vicinity of them will result in a Low magnitude of disturbance to roosting bats. Consequently, the magnitude of impact at this Local (Higher) Importance roost will be Low, and Not Significant.

TR1 is located c. 100m west of the closest component of the Ballynalacken Windfarm comprising turbine T10 and its associated foundation, hardstand and drainage network. This roost is located across an open field from construction activities and could potentially be abandoned. However, it is considered that due to the occasional number of bats recorded emerging/re-entering at this roost location (3) , that such a worst-case impact would be of Low magnitude as only a small proportion of the local bat population will be affected. Considering the Local (Higher) value of this roost, the magnitude of impact will be impacts will be Medium, with a significance of impact no greater than Slight.

In relation to the Tinnalintan Substation location, no potential roost structures were observed within 200m of this project element. There is treeline/hedgerow habitat present within 50m of this project element, as such it primarily serves as a commuter path for bats. There will likely be some disturbance to foraging and commuting bats during the construction phase of the Tinnalintan Substation due to noise, vibration and/or potential construction lighting. However, there is ample alternative available habitat for foraging in the local and wider area. As such the magnitude of this impact is low and the sensitivity of bat species to substation operations has shown no correlation to significant impacts. Therefore, the effect is estimated to Negligible magnitude, and Not Significant.

In relation to cabling works for the Internal Cable Link and Ballynalacken Grid Connection the potential for disturbance to bat roosts is considered Low due to the transient nature of these works, with impacts brief and reversible as works progress past any roosts.

In relation to tree trimming at HR11 on the regional road, it is considered that due to the nature and location of these branches which are overhanging the public road, there is already a high level of regular disturbance at these trees and the potential for increased disturbance to either roosting or foraging bats is unlikely to occur.

In relation to foraging/commuting bats, while there is potential for disturbance in close proximity to the main construction works areas (turbines, substation, borrow pits), the availability of suitable alternative foraging and commuting habitat reduces the magnitude of impact to Low magnitude.

Artificial lighting will be mainly used at the temporary construction compounds and at the Tinnalintan Substation, and occasionally at turbine sites if required to complete a construction work task. As the main source of light during the construction phase (i.e. at the compounds) will be >500m from the nearest identified bat roosts or features with Moderate or High suitability, it is considered that bats roosting at these features or commuting from them to foraging areas are unlikely to be affected by lighting at the construction compounds. In relation to foraging/commuting bats, while there is potential for displacement along short lengths of nearby hedgerow and treelines, the availability of suitable alternative foraging and commuting habitat reduces the magnitude of impact. Furthermore, the construction phase is temporary in duration, and it is therefore considered that any disturbance or displacement of bats will be Low magnitude.

Overall, due to the low number of identified/potential roosts, the Local importance of the area for bats, the negligible change to baseline conditions and the temporary duration of construction works, the magnitude of disturbance impacts will be generally Low to Negligible during the construction phase, Low magnitude at roost BL2, and Medium magnitude at roost TR1.

Impact Magnitude	Negligible to Medium	**Impact Significance: *(pre-mitigation)***	**Not Significant to Slight (TR2)**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

Design	Normal construction times will be between 07.00 to 19.00hrs Monday to Friday and 08.00 – 16.30hrs on Saturdays
SM07	One tree within 150m of the Construction Works Area Boundary was identified as a bat roost during pre-planning surveys. Pre-construction confirmatory surveys will be carried out at this tree to identify any changes in the interim period since initial pre-planning surveys. Surveys will be carried out by the Project Ecologist at a time of year that is appropriate to the type of roost e.g. June to August for maternity roosts, or November to February for hibernation roosts. If the location or status of roosts has changed, then the use of lighting at nearby construction works locations will be adapted accordingly by the Project Ecologist.
MM36	Security lighting will be used at the Temporary Construction Compounds, Tinnalintan Substation and at the Windfarm Control Building. All lighting will be cowled in order to prevent light spill, and no lighting will be left turned on overnight. Lighting will be controlled by motion and time sensors to minimise the amount of time the lights are operational.
MM37	Plant and machinery will not be permitted to idle and any plant operating within 200m of a bat roost will be fitted with noise dampeners and surrounded by an acoustic enclosure or portable screen.
MM38	A buffer area of 50m from the tips of Turbine blades to any trees or hedgerows, will be created through the felling of forestry and the removal of hedgerows and trees during the construction phase.
MM39	Forestry felling will be completed at least 6 months prior to the commencement of operation of the wind turbines.
MM40	Project Ecologist to supervise the placement of bat boxes to compensate for any loss through disturbance of potential roosts and provide alternative roosting locations for bats roosting in BL2 and TR1.
OMM12	The new bat boxes will be checked annually for integrity and will be replaced if necessary.
MM41	1.5km of new hedgerows will be planted during the construction phase. These new hedgerows will include c.43 no. trees (i.e. a new tree will be planted at 35-40m intervals in new hedges). 4.1km of existing hedgerow will be improved by interplanting new hedging into gaps in existing field boundaries. All new hedgerows and enhancement of hedgerows will take place outside of bat buffer zones. Hedgerows will be located to encourage bats to commute away from the turbines. A mix of native fruiting hedge species will be used for any new hedgerows and will comprise of hawthorn, along with blackthorn, holly, hazel, guelder rose, spindle, crab apple, and bird cherry.

	New trees will comprise a mix of native species such as oak, alder, birch, crab apple bird cherry and rowan. Hedging and trees will be of Irish provenance. Hedging plants will be sourced from Department of Agriculture approved nurseries.
OMM03	Post-construction bat activity and roost surveys will be carried out during the Operational Years 1, 2, 3, 5 and 10 to record any change to baseline roosting and activity trends.

Effectiveness of Mitigation:

Control of noise and working hours at construction works areas, and control of lighting in proximity to TR1 will reduce the potential for disturbance affects to roosting, foraging or commuting bats by controlling the sources of impact – i.e. noise, vibration, light, presence of personnel. Bat buffer zones will significantly reduce bat activity within close proximity to construction works at the turbine locations, also reducing the potential for disturbance to foraging bats. The potential for disturbance or displacement will also be offset through the erection of bat boxes in the vicinity of roosts, and through the provision of bat buffer zones and acceptable alternative foraging areas and commuting routes in the local area. The planted hedgerows will encourage commuting bats to move away from the turbines into the surrounding area.) Studies have indicated that there is no change in bat activity when a turbine was located 100m-283m from a hedgerow (Leroux *et al.* 2022).

The effectiveness of these measures will be verified through emergence and static detector surveys during the operational phase of the windfarm.

Residual Impact Significance *(post-mitigation)*:	**Neutral (general)** **Imperceptible (TR1, BL2)**

EIAR 13.3.5.2.4	Disturbance or displacement of roosting or foraging bats from operational turbines
Sensitive Aspect:	Bats
Importance:	**Local (High)** (as per Section EIAR 13.3.5.1)
Impact Source(s)	Noise and visual intrusion from operating turbines, lighting at turbines
Impact Pathway(s)	Air and visibility
Project Stage	Operational Phase

Overview of Impact (general):

Noise from operating turbines in close proximity to roosts can disturb bats, and can cause them to emerge during daylight, thus exposing them to diurnal predators. The turbines will be fitted with security lighting over the doors, and aviation warning lights at the top of a selected number of turbines. Sources of light close to, or shining on, roosts may affect emergence or re-entry.

Disturbance or displacement of foraging bats may affect roost success and population levels locally. The loss of a roost or foraging resource may have an effect on a local bat population, particularly if alternative roosts and foraging resources are not present in the area.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Surveys for suitable roosting features within, and 500m surrounding, turbine locations identified two buildings and three trees with suitability as roosting sites at the windfarm site. Of these features, one building (BL2) and one tree (TR1), both of Local (Higher) value, were identified as Key Ecological Receptors as bats were observed entering and leaving the features and are therefore identified as likely/confirmed roosts.

BL2 is located c. 323m from the closest turbine, T11. For BL2, it is considered that the distance of the identified bat roost from the turbine, the presence of intervening hedgerows and trees, will result in a Low magnitude of disturbance to roosting bats. Consequently the significance of impact at this Local (Higher) Importance roost will be Not Significant.

TR1 is located c. 134m west of turbine T10. This roost is located across an open field from the operating turbine and could potentially be abandoned. However, it is considered that due to the characterisation of this roost as occasional (number of bats recorded using this roost (3)), that such a worst-case impact would be of Low magnitude as only a small proportion of the local bat population will be affected. The magnitude of disturbance/displacement effects is evaluated as Medium. Considering the Local importance (higher value) of the TR1 roost, the significance of the effects will be no greater than Slight significance.

In relation to lighting on the operational turbines, due to the distance of operational turbines from local roosts and the establishment of bat buffer zones and the design of other mitigation measures to encourage bats away from the operational turbines, impact magnitude is Low.

In relation to foraging/commuting bats, while there is potential for disturbance in close proximity to the operating turbines, the availability of alternative foraging and commuting habitat reduces the magnitude of impact to Low magnitude. New hedgerow planting will be located to encourage bats to commute away from the turbines and to forage in suitable habitat in the surrounding area.

Overall, due to the low number of identified/potential roosts, the Local importance of the area for bats, the negligible change to baseline conditions at most roosts, and the distance of the operational turbines from local roosts, the magnitude of disturbance impacts will be Low in general throughout the windfarm site, Low at BL2, and Medium at TR1 which is within 200m of T10.

Impact Magnitude	Low to Medium	**Impact Significance: *(pre-mitigation)***	**Not Significant – Slight (TR1)**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

OMM16	Security lighting at Tinnalintan Substation and at the Windfarm Control Building will be cowled in order to prevent light spill and no lighting will be left turned on overnight. Lighting will be controlled by motion and time sensors to minimise the amount of time the lights are operational.

MM40	Project Ecologist to supervise the placement of bat boxes to compensate for any loss through disturbance of potential roosts and provide alternative roosting locations for bats roosting in BL2 and TR1.
OMM12	The new bat boxes will be checked annually for integrity and will be replaced if necessary.
MM38	A buffer area of 50m from the tips of Turbine blades to any trees or hedgerows, will be created through the felling of forestry and the removal of hedgerows and trees during the construction phase.
MM41	1.5km of new hedgerows will be planted during the construction phase. These new hedgerows will include c.43 no. trees (i.e. a new tree will be planted at 35-40m intervals in new hedges). 4.1km of existing hedgerow will be improved by interplanting new hedging into gaps in existing field boundaries. All new hedgerows and enhancement of hedgerows will take place outside of bat buffer zones. Hedgerows will be located to encourage bats to commute away from the turbines. A mix of native fruiting hedge species will be used for any new hedgerows and will comprise of hawthorn, along with blackthorn, holly, hazel, guelder rose, spindle, crab apple, and bird cherry. New trees will comprise a mix of native species such as oak, alder, birch, crab apple bird cherry and rowan. Hedging and trees will be of Irish provenance. Hedging plants will be sourced from Department of Agriculture approved nurseries.
OMM03	Post-construction bat activity and roost surveys will be carried out during the Operational Years 1, 2, 3, 5 and 10 to record any change to baseline roosting and activity trends.

Effectiveness of Mitigation:

Bat buffer zones will significantly reduce bat activity within close proximity to operating turbines, also reducing the potential for disturbance to foraging bats. The potential for disturbance or displacement will also be offset through the erection of bat boxes in the vicinity of roosts, and through the provision of bat buffer zones and acceptable alternative foraging areas and commuting routes in the local area. New hedgerow locations will encourage bats in area to commute away from the turbines.

The effectiveness of these measures will be verified through emergence and static detector surveys throughout the operational phase of the windfarm.

Residual Impact Significance *(post-mitigation)*:	**Neutral (general)** **Imperceptible (TR1, BL2)**

EIAR 13.3.5.3 Cumulative Impact on Bats with Other Projects

EIAR 13.3.5.3.1 Introduction to the Cumulative Evaluation for Bats

The Ballynalacken Windfarm Project (*whose effects range from Imperceptible to Significant, as per Section EIAR 13.3.5.2*) is examined hereunder for potential to have cumulative effects on Bats with other existing and permitted projects, and projects advanced in the planning system. These projects are referred to as 'Other Projects' herein.

A Cumulative Study Area is set out below and Other Projects located within this Study Area are identified and examined for in-combination effects with the Ballynalacken Windfarm Project. The potential for off-site and secondary consequential development is also considered.

EIAR 13.3.5.3.2 Scoping of the Cumulative Study Areas

The Cumulative Study Area comprises the construction works areas associated with the Ballynalacken Windfarm Project plus an area of 500m extending around the construction works areas and wind turbines within 10km of the Ballynalacken Windfarm turbines. It is considered that this area is sufficient to identify those Other Project or Activities which may cause cumulative effects to Bats with the Ballynalacken Windfarm Project.

EIAR 13.3.5.3.3 Evaluation of Cumulative Impacts

The Other Projects which occur within the Cumulative Study Area are identified in the table below and in Figure 13.10: Other Projects within the Bats Cumulative Study Areas (included at end of this chapter).

The Ballynalacken Windfarm Project is examined below for cumulative effects with each of the Other Projects within the Cumulative Study Area. An evaluation of the collective cumulative impact of the Ballynalacken Windfarm Project in-combination with all the Other Projects then follows. The evaluation takes into account any existing sources of pollution or damage identified in Section EIAR 13.3.5.1.5.

Table 13-19: Scoping of Other Projects & Activities for Cumulative Impacts

Other Project	Status	Evaluation of Cumulative Impacts
Pinewood Windfarm Cullenagh Windfarm	Consented	See Section EIAR 13.3.5.3.3.1
Laois-Kilkenny Grid Reinforcement Project Moatpark-Loan 38kV OHL Telecom Masts, Ballyouskill	Under Construction Existing Existing	<u>No Cumulative Impact</u>: No potential for cumulative noise/vibration disturbance/displacement impacts as construction of the OHL will be complete within the study area prior to the construction of the proposed development, and the 38kV OHL and Telecom Masts already existing. In addition, due to the location of works, effects to bats due to the extension of the Ballyragget Substation compound will be negligible. Overhead lines and telecom masts do not present a collision impact to Bats – therefore no potential for additive collision risk. In relation to cumulative EMF due to separation distance between the projects, any levels of cumulative EMF will be generally imperceptible due to separation between the projects and locally low (and substantially below EU EMF Limits), where underground Ballynalacken cables passes under either the new OHL or the existing 38kV OHL, any bats passing through will be exposed to low combined levels of EMF for momentary durations as the bat passes over the cables and under the OHL. No likely significant cumulative impacts will occur.
Farranrory Wind Farm Grid Connection	Consented	<u>Neutral Cumulative Impacts</u>: Even in the circumstance where these grid connection projects build during the same period as Ballynalacken, the combined activities, noise and vibration associated with their construction will be low, generally during daylight hours and will be limited to the

Other Project	Status	Evaluation of Cumulative Impacts
Parksgrove and Ballyragget Solar Farms Grid Connection		construction phase of the project. No potential for operational phase cumulative noise or collision impacts due to the separation distance between these projects and the Ballynalacken Windfarm or Tinnalintan Substation. In relation to cumulative EMF due to separation distance between the projects, any levels of cumulative EMF will be generally negligible/none and locally low (and substantially below EU EMF Limits), where the grid connections for the projects are routed beside each other at the existing EirGrid Substation - any bats passing alongside these cable routes will be exposed to low combined levels of EMF for momentary durations.
Battery Energy Storage Developments, Moatpark	Consented	No Cumulative Impact: The closest Ballynalacken Windfarm Project works relate to the Ballynalacken Grid Connection. Due to the transient nature of grid works and location of Ballynalacken works along the public road and within the existing hardcore EirGrid substation compound with no loss of suitable bat roosting or foraging habitat and where existing disturbance from traffic already exists, that cumulative impacts are unlikely to occur with the BESS projects which are consented in agricultural fields with little or no hedgerow loss.
Glanbia Wastewater Treatment Plant Tirlán Processing Plant	Existing (upgrade works currently under construction) Existing	No Cumulative Impact: Due to no potential for impacts. Works at the Wastewater Treatment Plant are likely to be completed prior to commencement of the construction phase for the proposed development, therefore no potential for cumulative construction phase disturbance/displacement impacts. Due to the nature of these developments, there are unlikely to be any significant light or noise disturbance, and do not present a collision risk to bats, therefore the potential for cumulative operational phase impacts can be excluded.
Mixed Use Development, Castlecomer	Consented	Neutral Cumulative Impact: Cumulative construction phase impacts are not predicted as the development is at a significant distance from the main windfarm works. The minor haul route works within Castlecomer will be of a very small magnitude and temporary duration within the road corridor and not expected to have any perceptible impact on local bat populations.
Hebron House Development, Kilkenny	Consented	Neutral Cumulative Impact: The closest Ballynalacken Windfarm Project works relate Haul Route Works HR2. Due to the small scale and temporary duration of works and location within the public road where existing disturbance from traffic already exists and there will be no loss of suitable bat roosting or foraging habitat, cumulative impacts to bats will be neutral.
Offsite Project – Forestry Replant Lands (outside the cumulative study area boundary)	Future activity	Scoped Out: The afforestation of 19.9 ha of agricultural lands will be located outside the study area at a distance substantially greater than 10km from the proposed windfarm site, therefore there is no potential for cumulative impacts as a result of afforestation activities.
Secondary Project – Other Energy Projects connecting to Tinnalintan Substation	Potential future project	Scoped Out: It is assumed that the construction works for the proposed development would be completed and therefore cumulative construction impacts are not predicted. In the unlikely scenario that a secondary project connection to Tinnalintan is carried out at the same time, then it is evaluated that any associated trench cabling or polesets would be of a small magnitude and would not be expected to have any perceptible impact on local bat populations.

Other Project	Status	Evaluation of Cumulative Impacts
		In relation to cumulative operational EMF, any combined levels will remain substantially below the EU EMF Limits and any exposure is likely to be momentary in duration as a bat passes over the electrical infrastructure associated with the utility projects.
Existing Sources of Impacts	Existing	Neutral/Not Significant Cumulative Impact: There are both positive and negative existing sources of impact in relation to the ongoing management of conifer plantations at the windfarm site and in relation to the prevalence of Ash-Dieback disease. In relation to cumulative impacts, there is no forestry near the roost at TR2, and therefore cumulative disturbance impacts to this roost are not expected to occur. Disturbance from construction works, including felling, in forestry areas has been evaluated as Not Significant for Ballynalacken, should forest management works occur during the same period, the cumulative disturbance in forestry areas is expected to be Not Significant. In relation to Ash Dieback, the windfarm works will not affect the structure or health of the Ash tree at TR2, and will not result in the felling of trees with bat-roost suitability, therefore no cumulative impacts are predicted to occur. In addition, the occurrence of ash-dieback in the area may provide alternative roosting habitat for bats in the short/medium term.

EIAR 13.3.5.3.3.1 Cumulative impacts with Other Windfarms

Cumulative evaluation for other operating turbines at Pinewood and Cullenagh within the greater area of Co.'s Kilkenny and Laois: The nearest of these turbines are the Pinewood turbines which at its closest point is located 4km North-East of the Ballynalacken wind turbines. There is extensive foraging habitat within this 4km area between the two windfarms. The extent of impact from these windfarms cumulatively on bat species is not likely to be of high magnitude. The Pinewood planning documents stated that bat activity at this location was low across the turbine locations and as such, no locally important populations will be affected. There is extensive treeline and riverine type habitat in the wider area of the proposed Ballynalacken Windfarm. In relation to Cullenagh, this windfarm is at the outer limit of the Cumulative Study Area, with extensive foraging habitats between this windfarm and the Ballynalacken site, and therefore it is considered that no locally important populations will be affected by the presence of the two windfarms. As such, any isolated impacts from these other windfarm projects that may contribute to impacts on the population of bats in Co. Kilkenny and Co. Laois are not likely to increase the significance of any effects described for the Ballynalacken Windfarm Project as described in Section EIAR 13.3.5.2 above.

In summary, the development of the Ballynalacken Windfarm Project will not result in significant cumulative impacts with any of the Other Projects within the Cumulative Study Area.

When the effects of the Ballynalacken Windfarm Project, are considered collectively with all of the Other Projects and existing sources of impacts within the Cumulative Study Area, it is evaluated that due to:

- the separation distance between the Ballynalacken Windfarm and the Other Projects,
- the existing status of the OHL and Telecom Masts, which do not present a collision risk to Bats,
- the location and nature of works associated with grid connections and energy projects in the vicinity of Moatpark substation compound,
- the separation distance of the bat roost in TR2 from windfarm works and from forestry plots,

- the extensive availability of alternative suitable foraging, commuting and roosting habitat in the surrounding area,

that **the collective cumulative impact on Bats will not be significant**.

EIAR 13.3.6 SENSITIVE ASPECT: BIRDS

This detailed evaluation section for Birds is presented as follows:

- Section EIAR 13.3.6.1 - description of the baseline environment of Birds;
- Section EIAR 13.3.6.2 - evaluation of the impacts of Ballynalacken Windfarm Project on Birds; and
- Section EIAR 13.3.6.3 - evaluation of cumulative impacts.

EIAR 13.3.6.1 Baseline Environment – Birds

The context, characteristics, importance and sensitivity of *Birds* are described in the subsections below. The trends and likely evolution (i.e. Do-Nothing scenario) for this Sensitive aspect are also considered.

The receiving environment in the proposed Ballynalacken Windfarm Project supports a wide variety of general bird species of open countryside and farmland, in addition to some birds of prey and wader species. Some migratory species are only present during the summer or winter months within which they disperse widely over suitable habitat, whilst other sedentary species are present throughout the year.

The composition of the baseline bird population in the Ballynalacken Windfarm area is based on the results of the bird transect, raptor roost, raptor hinterland, wetland and waterbirds, watercourse crossing and vantage point (VP) surveys which were carried out at the site during both breeding and winter seasons between 2020 and 2024. The key bird receptors are identified below.

The bird surveys focused on those species of high nature conservation value for which there is potential for impacts to occur. In Ireland, these target species are derived from the bird species listed on Annex 1 of the EC Birds Directive and those species that are of high conservation concern (Gilbert *et al*. 2021).

EIAR 13.3.6.1.1 Baseline Survey Results

EIAR 13.3.6.1.1.1 Birds of Prey

Key Bird Receptors:

Kestrel, Buzzard, Sparrowhawk, and **Peregrine Falcon** were recorded during bird surveys for the Project, and consequently are included as Key Bird Receptors herein. While **Barn Owl** was not observed during surveys, two Barn Owls were recorded within the NBDC grid square S47 on 11/08/2021. Five Long-eared Owls were recorded within the NBDC grid square S47 on 14/06/2022. As such, both owl species are deemed a key bird receptor, and evaluated herein.

No nesting Kestrel, Buzzard, Sparrowhawk or Peregrine Falcon were recorded within 2km of the proposed windfarm site.

Merlin have not been recorded during bird surveys for the Project and are also absent from the list of birds recorded in grid square S47 with the NBDC. Therefore, Merlin are scoped out from further evaluation.

Hen Harriers were not observed during bird surveys for the Project. One Hen Harrier was sighted in OS grid square S47 in 1972. Hen Harriers were not recorded with the NBDC in the site region after this date. As Hen Harriers were not found to be foraging, roosting or breeding within or in close proximity to the Proposed Ballynalacken Windfarm and were not observed in the site, and the area of the windfarm site and the surrounding landscape (2km) does not provide optimal or sufficient levels of suitable habitat to support breeding hen harrier - Hen Harriers are scoped out from further evaluation.

The context and characteristics of the key bird receptors are described below:

<u>Kestrel – context and characteristics</u>

Kestrel (*Falco tinnunculus*) is a raptor species which is widespread and common throughout Ireland. Kestrel forage over farmland, wetlands, moorland and roadside verges, and nest in trees, buildings and in cracks on cliffs and are known to utilise old crows' nests.

Kestrel was observed commuting and hunting during the breeding and winter season survey efforts. Kestrel was recorded 73 times during the breeding season VP surveys between 2021 and 2022. Winter season records totalled 110 observations during VP surveys between winter 2020/2021 and winter 2023/2024. A total of 12 Kestrel were recorded during the breeding raptor surveys in 2021. No sightings of Kestrel were recorded during breeding raptor efforts in 2022. Transect surveys conducted in the Proposed Ballynalacken Windfarm yielded three sightings during the breeding seasons 2021 and 2022. Winter Transects recorded two individuals in the winter 2021/2022 season. Thirteen Kestrel sightings were recorded within the OS grid square S47 with NBDC, the most recent of which was recorded on 16/09/2022.

The National population estimate for Kestrel is uncertain in Ireland. They have been noted to be in serious decline for both their breeding and wintering populations (Gilbert *et al*. 2021). Based on the results of Countryside Bird Surveys (CBS) over 16 years between 1998 and 2016, Kestrel was identified as the most widespread bird of prey in Ireland, with an estimated population of 13,500 individuals in the Republic of Ireland (Lewis *et al*. 2019). Crowe *et al.* (2014) determined that the best estimate of the population within the republic was between 12,100 to 21,220 individuals based on data collected between 2006-2010. Further surveys since 2016 have shown recent severe declines in their breeding population which resulted in Kestrel moving from the Amber list onto the Red list, based on the time period closer to the ideal 25-year period for this category (Gilbert *et al*. 2021). The estimates of this population via CBS methodologies are not considered representative of breeding pairs or total abundance due to the acknowledged inconspicuous nature of Kestrel during times when CBS surveys are conducted and the secretive nature of their nesting behaviour.

Based on the most recent Article 12 estimates available, it is considered that a population of National importance would equate to 121 individuals during the breeding season (12,100; 2006-2011). As a result, one nesting pair present within the ecological baseline would equate to a population of county importance. No nesting pairs were recorded within 2km of the proposed windfarm site.

Due to their conservation status, Kestrel are included as Key Bird Receptors and evaluated further herein.

<u>Buzzard – context and characteristics</u>

Buzzard (*Buteo buteo*) is a common resident raptor species in Ireland with a widespread distribution and an increasing population (Hardey *et al*., 2013; Gilbert *et al.*, 2021). Buzzard was observed 266 times during VP surveys, 20 times during breeding raptor surveys and only eight during transect surveys. As such, Buzzard is considered a key bird receptor.

<u>Sparrowhawk – context and characteristics</u>

In Ireland, Sparrowhawk (*Accipiter nisus*) is considered to be one of the most common birds of prey. Sparrowhawk was sighted 47 times during VP, during breeding raptor and transect surveys from May 2020 to March 2024 in the Proposed Ballynalacken Windfarm. Nine Sparrowhawk sightings were recorded within the OS grid Square S47 with NBDC, the most recent occurring on 31/12/2011. Due to the presence of Sparrowhawk within the vicinity of the site, they are deemed a key bird receptor.

<u>Peregrine Falcon – context and characteristics</u>

Peregrine Falcon breed on coastal and inland cliffs but can also be found in cities. Peregrine was observed twice utilising habitat within the Ballynalacken Windfarm site during VP surveys in June 2022 and March 2024 respectively. In consideration of this and due to the presence of suitable nesting sites in the wider landscape and foraging habitat within the site, Peregrine is deemed a key bird receptor.

Barn Owl – context and characteristics

Barn Owls were not observed during Barn Owl surveys undertaken in Ballynalacken Windfarm. However, two Barn Owls were recorded within the NBDC grid square S47 on 11/08/2021. As such, Barn Owls are deemed a key bird indicator.

Long-eared Owl – context and characteristics

Long-eared Owl is a small owl that utilises abandoned corvid nests during the breeding season. They have been recorded roosting in groups of five or more in winter in enclosed forestry. Long-eared Owl was not recorded during any surveys conducted for the proposed Ballynalacken Windfarm. Five records of this species are present with the NBDC grid square S47 on 14/06/2022. This species is identified in the site synopsis of the River Nore and Barrow SAC as being present in the Abbeyleix old oak woodland. The Ballynalacken Windfarm is greater than 5.8km from this area of the SAC. Although not present in the field study data, there is ample suitable habitat for this species within the area of the proposed Ballynalacken Windfarm. This species is considered stable and has not been associated with sensitivity to windfarm developments. As such, Long-eared Owl is not deemed a key bird indicator.

In brief, birds of prey which are brought forward for further evaluation include Kestrel, Buzzard, Sparrowhawk, Peregrine Falcon, and Barn Owl.

EIAR 13.3.6.1.1.2 Kingfisher

Kingfisher are the special conservation interest of the River Nore SPA and are known to occur within the River Nore SPA which is located 1.8km to the northwest (Owveg River) and 4.9km to the west (River Nore) of the closest turbines in Ballynalacken Windfarm and c.180m *(measured along the watercourse channel)* from the nearest project element (Ballynalacken Grid Connection at W3 watercourse crossing over the Rathduff_15 stream on the Regional Road). There are 23 existing records (NBDC, 12/06/2022) for Kingfisher presence within the NBDC square S47.

Kingfisher favour slow flowing rivers and streams with abundant fish prey items and suitable nesting habitat in the form of vertical sandy banks. The presence of shrubs, logjams, stakes or any other type of perch above the water is essential to allow the bird to lie in wait for its prey. It feeds mainly on small fish (average size 4 to 6 cm, maximum 10 cm). Kingfisher also catch tadpoles and other small aquatic invertebrates.

The kingfisher's nest is characteristic, it comprises a chamber at the end of a gallery dug into a clay or silt bank more than 80 cm from the water level. The entrance tunnel can be up to one meter long (usually 35 to 90 cm). The entrance to the burrow is often oval and with a diameter of 5 to 7 cm. This type of nest requires a particular habitat: natural eroded banks. Kingfisher nests are typically found in the banks of rivers whose course has not been too greatly modified, sometimes also on the edge of lakes and ponds.

Kingfisher were not observed during ecological surveys undertaken for Ballynalacken Windfarm, or during water crossing surveys undertaken in April 2022. Survey work carried out in April and May 2022 noted no watercourses of suitable habitat quality for King=fisher within the study area.

The Rathduff_15 stream flows through the study area, with two watercourse crossings – W2 and W3, involving the installation of cables in the public road pavement over an existing culvert at W2 (c.3.5km from the SPA) and either in the deck (which will include raising the height of the parapet walls) or directionally drilling under the bridge at W3 (c.180m from the SPA). While the Rathduff_15 has banks of the type suitable for nesting Kingfisher downstream of the regional road bridge, as shown in the photos below the Rathduff_15 stream is a non-perennial watercourse which was mostly dry in May 2022, and completely dry in June 2024, and therefore the value of this habitat is reduced and is evaluated as having Low value to nesting and foraging Kingfisher.

The photo (left) is taken c.140m downstream from the W3 road bridge crossing in June 2024.

It is noted that although the banks are a type suitable for nesting Kingfisher, due to the non-perennial nature of this stream, they are of Low suitability for Kingfisher.

As shown on the photos below (June 2024), the banks of the stream immediately upstream and downstream of the road bridge crossing at W3 are unsuitable for nesting Kingfisher.

Immediately downstream of the road bridge W3

Immediately upstream of the road bridge W3

However, suitable nesting banks and foraging habitat of Intermediate value were identified on the banks of the River Nore main channel, c. 300m downstream of the confluence point of the Rathduff_15 with the River Nore. Given this, Kingfisher is included as a key bird receptor.

EIAR 13.3.6.1.1.3	Passerines

The bird species recorded at the windfarm site during bird surveys are typical for the habitats at the windfarm site, which mainly comprises conifer plantation and agricultural grassland used for cattle-rearing/hill farming and hedgerows.

Key Bird Receptors: 'Red-list' passerine and thrush species recorded during surveys in Ballynalacken Windfarm comprise **Meadow Pipit**, which was recorded during transect surveys during the breeding season 2021 and 2022 and winter season 2021/22 and 2023/24. Winter Red-list comprised Redwing and Snipe recorded in winter season 2021/2022 and 2023/2024.

'Amber-list' species recorded during surveys in Ballynalacken Wind Farm include **Skylark, Willow Warbler, Starling, Linnet, House Sparrow, Spotted Flycatcher, Swallow and Goldcrest**. Starling is the only winter amber-listed species recorded, with the remaining species amber-listed for their breeding season only. Red-listed and amber-listed species which were recorded during surveys are brought forward for further evaluation as key bird receptors.

Raven is Irelands largest passerine species and is a widespread resident of Ireland, especially in upland areas. Raven was observed 66 times during VP surveys and 14 times during transect surveys in the Proposed Ballynalacken Windfarm from survey efforts between September 2020 to February 2024. A total of 14 Ravens were also recorded within the OS grid square S47 within which the Ballynalacken Windfarm site is located, the most recent occurring on 12/06/2022. Raven is green-listed in Ireland (Gilbert *et al*. 2021), and therefore is not brought forward for further evaluation as a key bird receptor. All other passerine species recorded were 'green-list' species and are not considered further herein.

Details of red, amber and green-listed birds recorded during transect and vantage point surveys are provided in full in Appendix 13.4.

Sedge Warbler and Water Rail were not recorded utilising the habitat of the windfarm site. Water rail was recorded within the wider receiving environment but not within any reasonable distance to be within a possible Zone of Impact for impacts. Despite their mention in the SAC site synopsis, they have no relevance to the baseline receptors for the Project.

Meadow Pipit– context and characteristics

Meadow Pipit are a widespread breeding species in Ireland found in bogs, uplands and areas of open land and pasture. They are generally sedentary but will move to lowland areas from their breeding sites in winter. They feed on invertebrates such as craneflies, mayflies and spiders and to a lesser extent on seeds.

Meadow Pipit were recorded 45 times during breeding transect surveys in 2021 and 2022 with the majority of records along transects within habitats between T6 and T11. Habitat adjacent to these turbines is a mix of wet grassland, forestry and improved agricultural grassland. A total of 36 Meadow Pipit records were documented during the winter transect surveys.

Skylark– context and characteristics

Skylark breed in a variety of habitats including tilled croplands, grasslands and upland heaths and bogs. They usually move out of their breeding areas for winter, forming flocks utilising stubble fields, grasslands and coastal areas. They feed on a variety of insects, seeds and plant leaves.

Skylark were recorded 22 times during transect surveys during the breeding season 2021 and 2022, with the majority of records along transects within habitats between T6 and T11. Skylark was recorded twice during winter 2023/2024 transect surveys.

Willow Warbler – context and characteristics

One of the commonest breeding birds in Ireland with highest densities in willow stands along the edges of bogs and marshes, less frequently but still common in hedgerows, woodlands and gardens with well-established shrubs and trees. They are not present in Ireland as an overwintering species. Willow Warbler feed almost exclusively on insects and other invertebrates.

Willow Warbler were recorded 18 times during transect surveys from 2021 to 2022 breeding seasons with the majority of records along transects within habitats between T6 and T11.

Starling – context and characteristics

A widespread bird found in the countryside, in woodland and farmland, and in towns and cities. Breeds throughout Ireland, but rare or absent on mountain and on moorland. Breeds in holes or crevices in buildings and in trees. Often breeds in loose colonies. Breeding birds are largely resident and are joined by huge numbers of birds from the continent in the winter. Will form huge flocks in the winter and roost in urban situation such as old buildings and piers and in the countryside in reed beds, woodland and on the coast. Starlings will forage in a wide variety of situations, usually on grassland in parks, gardens and farmland, but will also feed in trees. Will also feed on scraps in the streets, on refuse tips and on the strandline. Feeds on both plant and animal material. Foods include invertebrates, fruits, cereals and seeds. This species is amber-listed based on the low survival rate of juveniles through their first winter. As such, its winter abundance and foraging habitat is the primary conservation objective.

Starling were recorded 137 times during winter transect surveys in 2021/2022 and 2023/2024 winter seasons with ample wintering habitat for foraging and roosting across the projects area. A total of 32 Starling were recorded during the breeding bird transect surveys.

Linnet - context and characteristics

Linnets breed in a variety of habitats, including rough grassland, uplands and in coastal areas with gorse. Rather social and small flocks can be seen even during the breeding season. They are mainly resident within Ireland but will gather in large flocks outside of the breeding season. Linnets feed on seeds, spilt grain, buds and some insects, particularly when feeding young.

Linnet were recorded 28 times during transect surveys in the 2021 and 2022 breeding season with the majority of records along transects within habitats between T6 and T11.

House Sparrow – context and characteristics

House sparrows breed throughout Ireland, mainly around farm buildings and built-up areas. They nest in cavities in buildings, especially under eaves or holes formed by missing brickwork. Wintering, generally in similar locations to breeding albeit with minor movements throughout the year. House Sparrows feed on seeds, spilt grain, buds and some insects, particularly when feeding young.

House Sparrow were recorded two times during the 2021 breeding season during transect surveys with the majority of records along transects within habitats North-east of the windfarm site near the hardcore area works located adjacent to the L5838 road.

Spotted Flycatcher – context and characteristics

Spotted Flycatchers are a widespread breeding bird in broadleaf woodlands, well-vegetated hedgerows, parks and gardens. They are not present in Ireland as an overwintering species. Spotted Flycatcher feed on insects caught in flight, usually from exposed branches in woodland clearings.

Spotted Flycatcher was recorded once during 2022 breeding transect surveys and is scarce in the area.

Swallow – context and characteristics

Swallows construct a bowl shaped nest out of mud in suitable locations, generally on farm buildings with easy access to insect rich feeding areas where they feed on insects in flight.

Swallow were recorded eight times during transect surveys in the 2021 and 2022 breeding seasons with potential breeding in the buildings found around the windfarm site and the surrounding area.

Goldcrest – context and characteristics

Goldcrests breed in a wide variety of habitats, including broadleaf forests, hedgerows and suburban gardens. It is also one of the few species that will breed in dense coniferous woodlands. Resident throughout the year, numbers are reinforced by winter immigrants from the north and east. Feeds almost exclusively on insects and other invertebrates.

Three Goldcrest were recorded during breeding transect surveys in 2021 and 2022. These records were documented in the area around T9 and T11. Twelve individuals were recorded in the winter 2023/2024 season.

EIAR 13.3.6.1.1.4 Waders

Key Bird Receptors:

Golden Plover, Woodcock, and Snipe were recorded during bird surveys for the Project, and consequently are included as Key Bird Receptors herein. While **Curlew** was observed once during surveys, this species was recorded within the NBDC grid square S47, most recently in December 2011 and suitable habitat occurs onsite. As such, Curlew are deemed a key bird receptor, and evaluated herein.

Lapwing was not recorded utilising the windfarm site. The I-WeBS records of this species were located 0.5km from the nearest project element and 4.9km from the nearest Turbine location. Due to their presence on the Red List (BOCCI) and the availability of suitable habitat within the site they are deemed a key bird receptor.

Other wader species which were not observed during surveys but are present on the Red List are scoped out at this stage due to the unsuitability of the habitat within the site for their use (Dunlin and Redshank) or the absence of observations of the species in surveys and in the NBDC records for the grid squares covering the site (Common Sandpiper).

Therefore, waders which are brought forward for further evaluation include Golden Plover, Woodcock, Curlew, Snipe and Lapwing.

The context and characteristics of the key bird receptors are described below:

Golden Plover – context and characteristics

Golden Plover are generally found in large, densely-packed flocks, and in a variety of habitats both coastal and inland during winter, when their distribution is widespread in Ireland. They breed very rarely in Ireland (c.10 pairs) in heather moors, blanket bogs and acidic grasslands. Golden Plover feed on a variety of soil and surface-living invertebrates, principally soil invertebrates. They regularly feed in association with Lapwing and Black-headed Gulls.

Six Golden Plovers sightings were recorded in NBDC OS grid square S47, the most recent on 19/12/2022.

Golden Plovers were observed during the winter VP surveys undertaken in the Proposed Ballynalacken Windfarm in winter 2021/22 and 2023/24 with Golden Plover recorded in the month of March/April efforts in both seasons – 799 in 2021/2022, and 477 in 2023/2024. Golden Plover were also observed during the April months of the breeding season in 2021 and 2022, with 132 birds recorded in total over during the April months. In addition, 12 individuals were recorded near the River Nore in winter 2023/24 during I-WeBS surveys. These survey results indicate that Golden Plover occasionally use habitat within Ballynalacken Windfarm primarily as part of their migratory path from their breeding and wintering grounds, based on the counts for both the winter and breeding seasons being solely from the March and April efforts. While there are habitats which are suitable for breeding (wetland and peatland/heath habitat), no evidence of breeding Golden Plovers has been recorded in Co. Kilkenny.

Woodcock – context and characteristics

Woodcock nests on the ground in forests and woodland, usually well camouflaged against dead leaves and low vegetation. The forestry surrounding the area of the proposed Ballynalacken Windfarm site borders wet grassland providing ample foraging and nesting areas for this species. Woodcock is red-listed for its breeding population due to loss of suitable habitat.

Three Woodcock sightings were recorded in grid square S47, within which Ballynalacken Windfarm is located, the most recent of which was on 13/03/2018.

Woodcock surveys were undertaken in May and June 2021 and 2022 in the Proposed Ballynalacken Windfarm site. A total of 19 Woodcock were recorded visually and through vocalisation. Another five were seen and five were recorded via their vocalisations alone during surveys undertaken in 2021 and 2022. Activity to this degree supports the likelihood that this species is nesting within the receiving environment of the proposed Ballynalacken Windfarm site. The records were from an area east of T2 and T3 and in another between T6 and T7.

Curlew – context and characteristics

The Curlew is the largest wader in Ireland. It nests on the ground in rough pastures, meadows and heather. While it is not a common breeder in Ireland, it is found in most parts of the country. In winter it may be found in a wide range of wetland habitats both coastal and inland and in damp fields. They feed on invertebrates, crabs and molluscs.

Eight Curlew observations were recorded in OS grid square S47, the most recent was on 31/12/2011. Curlew was not sighted during VP, transect or breeding wader surveys undertaken in Ballynalacken Windfarm. However, there is suitable foraging habitat at the windfarm site (Wet Heath). The nearest breeding pairs for this species were recorded in Counties Tipperary and Laois (Colhoun *et al.*, 2022). No pairs have been reported in Co. Kilkenny.

One sole incidental sighting of Curlew was recorded flying over the site during a dusk Woodcock survey in May 2022 (648872, 673689).

Snipe – context and characteristics

A relatively common wader, Snipe are a summer visitor from western Europe and west Africa and a winter visitor from Scandinavia and Scotland. They nest on the ground, usually concealed in a grassy tussock, in or near wet or boggy terrain. Young leave the nest soon after hatching. They have a widely dispersed distribution in winter foraging across a variety of wetland and damp habitats. Snipe diet consists largely of vegetable matter and seeds, earthworms, tipulid larvae and other soil invertebrate fauna.

One Snipe was observed during Breeding Wader surveys undertaken in April 2021. One individual was recorded during transect surveys in the breeding season, seven were recorded during the 2021/22 and 2023/24 winter season transects. Six Snipe were recorded during VP surveys in the Winter 2023/24 season.

Lapwing – context and characteristics

A resident and widespread species that has suffered significant population decline in recent years. They breed on open farmland, and appear to prefer nesting in fields that are relatively bare (particularly when cultivated in the spring) and adjacent to grass. Wintering distribution in Ireland is widespread. Large flocks regularly recorded in a variety of habitats, including most of the major wetlands, pasture and rough land adjacent to bogs. Lapwing feed on a variety of soil and surface-living invertebrates, particularly small arthropods and earthworms. Suitable foraging habitat is present within the receiving environment of the project and this species was recorded within the S47 grid square (11 on the 19/12/2022).

EIAR 13.3.6.1.1.5 Waterbirds

The River Barrow and River Nore SAC is separated by a distance of 1.6km from the nearest wind turbine in the Proposed Ballynalacken Windfarm. The River Barrow and River Nore SAC is of ornithological importance for a number of E.U. Birds Directive Annex I waterbird species including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan and Bar-tailed Godwit. Furthermore, nationally important numbers of Bar-tailed Godwit are found during the winter in the SAC. NBDC records show observations of each of these species within the grid squares covering the site.

The River Nore SPA (Site Code: 004233) is located 1.8km from the nearest Ballynalacken Windfarm turbine. The site is of special conservation interest for Kingfisher. In addition to Kingfisher (addressed at 13.3.6.1.1.2 above), other waterbird species which occur within the SPA include Mute Swan, Mallard, Cormorant, Grey Heron and Moorhen (NPWS, 2011). NBDC records show observations of each of these species within the grid squares covering the site, with the exception of Cormorant.

Key Bird Receptors:

Black-Headed Gull and Herring Gull sightings were recorded in the NBDC grid square within which Ballynalacken Windfarm is located, and Cormorant was recorded near Castlecomer in S57. However, as these species were not recorded during bird surveys, and as it is considered that these species are not likely to be present in the windfarm area, they are not considered key bird receptors, and are scoped out from further consideration herein.

Greenland White-fronted Goose, Bewick's Swan, and Bar-tailed Godwit were not recorded in the NBDC grid square within which the Ballynalacken Windfarm is located and were not recorded during surveys and it is considered that these species are not likely to be present at the Project site and therefore not likely to be affected by the development. As a result, they are not considered key bird receptors, and are scoped out from further consideration herein.

Water birds observed during surveys for the Ballynalacken Windfarm Project include:

- Mallard (2.25km north-west of T11, 4 individuals)
- Coot (c. 3.2km north of T11, the closest element of Ballynalacken Windfarm Project),
- Little Grebe (c. 3.2km north of T11 and 4.3km east of T5),
- Little Egret (c.3.8km West of T7)
- Moorhen (c. 3.2km north of T11 and 4.3km east of T5),
- Mute Swan (c. 0.75km north of the Existing Eirgrid Ballyragget Substation, c. 3.2km north of T11 and 4.3km east of T5),
- Pochard (c. 3.5km North of T12),
- Teal (c. 3.2km north of T11),
- Whooper Swan (c. 1.7km South of the Ballyragget Substation) and
- Wigeon (c. 4.6km East of T1 and c. 6km North of T12).

As indicated by the distances listed above, none of these waterbird species (Mallard, Coot, Wigeon, Mute Swan, Teal, Pochard and Whooper Swan) were recorded within 1km of the proposed Ballynalacken Windfarm site. While the Internal Cable Link, Tinnalintan Substation and the Ballynalacken Grid Connection are closer to the River Nore where some of these species were recorded during I-WeBS efforts, these elements will not take place on habitat of high suitability for these species. Works affiliated with the cable link and the substation are greater than 1km from the nearest record of these species. While the grid connection and the existing Ballyragget substation are 70-250m from the nearest records for some of these species. Most of these records are from the fields adjacent to the River Nore, north-west of Ballyragget town. In addition, none of these waterbird species were recorded along the internal cable link or grid connection routes or in the vicinity of Tinnalintan Substation or within any waterbody directly connected to a Project element. Most of these species were recorded in waterbodies and habitats surrounding Ballyragget and Castlecomer towns and Ballinakill village. It is evaluated that the habitats at the Project site have low to no suitability and are of local importance (lower value) for these species. Therefore, Mallard, Coot, Little Grebe, Little Egret, Moorhen, Wigeon, Mute Swan, Teal, Pochard and Whooper Swan are not likely to be present within the receiving environment of the proposed Ballynalacken Windfarm Project site boundary or associated works and therefore are not likely to be affected by the development. As a result, they are not considered key bird receptors, and are scoped out from further consideration herein.

Lesser Black-backed Gull and **Grey Heron** were recorded at the windfarm site during bird surveys for the Project, and consequently are included as Key Bird Receptors herein.

Lesser Black-backed Gull – context and characteristics

Lesser-Black-backed Gull breed colonially with most colonies on the coast although they also utilise islands on inland lakes, sand dunes and coastal cliffs. In the winter they are found in a wide variety of habitats both inland and along the south and east coasts. They take a wide variety of prey including fish from the sea, waste from fisheries, rubbish from landfill sites and insects in flight.

Lesser Black-backed Gull were observed on six occasions in low numbers (less than 10 no. individuals in total) during VP surveys at the Ballynalacken Windfarm site. However, they were predominantly recorded during I-WeBS efforts within the rivers within the wider receiving environment and not near the windfarm site or affiliated operational works. Three sightings of Lesser Black-backed Gull were recorded in the OS grid square S47 on the NBDC website, the most recent on 15/06/2022. There is suitable foraging habitat within the watercourses surrounding the Ballynalacken Windfarm, such as, the River Nore, Dinin and Owveg rivers.

Grey Heron – context and characteristics

Grey Heron are a widely distributed and year-round resident in Ireland. It feeds along the edge of a wide range of wetland habitats from coastal waters to loughs, streams and marshy ground. Grey heron breed in large trees and can form large heronries. 21 records of Grey Heron were recorded during I-WeBS efforts. Only 3 records were observed during VP surveys.

EIAR 13.3.6.1.2 Existing Sources of Impacts to Birds

The occurrence of existing pollution or environmental damage in the areas on or around the location of the Project have also been considered and no existing pollution or damage to suitable bird breeding or foraging habitat is taking place at the Project site.

EIAR Figures: (included at the end of this Chapter)

Figure 13.5: Birds

EIAR Appendices: (included at the end of this Chapter)

Appendix 13.4: General Bird Fieldwork & Survey Results
Appendix 13.5: Collision Risk Modelling

EIAR 13.3.6.1.3 Importance of Birds & Sensitivity to Change

All species of wild bird that occur naturally in Ireland are fully protected at all times by the Wildlife Act and relevant amending legislation.

The Sensitivity of bird species (in accordance with Percival and NRA methodology, see Section A13.8.1.2 of Appendix 13.8), and their sensitivity to changes in the environment are described below.

- **Birds of Prey**

Importance & Sensitivity rating:

Kestrel moved from the Amber list to the Red List in the Birds of Conservation Concern in Ireland (BoCCI) in 2021 partly due to an increase in the timespan of the short-term breeding decline criteria (Gilbert *et al*. 2021), and due to its presence on the Red List is considered to have **High** sensitivity.

Due to the population decline and its red-listed status, a single nesting pair would equate to a population of county importance. No roost or nest sites were recorded or indicated by the activity surveys or VP surveys within 2km of the proposed windfarm site. Based on the breeding season and winter season abundances, Kestrel is of local importance (High value) only.

Buzzard and Sparrowhawk are on the Green BoCCI list and were both considered of **Local (High Value) Importance** for the receiving environment based on the numbers recorded during survey efforts. Both are considered to have **Low** sensitivity based on this importance rating. However, although of low sensitivity, both species were scoped in for their risk of collisions with operating turbines. As Buzzard is a Green-listed species, it is considered that the threshold of county importance or higher would require the presence of multiple nest pairs present within ecological baseline. The Article 12 estimate puts a nationally important number of breeding pairs at 15 based on 1% of the national breeding pair estimates (1500; 2008-2011). No breeding pairs were recorded within 2km of the proposed windfarm site.

The national population of Sparrowhawk is estimated between 9,100 to 14,830 individuals. As such the minimum threshold for a national important population would be 91 individuals (1% of Population). While the short-term population trend for Sparrowhawk is stable, the long-term trend is unknown. Only 30 individuals were recorded during VP surveys within 1km of the turbine locations. No breeding pairs were recorded within 2km of the proposed windfarm site.

Peregrine, although on the Green BoCCI list, are Annex I species under the EU Birds Directive. Peregrine was only recorded once throughout the survey efforts. As such it is considered is of Local (High Value) Importance and consequently is considered to have **Low/Medium** sensitivity.

Irelands Peregrine breeding pair count was estimated at 390 pairs in 2009 (Burke *et al*. 2015). As such, it is beyond the threshold of 120 pairs to be of international importance. Three nesting pairs present within a 10km area is considered to be the threshold for a nationally important population which due to its Annex I status would elevate it to an Internationally important population. Where one nest is present this would equate to a population of county importance. Consultation with NPWS provided no nest present within the S47 grid square. A nest was recorded within the S46 and S55 squares in 2002. No nest site was identified within 2km of the proposed Ballynalacken Windfarm during bird surveys.

Barn Owl, Although it is a species of *Least Concern* in Europe, this species is placed on the Red list in Ireland. Due to its presence on the Red List, this species is considered to have **High** sensitivity. Adults will travel up to 8km from nests for foraging but may overlap hunting territories. The population is estimated at 400 breeding pairs nationally. As such an area with four nesting territories would equate to a nationally important population. One to three nests present would equate to a county importance level based on the population estimate. Barn owl activity of more than eight individuals would be of county importance or higher in any season. Any presence of Barn Owl would equate to Local importance (High Value) (Section A13.8.1.1 in Appendix 13.8).

All these species of birds of prey were recorded on the site (Kestrel, Peregrine, Barn Owl (not recorded on site, but likely to be occurring in the locality), Buzzard and Sparrowhawk). Due to the low quality of potential habitat within the Ballynalacken Windfarm Project area, the habitat resources at the Project site was assessed as being of Local (higher) value to Birds of Prey.

Sensitivity to change:

Causes for the decline of **Kestrel** in Ireland in recent years are likely centred around prey availability, agricultural changes and reduced feeding opportunities (Wilson-Parr & O'Brien, 2019), as well secondary rodenticide poisoning.

Sparrowhawk is widespread throughout Ireland, but breeding is scarce in the west where tree cover is low. This species is reported to be highly vulnerable to wind energy developments (Strix, 2012) and fatalities through direct collision with turbines have been reported (e.g. Cullen & Williams, 2010). Secondary poisoning from lead through the ingestion of shot prey is also considered a threat for Sparrowhawks (Fisher et al. 2006), which was also amongst the species that were affected by the use of organochlorine pesticides in Europe, with population declines in the middle of the 20th century.

Buzzard has spread slowly down from the north of the country throughout the twentieth century, and is now widespread throughout Ireland. They are sensitive to persecution and hunting and also susceptible to secondary poisoning through the food chain (although this appears to be less of an issue now since the ban (and reduction in use) of certain chemicals). Due to the nature of their flight, Buzzard are vulnerable to collision with moving turbines at windfarm sites. No published study has reported the extent this impact has on Buzzard populations but they are typically included as sensitive receptors for collision risk model assessments for windfarms.

Peregrine remain sensitive to persecution at breeding sites, with several cases of illegal killing reported annually. They are also susceptible to secondary poisoning through the food chain. Threats and pressures faced by Peregrine also include hunting and collecting of wild animals and renewable energy developments.

Barn Owl are well studied in Ireland and face a number of threats. Loss of nesting sites and prey-rich foraging habitats is one of the main issues, as well as the ingestion of second-generation rodenticides that prey may have consumed. These can build up within the tissue of the Barn Owl to lethal levels. Barn Owls are also susceptible to road mortality, particularly whilst hunting along embankments and verges of motorways and other major roads. Barn Owls breed in ruined buildings and in outbuildings, though their breeding success is heavily dependent on the presence of suitable prey – Greater White-toothed Shrew, other small mammals and frogs. Therefore, pressures on these prey items is a threat to Barn Owls.

- **Kingfisher**

Importance: Kingfisher, an Amber-listed species in Ireland described as 'Vulnerable' in Europe, is an Annex I species under the EU Birds Directive, and is the cited interest of the downstream River Nore SPA and is therefore assessed as being of **Very High** sensitivity.

In relation to the importance of habitat resource at the Project site, it is considered that habitats at the windfarm site are Local importance (Higher Value), and similar value on the lower reaches of the Rathduff_15 stream where it joins, and overlaps with, the River Nore SPA. Where this stream has flowing water, it has the potential to be of low suitability use for Kingfisher ex-situ of the SPA.

An internationally important number of Kingfisher breeding pairs in any country would be 682 pairs. Ireland population is estimated at 1,300 to 2,100 pairs (NPWS, 2013). A Nationally important number of breeding pairs along any particular watercourse/river would be 13-21 pairs. As this species is an Annex I bird under the EU Birds Directive and the Irish population is considered to be of international importance, 6.8 pairs using a waterbody would also equate to an internationally important population. Where one nesting pair is present, that would equate to a county important population. No nesting Kingfisher were recorded during surveys.

Sensitivity: The kingfisher is sensitive to the quality and turbidity of the water, the availability of small fish as prey items. Water quality issues, such as nutrification from agricultural run-off or point-source pollution, may also impact on prey availability and sedimentation can affect water clarity (Kingfishers hunt by observing prey within the water).

The presence of banks favourable to nest construction is important for Kingfisher. These small earthen cliffs can be destroyed by development to facilitate the construction of watercourse crossing structures, or to make them stable (installation of gabions, concrete walls, etc.) or accessible (fishing mats, livestock access to the watercourse, etc.).

Kingfishers are known be particularly sensitive to disturbance at their nests, although they can tolerate disturbance in the vicinity (e.g. on the bank or within the watercourse) provided that the actual nest is not interfered with.

- **Passerines**

Importance & Sensitivity:

Suitable habitat occurs at the Project site for passerines, and is evaluated as Local importance (higher value).

Meadow Pipit are on the BoCCI Red List, and are evaluated as being of **Medium** sensitivity, due to their BoCCI status, recent stable/increasing population trends, and the low numbers of these species recorded at the Project site.

Skylark, Spotted Flycatcher, Willow Warbler, Starling, Linnet, House Sparrow, Swallow and Goldcrest are are on the BoCCI Amber List, and are evaluated as being of **Low** sensitivity due to their BoCCI status, recent stable/increasing population trends, and the low numbers of these species recorded at the Project site.

Sensitivity to Change:

Meadow Pipit: Changes in grazing regimes can influence the breeding abundance of Meadow Pipit. Further, climate change may cause the species to be increasingly restricted to suitable areas for breeding as Meadow Pipit abundance is negatively correlated with temperature (Risely *et al.*, 2011).

With regards to **Spotted Flycatcher, Skylark, Willow Warbler, Goldcrest, Starling, Linnet, House Sparrow** and **Swallow**. These species are vulnerable to changes in agricultural management (changes to grassland cropping and grazing regimes), hedgerow, scrub and woodland loss and insect population food item declines.

- **Waders**

Importance: **Golden Plover** and **Woodcock** are on the Red BOCCI List and are birds of *Least Concern* in Europe and globally, while the **Curlew** is on the Red List and is described as *Vulnerable* in Europe and *Near Threatened* globally. **Golden Plover** is an Annex I species. **Snipe** and **Lapwing** are present on the Red list.

The sensitivity of Golden Plover, Woodcock, Curlew, Snipe and Lapwing to the proposed development is evaluated as **High** due to recent population declines in addition to their Red Listed status. In relation to Golden Plover, an internationally important population is considered 9,300 while the nationally important population is 920. As per the importance criteria set out in Section A13.8.1.1 of Appendix 13.8, a population of county importance for this species is 1% of the National threshold within the context that this population is using the habitat within the baseline environment to forage, roost or regularly occupy during the winter season. As such, where a resident population of 92-100 individuals are present within 500m of the windfarm site, it would be considered of County importance. Due to this species Annex I listing in the EU Birds Directive this species can only be considered of county importance or higher if it is regularly foraging or roosting within the windfarm site. It is noted that the Golden Plover recorded at the Ballynalacken site were not breeding, nor resident wintering birds, the Golden Plover recorded at the Ballynalacken site were migratory flocks at the end of the winter season, and as a result the importance is considered to be Local (higher value).

While suitable habitat does occur at the Project site (in the form of Improved Grassland, Wet Grassland and Wet Heath), the semi-natural habitats of (Wet Grassland and Wet Heath) provide the best habitat onsite for Golden Plover, Curlew, Lapwing and Snipe. The mix of habitats at the Project site are abundant and widespread throughout the surrounding area, and overall the habitats at the Project site are assessed as Local Importance (higher value) to Golden Plover, Curlew, Lapwing and Snipe.

In relation to Woodcock, which utilises woodland and forestry habitats, due to the dynamic nature of conifer plantations which are felled and replanted as part of their management, and the availability of this habitat along the entire ridgeline, it is considered that habitats at the Project site are of Local Importance (higher value) to Woodcock.

<u>Sensitivity to Change</u>

The main pressures and threats faced by **Golden Plover** include renewable energy developments, modification of cultivation practices, marine and freshwater aquaculture, outdoor sports and leisure activities/recreational activities and marine water pollution. Golden Plover are sensitive to changes in land cover or land use of suitable foraging or roosting habitats such as improved agricultural grassland, wet grassland or grassland mosaics, and upland blanket bog, where land cover/use change may cause reductions in foraging success, increased exposure to predation through displacement to less viable feeding areas, and also reduction in survival rates of wintering birds. Wintering Golden Plover are also sensitive to disturbance or displacement effects due to noise, visual intrusion, and anthropogenic sources.

Fuller *et al*. (2005) listed disturbance, reduction of the field layer by deer, increasing dryness of woodland and changes in surrounding land management as potentially relevant in terms of threats faced by **Woodcock**.

Lowland breeding waders such as **Snipe** and **Curlew** are sensitive to habitat loss or fragmentation through afforestation, habitat loss from peat extraction, ground based predation, destruction from agricultural machinery and physical variables such as flooding.

The main threats faced by **Lapwing** are renewable energy developments, modification of cultivation practices, marine and freshwater aquaculture, outdoor sports and leisure activities, recreational activities and marine water pollution.

- **<u>Waterbirds</u>**

<u>Importance:</u>

Lesser Black-backed Gull is Amber-listed in Ireland, with stable or increasing population trends nationally, they are therefore assessed as having **Low** sensitivity to development based on their Local (High Value) Importance. Lesser Black-backed Gull has been identified to having a high sensitivity to collisions with operational turbine.

Grey Heron are Green-listed and is assessed as being of Negligible sensitivity.

<u>Sensitivity to Change</u>

Threats and pressures faced by **Lesser Black-backed Gull** include marine water pollution, fishing and harvesting aquatic resources and renewable energy developments.

Threats and pressures faced by **Grey Heron** includes loss of nesting habitat near waterbodies and the decline in water quality impacting the abundance of fish prey items. Grey heron population in Ireland is considered stable, however extensive decline of quality in Irelands rivers and lakes could change this trend should it occur in the future.

EIAR 13.3.6.1.4 Evolution of the Baseline Environment (the 'Do-Nothing' scenario)

EIAR 13.3.6.1.4.1 Birds of Prey

Kestrel population estimate is uncertain in Ireland. They have been noted to be in serious decline for both their Breeding and wintering populations (Gilbert *et al*. 2021). Based on the results of Countryside Bird Surveys over 16 years between 1998 and 2016, Kestrel was identified as the most widespread bird of prey in Ireland, with an estimated population of 13,500 individuals in the Republic of Ireland (Lewis *et al*. (2019). Crowe *et al.* (2014) determined that the best estimate of the population within the republic was between 12,100 to 21,220 individuals based on data collected between 2006-2010. Further surveys since 2016 have shown recent severe declines in their breeding population which resulted in Kestrel moving from the Amber list onto the Red list, based on the time period closer to the ideal 25-year period for this category (Gilbert *et al*. 2021). Causes for the decline of Kestrel in Ireland in recent years are not clear cut, but possibly due to prey availability, agricultural changes and reduced feeding opportunities (Wilson-Parr & O'Brien 2019), as well as secondary rodenticide poisoning (Nakayama *et al*. 2019). The estimates of this population via CBS methodologies are not considered representative of breeding pairs or total abundance due to the acknowledged inconspicuous nature of Kestrel during times that CBS surveys are conducted and the secretive nature of their nesting behaviour.

Buzzard exact population in Ireland is uncertain. They have been recorded throughout Ireland and have been spreading further West since 2010. Buzzard long and short-term breeding range is increasing. Furthermore, their long and short-term population trends are also increasing.

Sparrowhawk is also a green listed species. Its exact population is uncertain but the population was considered to be largely stable in Ireland following a decrease in abundance between 1997 and 2017 (Lewis *et al* (2019)).

Peregrine population estimates in Europe range from 12,000 to 25,000 breeding pairs. Irelands breeding pair count was estimated at 390 pairs in 2009 (Burke *et al*. 2015). The short-term and long-term population trends for Peregrine are increasing.

Barn owl population estimates in Ireland are 400 breeding pairs. 100 nesting pairs were reported within Co. Cork in 2023 by Birdwatch Ireland. The short-term population trend for the Barn Owl is decreasing while the long-term trend is unknown.

The main threats identified for Birds of Prey are:

- Agricultural intensification and activities generating point source pollution for pesticides,
- Avian Influenza
- Direct Poisoning,
- Loss of nesting habitat due to erosion via climate change,
- Loss of nesting habitat due to human development,
- Direct persecution by humans,
- Disturbance from Humans (Construction, traffic and other activities), and
- Increased competition from predators (Kestrel - Barns Owl, Pine Marten)

These threats may have sources within the receiving environment and are likely to be present in a 'Do-Nothing' scenario.

Birds of Prey populations declined significantly in the 20th century to the use of pesticides that resulted in chicks prematurely hatching or dying before fledging. Since the ban of pesticides the population of Birds of Prey have been recovering.

Tainted meat is still being used by farmers and others to targets corvids, foxes and sometimes directly raptors. Buzzard are regular scavengers, and while Kestrel, Peregrine, and Sparrowhawk are not typical scavengers they will avail of unclaimed meat all the same. Either directly targeted or indirectly, Birds of Prey are vulnerable to death as a result of poisoning efforts.

The recent significant decline in Kestrel populations has been observed since 2011. The main reason for this decline has been habitat loss and decline in food sources. Kestrel rely on nesting opportunities similar to Barn Owl. The increased demand for housing in Ireland has led to the renovation of hundreds of previous derelict buildings removing potential breeding sites. Kestrel also rely on flying insects and rodents for food. The decline of insects in Ireland is contributing to the decline of several bird species. Kestrel nests have been documented to be predated by Pine Marten and Barn Owl, typically raiding the entire nest of chicks in one evening. As this species is in decline, the pressures and drivers of further decline listed above are likely to continue to present within the receiving environment.

Avian influenza has become a persistent presence in the wild bird population of all species. Birds of Prey are arriving at rescue centers since they are an apex predator, they are often the last one of a chain to contract the virus from their prey.

Human disturbance is the largest driver of change to birds of prey species. Kestrel and Barn Owl will use old stone buildings, but the regular presence of humans near nests can increase the stress levels of the adults and lead to the nest being abandoned in future seasons. Historical tall structures like old churches and stone buildings are being upgraded, replaced or built around, creating a less suitable area for the Kestrel or Barn Owl to choose these sites as nesting sites. Similarly, Peregrine will use quarries for nesting sites, and the regular presence of human near nests can result in abandonment.

Buzzard and Sparrowhawk nests are widespread, typically using mature broadleaf trees along treelines and forest edges and within mature and immature mixed broadleaf forestry. Where these trees are being removed or felled, it will contribute to loss of potentially suitable nest sites. Where mixed broadleaf forestry is being permanently lost for development or land-use changes, these pressures would also result in nesting habitat loss.

EIAR 13.3.6.1.4.2 Kingfisher

Kingfisher EU population is estimated between 68200-115000 breeding pairs. Ireland population is estimated at 1,300 to 2,100 pairs (NPWS, 2013).

While the short-term breeding distribution range for the Kingfisher is increasing, the long-term range is decreasing. Furthermore, the short-term and long-term population trends for the species are both decreasing.

The main threats identified for this species are:

- Agricultural activities generating point source pollution to surface or ground waters,
- Agricultural activities generating diffuse pollution to surface or ground waters,
- Forestry activities generating pollution to surface or ground waters,
- Discharge of urban waste water (excluding storm overflows and/or urban run-offs) generating pollution to surface or ground water,
- Modification of flooding regimes, flood protection for residential or recreational development,
- Illegal harvesting, collecting and taking of food stock

- Other impacts from marine aquaculture, including infrastructure,
- Physical alteration of water bodies,
- Temperature changes (e.g. rise of temperature & extremes) due to climate change, and
- Human disturbance via trails, works and instream fishing.

These threats may have sources within the receiving environment and are likely to be present in a 'Do-Nothing' scenario.

Kingfisher are dependent on fish and winged invertebrates for dietary needs. Where agricultural or human activities contribute to the decline in aquatic habitat for these species or the decline in the species abundance within the river system, it translates to a decline in food stock for the Kingfisher.

Studies of their distribution in Ireland have linked the absence of nesting on suitable banks to the proximity of trails and roads contributing to noise and vibration disturbance to the nests.

Any drivers changing watercourse levels and bank erosion will affect this species' ability to nest and feed their progeny. As such, the increased human population and pollution sources along with climate change sources are likely to continue to contribute to this species' decline.

EIAR 13.3.6.1.4.3 Passerines

Meadow Pipit short-term and long-term breeding distribution range are stable. However, the short-term population trend is decreasing.

Skylark, Goldcrest, and Starling are experiencing a short-term decline in population trends. Skylark is also experiencing a decline in distribution range. Long term trends for Goldcrest and Starling are stable.

Starling, Linnet, House Sparrow, Swallow and House Martin have stable short-term population trends, while Willow Warbler is experiencing an increase in short-term population trends. The long-term trends for these species is stable or increasing.

Passerines native to Ireland vary in population trends. Habitat specialists and generalists alike are experiencing increases and declines dependent on factors such as habitat degradation due to urban expansion and intensification of agricultural practices. Species specific trends vary dependent on the specific niches they occupy and are able to utilise as a result of climate change and other habitat changes.

Varying impact sources can contribute to declines in a passerine species population.

The main threats identified for this group are:

- Agricultural activities removing vegetation cover, pesticide dispersal and hedgerow habitat degradation;
- Forestry activities such as felling;
- Temperature changes (e.g. rise of temperature & extremes) due to climate change; and
- Human disturbance via trails, works and instream fishing.

EIAR 13.3.6.1.4.4 Waders

Golden Plover wintering population is estimated at 92,800 (Lewis *et al*. 2019). Golden Plover breeding population is not relevant to this project as it's Irish breeding sites are isolated to the West and North-west regions of Ireland. The short-term trend in the Golden Plover population is decreasing with this estimate being of good quality. The long-term trend is unknown.

The main threats identified for Golden Plover are:

- Agricultural activities overgrazing and under grazing, and unregulated heather burning,
- Avian Influenza
- Loss of nesting habitat due to erosion via climate change,
- Loss of nesting habitat due to human development,
- Direct persecution by humans, and
- Disturbance from Humans (Construction, traffic and other activities)

Golden Plover winter in small and large loughs and fields across Ireland. The wintering population is primarily from the Icelandic/Greenland breeding population. The wintering location for Irish breeding population is uncertain. Golden Plover are primarily insectivores feeding on earthworms and sometimes fruits as well, a decline in suitable habitat for their food choices will contribute to their population decline. As such, a decline in grazing in suitable foraging fields (waterlogged sections of grasslands) will discourage foraging due to the increased vegetation density and height. The same is true for overgrazing, reducing the suitability of the grassland to host large stocks of invertebrates.

The breeding population is isolated to the North-west region of Ireland. Any decline in habitat as a result of human activity or natural changes would cause this population to decline further.

Disturbance to wintering individuals is less significant due to the larger range that flocks will travel during the winter. However, a permanent feature change to a suitable roost or foraging habitat (i.e. Development Park, Housing or windfarm) would likely displace them from returning to the area in the future.

These threats may have sources within the receiving environment and are likely to be present in a 'Do-Nothing' scenario. Based on the population identified within the proposed Ballynalacken Windfarm Project being limited to migratory flocks at the end of the winter season, Golden Plover is unlikely to experience significant decline as a result of the future baseline in a "Do-Nothing Scenario".

Woodcock have a wider distribution in Ireland in the winter season, occurring in woodland, scrub and open areas such as bracken and heather-covered hills. The estimated short-term population trend for the species is stable with this estimation based on partial data with some extrapolation. The long-term breeding range trend for woodcock in Ireland is decreasing. Due to this species' preference for nesting near conifer forestry, they are vulnerable to disturbance during felling and thinning activities. Where these works are planned over the next 30 years within the receiving environment, there is potential for Woodcock to be impacted in the "Do-Nothing" Scenario.

Curlew: The short-term and long-term population trends for Curlew in Ireland are decreasing with these estimates based on complete surveys or a statistically robust estimate. As part of international species action plans, the Curlew has been removed from the hunting list in Ireland.

Snipe is a relatively common wader. However, the long and short-term population trends for this species are decreasing, with long and short-term breeding range also decreasing. Snipe is vulnerable to direct loss via hunting practices, changes in agricultural practices affecting foraging habitat and loss of suitable habitat due to decline in peatland type areas as nesting options.

Lapwing utilise a variety of habitats but generally prefer to nest in fields that are relatively bare and adjacent to grass. The long and short-term population trends for this species are decreasing, with long and short-term breeding range also decreasing. Nest protection is currently in place as an objective of a European Management Plan for this species (European Communities, 2009).

Curlew, Lapwing and Snipe are all vulnerable to similar threats as Golden Plover that are listed above.

Curlew is also considered vulnerable to predation by fox, pine marten and corvids while nesting due to their breeding habitat being open tall wet grassland. Many sites hosting Curlew breeding pairs are managed with predator control measures to remove this pressure as much as possible.

EIAR 13.3.6.1.4.5	Waterbirds

Lesser Black-backed Gull has experienced an increase in short-term and long-term population trends and an increase in short-term and long-term breeding distribution range. The primary threats to Lesser Black-backed Gull are the decline of food options and changes to their breeding islands due to climate change related sea-level rises. Research has shown that individuals among the Northern Europe regions have high levels of degraded pesticide compounds within them, as well as carcinogenic compounds that were regularly used during the 20th Century and are still present in the habitats across Europe due to pollution and direct exposure through Agricultural and industrial practices.

Grey Heron long-term and short-term breeding distribution ranges are stable. Their short-term wintering population range is also stable. Sources of contamination from agricultural and human activities are contributing to a decline in water quality in streams and watercourses across Ireland. This decline poses the main threat to population decline for Grey Heron in the future.

These pressures are likely to remain present within the receiving environment in the “Do-Nothing” Scenario for these waterbird species.

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

Climate Change has been identified as a threat to several bird species and their habitats. Instances of extremely warm summers places pressures on nesting habitats and hunting ability for raptors. Extreme temperature put greater pressure on brooding females and can result in eggs over heating or for chicks to die from dehydration. The increase of regular high energy storms as a result of climate change can affect prey availability and also put greater pressures on young birds still developing their flight skills.

Drivers of this threat are tied to greenhouse gas emissions and continued reliance on fossil fuels. These drivers are projected to remain sources for climate change pressures and threats to aquatics species for the foreseeable future as most developed nations are not on target to achieve net zero carbon emissions by 2030.

None of the species or habitats within the River Nore SPA or River Barrow and River Nore SAC were identified specifically for being under threat from climate change. However, general vulnerability to increased temperature and extreme weather events such as storms, floods and droughts are likely to affect the aquatic habitat within the receiving environment in the vegetation and sediment compositions of rivers with potential to change watercourse levels and increase risk of bank erosion which could affect Kingfishers ability to nest and feed their progeny

These threats are likely to be present in a ‘Do-Nothing’ scenario

EIAR 13.3.6.2 Impact Evaluation – Birds

This Section comprises an evaluation of the likely significant impacts of the proposed Ballynalacken Windfarm Project on the receiving environment. Moderate, Slight, Imperceptible and Neutral Impacts are also taken into consideration.

The impacts are presented/evaluated as follows:

a) Significant Impacts which are likely or have potential to occur, are subject to detailed evaluation;

b) Moderate or Slight Impacts, which are likely or have potential to occur, are subject to detailed evaluation;

c) Non-significant impacts of local concern or considered important enough to merit detailed evaluation;

d) Neutral or Imperceptible Impacts are scoped out from detailed evaluation, and a short evaluation is provided in the table below. Unlikely Impacts are also scoped out.

Table 13-20: Scoping of Impacts to Birds

Likely/Potential Impact	**Evaluation**	
Moderate or Slight Impacts, which are likely or have potential to occur - see detailed evaluation		
Operation Phase: Birds of Prey: Collision risk		*Section EIAR 13.3.6.2.1*
Construction Phase: Kingfisher: Reduction in foraging or nesting resource in downstream habitats		*Section EIAR 13.3.6.2.2*
Construction Phase: Passerines: Physical injury/destruction of nests or chicks		*Section EIAR 13.3.6.2.3*
Operation Phase: Waders: Collision risk		*Section EIAR 13.3.6.2.4*
Non-significant impacts considered important enough (or of local concern) – see detailed evaluation		
Operation Phase: Birds of Prey: Disturbance/Displacement from operational (i.e. rotating) turbines		*Section EIAR 13.3.6.2.5*
Construction Phase: Waders: Physical injury/destruction of nests or chicks		*Section EIAR 13.3.6.2.6*
Neutral or Imperceptible Impacts, or where no impact is likely to occur – evaluation below		
Birds of Prey (Kestrel, Buzzard, Sparrowhawk, Peregrine, Barn Owl)		
Construction Phase: Permanent or temporary reduction or loss or fragmentation of suitable habitat (foraging, nesting, roosting)	Not Significant: Due to the limited nature and value of the loss of semi-natural habitats due to the development, and the adaptability of the Bird of Prey species which were recorded at the Project site, which are known to be adaptable to a range of different habitats, with abundant similar habitat available/occurring throughout the Project site and in the wider surrounding area, that permanent reduction in suitable habitats will be Low magnitude on site, and Negligible at a wider landscape scale, and taking account the High Sensitivity of Kestrel, Peregrine Falcon, and Barn Owl, and the Negligible sensitivity of Buzzard and Sparrowhawk, that magnitude of permanent impacts to these species will be Low/Negligible and Not Significant. Any temporary losses are considered Negligible and Not Significant with reinstatement of the area and availability to birds of prey, following completion of construction works.	
Construction Phase: Destruction of nests, mortality of chicks	No Likely Impact: Due to the limited extent and value of semi-natural habitats at the Project site, and no nesting Birds of Prey recorded within the site boundary during surveys 2022 and 2023, it is considered unlikely that this impact will occur.	
Construction Phase:	Not Significant: Due to the low numbers of small mammals, passerines, reptiles or amphibians recorded on site, with the construction works likely to displace rather than remove any prey items from construction works areas, with prey items therefore likely to be	

Reduction in prey item species	available to Birds of Prey outside of works areas, it is considered that any impacts will be of Negligible magnitude and Not Significant.
Construction Phase: Disturbance and/or displacement	Not Significant: Construction works and activities may result in some disturbance and/or displacement as a result of visual stimuli, noise, presence of people and operating machines. However, the species recorded are known to utilise a range of different habitats and tend to have large ranges both during the breeding and wintering periods. As suitable habitat is widespread in the area and wider countryside and taking into account the low occurrence of species throughout the Project site, it is evaluated that the potential for disturbance/displacement as a result of construction works and activities is low to negligible. Furthermore, this potential effect relates to the construction phase and is therefore temporary/short-term in duration. As a result, disturbance and displacement is unlikely to significantly impact birds of prey species using the site, and overall it is considered that any effects will be Not Significant. Barn Owl is a nocturnal bird of prey and unlikely to be affected by construction works which will mainly be carried out during daylight hours.
Operation Phase: Exposure to EMF	No Likely Impact: Increases in EMF will be Negligible/Low due to the screening by the steel turbine towers, the steelwork/metalwork at the substations, the metallic sheaths surrounding the cables and the backfill materials above underground cables, with any increases in levels of EMF substantially below EU EMF Limits. No likely effect to birds of prey using the site as literature supports no precedent for EMF as a viable impact.
Operation Phase: Habitat enhancement	Not Significant (positive): Overall, the increase and enhancement of the hedgerow network, and the protection and management of the wet heath area will not result in the windfarm site becoming an important or valuable resource to Birds of Prey. While it is expected that Birds of Prey will benefit positively from habitat protection, and hedgerow creation and enhancement, this will be a minor (albeit positive) shift away from the baseline habitats and therefore of Low magnitude and Not Significant.
Operation and Decommissioning Phases: Disturbance and/or Displacement from maintenance activities, turbine noise	Not Significant: Levels of works and activities during both the operational and decommissioning phases will be substantially less than during the construction phase. Taking the lower levels of works/activities, the low levels of birds of prey recorded on site during surveys, and the characteristics of the species recorded which are known to utilise a range of different habitats and tend to have large ranges during the breeding and wintering seasons, with suitable habitat widespread in the area and wider countryside. Therefore, it is evaluated that any disturbance or displacement effects as a result of works or activities during the operational or decommissioning phases will be Negligible and Not Significant.
Operation and Decommissioning Phases: Destruction of nests, mortality of chicks	No Likely Impact: Groundworks during operation and decommissioning are limited to haul route works, site entrances and at turbine hardstands, with annual maintenance of the drainage system and site roads. Due to the very small scale and infrequency of works, which will be brief in duration, with Birds of Prey unlikely to nest in lands adjacent to public roads or adjacent to turbines, it is considered that destruction of nests and/or mortality of chicks is unlikely to occur.
Kingfisher	
Construction Phase: Permanent or temporary reduction or loss or fragmentation of suitable nesting or roosting habitat	No Likely Impact: The Project works cross a small number of natural watercourses and man made drains. The natural watercourses are all small watercourses, comprising narrow 1st order stream (W1 on the Cloghnagh, and W2 on the Rathduff_15) or 2nd order stream (W3 lower down on the Rathduff_15) streams, with the construction of infrastructure also across wet drainage channels (D1, D2 and D3 in the Cloghnagh catchment, and D4 in the Kilcronan stream catchment). While it is noted that W3 occurs c.180m upstream from the River Nore SPA, this watercourse (Rathduff_15) is dry for part of the year, and therefore is considered unsuitable as breeding habitat for Kingfisher. Furthermore, the works at this crossing point will be entirely within the public road corridor and within the deck of the bridge or under the bridge and the watercourse if directional drill method is used. No instream works associated with this crossing, and therefore no loss or fragmentation of habitat will occur at W3.

	Surveys of these watercourses and of the existing drains confirm that no suitable nesting or roosting habitat occurs at watercourses crossings, or within the construction works area boundary at watercourse/wet drain crossing points, or within the site boundary of the Project, and therefore loss, reduction or fragmentation of suitable Kingfisher nesting or roosting habitat is not likely to occur.
Construction Phase: Physical injury/destruction of nests or chicks	No Likely Impact: Due to the location of grid connection works in the public road and within the deck of the bridge/drilled under the bridge at W3, there is no potential for physical injury of chicks or destruction of nests associated with this element. Surveys of the watercourses within the site boundary found no suitable nesting habitat and no evidence of Kingfisher nests at watercourses crossings locations, or within the construction works boundary. Therefore, it is evaluated that destruction of nests either due to physical removal of banks, or as a result of nest collapse due to vibration/compaction and/or resultant injury or mortality of chicks are not likely to occur.
Construction Phase: Permanent or temporary reduction or loss or fragmentation of suitable foraging habitat	No Likely Impact: The Project works crosses a small number of natural watercourses and a number of man made drains. The natural watercourses are all small watercourses, comprising narrow 1st order stream (W1 on the Cloghnagh, and W2 on the Rathduff_15) or 2nd order stream (W3 lower down on the Rathduff_15) streams, with the construction of infrastructure also across wet drainage channels (D1, D2 and D3 in the Cloghnagh catchment and D4 in the Kilcronan catchment). While it is noted that W3 occurs c.180m upstream from the River Nore SPA, with the lowest sections of this watercourse (Rathduff_15) near its confluence with the River Nore providing some low suitability for nesting Kingfisher, however due to the fact that this stream is dry for part of the year, it is considered sub-optimal as foraging habitat for Kingfisher. Surveys of the watercourses and of the existing drains confirm that, due to the shallow and narrow (0.5 – 1m at the windfarm site, 1 – 2m on the Rathduff_15) characteristics of the water features which interact with the Project site, and that none were evaluated as being of high fisheries value, and furthermore the lower reaches of the Rathduff_15 stream runs dry for part of the year, it is evaluated that the watercourses and wet drainage channels at the Project site are sub-optimal foraging habitat for Kingfisher, and no loss of suitable foraging habitat is likely to occur.
Construction Phase: Disturbance and/or displacement	No Likely Impact: Surveys of the watercourses within the site boundary found no suitable foraging or nesting habitat and no evidence of Kingfisher nests. The closest suitable habitat occurs (low suitability) within 10m from the closest construction works which are located at W3 on the Rathduff_15 stream and involve the installation of cables either into the deck of the existing bridge and works to the parapet walls or under the bridge by directional drill. This location is of low/negligible suitability due to the watercourse drying out in summer/dryer months of the year. No instream works will occur. The nearest intermediate suitable habitat is c. 450m downstream of the nearest construction works located at W3. This location is along the River Nore SPA. Due to the absence of suitable habitat within the site and low suitability foraging habitat in close proximity (<10m) to construction works areas, which will be contribute a negligible increase of noise activity and vibration from the baseline road traffic crossing the bridge at which these works are located. It is evaluated that disturbance and/or displacement of Kingfisher is unlikely to occur.
Operation Phase: Collision risk	No Likely Impact: Due to the distance of the turbines and met mast from watercourses (min 50m), the separation distance to suitable Kingfisher habitat (4km), the typical flight heights of Kingfisher (<15m above ground), it is evaluated that collision of Kingfisher with operating turbines is not likely to occur. In relation to the Tinnalintan Substation and met mast, no watercourse is in close proximity to this substation. The nearest suitable habitat for kingfisher is 450m from this project element. The likelihood of kingfisher colliding with live electrical parts is extremely low and is not likely to occur.
Operation Phase: Disturbance/ Displacement from operational turbines	No Likely Impact: Due to the distance of the turbines from watercourses (min 50m), the separation distance to suitable Kingfisher habitat (4km), it is evaluated that disturbance or displacement of Kingfisher from operating turbines is not likely to occur.
Operation Phase: Habitat enhancement	No Likely Impact: While watercourses will be reinstated at crossing works points, due to the size and nature of the streams at these locations they do not provide suitable foraging or

	nesting habitat for Kingfisher, and the reinstated watercourses will continue to not be suitable habitat for Kingfisher. The planting of hedgerows and protection of the dry heath area will have no effect on Kingfisher, as these types of habitats do not comprise suitable habitat.
Operation and Decommissioning Phases: Reduction in foraging or nesting resource in downstream habitats	No Likely Impact: As there is no potential for significant reductions in water quality or significant changes to flow in larger streams and rivers downstream of the Project (where there is suitable Kingfisher habitat), and taking into account the natural rise and fall of sediment levels and water levels in streams and rivers throughout the year, it is considered that changes to the availability of prey or hunting conditions (i.e. visibility of prey, flow rates) and the availability of nesting locations are not likely to change as a result of the operation or decommissioning of the Project.
Operation and Decommissioning Phases: Disturbance/ Displacement from works and activities	No Likely Impact t: Due to the distance of the turbines (location of majority of operational works and activities) away from watercourses (min 50m) and the separation distance of the windfarm (1.8km to Owveg River, 4.9km to River Nore), internal cable link (>600m) and joint bay locations along the grid connection (>230m) to suitable Kingfisher habitat , the low intensity of works in proximity to watercourses (bi-annual maintenance of Site Access Roads and drainage system at the windfarm, and yearly/infrequent joint bays inspection and maintenance along cable routes), the negligible increase of baseline roadside noise contributed by the other works during the operational or decommissioning phases, it is evaluated that disturbance or displacement of Kingfisher is not likely to occur.
Operation and Decommissioning Phases: Destruction of nests, mortality of chicks	No Likely Impact: Groundworks during operation and decommissioning are limited to haul route works, site entrances and at turbine hardstands, with annual maintenance of the drainage system and site roads. No instream works will be required, and no works will take place in proximity to suitable Kingfisher habitat. Therefore, it is considered that destruction or nests and/or mortality of chicks is unlikely to occur.
Passerines	
Construction Phase: Permanent or temporary reduction or loss or fragmentation of suitable habitat (foraging, nesting, roosting)	Imperceptible: Passerine species identified utilise a wide range of habitats that are widespread throughout the Ballynalacken Windfarm Project site and throughout the local area. While there will be some loss of semi-natural habitat, including hedgerows and wet grassland, it is considered that in the context of the availability of these habitats in the wider surrounding area, with no loss or alteration of key habitats, and the limited value to foraging, nesting or roosting passerines of the majority of habitats subject to permanent and temporary land-use change (improved agricultural grassland, conifer plantation) , that the impact magnitude will be Low, representing a minor shift away from baseline conditions, and taking into account the Medium sensitivity of Meadow Pipit and the Low sensitivity of the other passerine species recorded, that any impact will be Imperceptible.
Construction Phase: Disturbance/ displacement	Not Significant: It is considered that due to the recorded and predicted low occurrence of passerine species throughout the Ballynalacken Windfarm Project site, and due to the availability and abundance of suitable alternative habitat away from construction works areas and due to the temporary nature of works, that any disturbance or displacement of passerines will be Low, and therefore Not Significant. In addition, studies on the impacts of wind farms during construction (Pearce-Higgins *et al.* 2012) have found little evidence of significant disturbance effects on passerine species.
Operation Phase: Disturbance/ Displacement from operational turbines, and from maintenance works/activities	Not Significant: Most passerine (perching) species and general lowland farmland birds are not considered to be particularly susceptible to impacts from wind farms (SNH, 2017). Studies on the impacts of wind farms during operation (Pearce-Higgins *et al.* 2009) have found little evidence of significant disturbance effects on passerine species. In addition, habitats on site are generally of limited value to passerines (improved agricultural grassland and conifer plantation), and low numbers of passerines were recorded. It is considered that any impacts will be of Low magnitude, and Not Significant.
Operation Phase: Collision risk	Neutral Impact: Most passerine species and common resident passerines such as Meadow Pipit, Skylark and other passerines are not considered to be at risk of collision with the operating wind farm as their flight heights are generally well below the lowest point of a rotating turbine blade. Therefore, collision risk with the turbines is considered unlikely and Not Significant.

	In relation to the Tinnalintan Substation, Met Mast, Telecoms Relay Pole and Control Building, collision risk is considered unlikely due to the stationary nature of these facilities and no impact is expected to occur.
Operation Phase: Habitat enhancement	Not Significant: While it is expected that Passerines will benefit positively from habitat protection, and hedgerow creation and enhancement, this will be a minor (albeit positive) shift away from the baseline habitats and therefore of Low magnitude and Not Significant
Decommissioning Phase: Disturbance/ displacement	Not Significant: Due to the location of decommissioning works predominantly at turbine locations, with low numbers of passerines expected due to the removal of scrub and hedgerow/trees from surrounding bat buffer zones during operation, and the separation distance between works (i.e. at turbine locations, site entrances, haul route works locations, at the Tinnalintan Substation and at jointing locations along cable routes), with works of brief duration, and reversible with completion of works, and the assumed continued availability of suitable alternative habitats in the surrounding landscape, it is considered that any disturbance or displacement of passerines during decommissioning works will be Negligible, and any impacts will be Not Significant.
Decommissioning Phase: Physical injury/destruction of nests or chicks – either ground nesting or off the ground	Neutral Impact: Groundworks during decommissioning are limited to small discrete locations at turbine hardstands, at site entrances and haul route works locations, and at jointing locations along the internal cable link. Due to the small scale of individual works, and the likely continued low use of the windfarm site by passerines, it is considered unlikely that a significant/important number of nesting birds will be affected, and the potential for significant impacts can be excluded.
Waders (Golden Plover, Woodcock, Curlew, Snipe, Lapwing)	
Construction Phase: Permanent or temporary reduction or loss or fragmentation of suitable habitat (foraging, nesting, roosting)	Not Significant: While suitable habitat does occur at the Project site (in the form of Improved Grassland, Wet Grassland and Wet Heath), the semi-natural habitats of (Wet Grassland and Wet Heath) provide the best habitat onsite for Golden Plover, Curlew and Lapwing and Snipe. The mix of habitats at the Project site are abundant and widespread throughout the surrounding area. It is considered that the loss of 8ha of agricultural grasslands at the Tinnalintan substation and at the windfarm site (which includes 2.75ha of semi-natural habitats), and the temporary loss of agricultural lands along internal cable routes, construction compounds, borrow pits and a HR8 will be Low/Negligible magnitude being a minor change to the makeup of habitats in the area, and consequently it is evaluated that loss of suitable habitat in relation to Golden Plover, Curlew, Lapwing or Snipe will be Not Significant. In relation to Woodcock, which utilises woodland and forestry habitats, the loss of 20.8ha of conifer plantation, will be Medium in the context of the availability of conifer plantation at the windfarm site, and Low in the context of availability of this habitat along this upland ridgeline (275ha, as per Chapter 6: Land). Given the Low sensitivity of Woodcock, and the dynamic nature of conifer plantations which are felled and replanted as part of their management, it is evaluated that loss of suitable habitat in relation to Woodcock will be Not Significant
Construction Phase: Disturbance/ displacement	Not Significant: While suitable habitat is available within the construction works area boundary and adjacent lands for Curlew, Woodcock, Snipe and Lapwing, large/important numbers of these species were not recorded during surveys, nor are there important feeding, nesting or wintering areas at the Project site. No species of wader, other than Woodcock, were recorded as breeding within the Ballynalacken Windfarm Project site or within its immediate environs. Woodcock were identified as likely breeding approximately c.328m from T6 and associated Windfarm Site road. Given the distance of this potential breeding location from proposed works, it is anticipated that any potential disturbance/displacement impacts will be negligible. Golden Plover was recorded flying through the project site area at numbers in VP surveys in the March and April months. 1,324 individuals total. However, these were not recorded foraging or utilising any habitat within 5km of the project site as regular residents. I-WeBS results recorded only 12 individuals total. This population was determined to be entirely migratory and non-resident. Due to the nature of migratory flocks travelling large distances, any disturbance to the flock will be in a worst case scenario a slight adjustment of Golden

	Plover flight path. As such, it is highly unlikely this impact will effect this receptor species, and therefore disturbance or displacement of wintering or breeding populations is scoped out. When the availability of suitable habitat both throughout the Project site and in the wider surrounding area, and the temporary nature of construction works are also taken into account, it is evaluated that any disturbance or displacement of Golden Plover, Curlew, Woodcock, Snipe and Lapwing will be Negligible to Low, and Not Significant.
Operation Phase: Habitat enhancement	Not Significant (positive): Overall, the increase and enhancement of the hedgerow network, and the protection and management of the wet heath area will not result in the windfarm site becoming an important or valuable resource to Waders. While it is expected that Waders will benefit positively from habitat protection, and hedgerow creation and enhancement, this will be a minor (albeit positive) shift away from the baseline habitats and therefore of Low magnitude and Not Significant.
Operation & Decommissioning Phase: Disturbance/ displacement	Not Significant: While suitable habitat is available within the works area boundary (i.e. at site entrances and haul route works locations where re-widening may occur, and within bat buffer zones and within the Biodiversity Protection Area where scrub removal and vegetation management will occur), with suitable habitat also occurring on adjacent lands for Golden Plover, Curlew, Woodcock, Snipe and Lapwing, important numbers of these species are not expected to occur at the Project site. When the availability of suitable habitat both throughout the Project site and in the wider surrounding area, and the brief nature of operational or decommissioning works are also taken into account, it is evaluated that any disturbance or displacement will be Negligible, and Not Significant.
Operation & Decommissioning Phase: Mortality of ground nesting birds	No Likely Impact: While suitable habitat is available within the works area boundary subject to groundworks during the operational and decommissioning phases (i.e. at site entrances and haul route works locations where re-widening may occur), it is considered unlikely that these wader species will nest close to the public road. During decommissioning, the hardstands and foundations will be covered over using soils in permanent berms at each turbine location, it is considered unlikely that waders would nest on these berms. During the operational phase, scrub and tree saplings within the bat buffer zones and the Biodiversity Protection Area will be regularly removed, this work will take place by hand and is unlikely to result in mortality of ground nesting birds or destruction of nests/chicks. Woodcock are considered unlikely to nest in the open bat buffer areas around turbines in conifer plantation, and therefore unlikely to be affected by any vegetation management in these areas. Overall, it is considered unlikely that mortality or injury will occur to any nesting waders, or their eggs/chicks during the operation or decommissioning phases.
Waterbirds (Grey Heron and Lesser Black-backed Gull)	
Construction Phase: Permanent or temporary reduction or loss or fragmentation of suitable habitat (foraging, roosting)	Not Significant: While there are a small number of watercourses and wet drains onsite, with potential suitability for Grey Heron, the extent of loss is Negligible and limited to 2 watercourse crossing locations where a new culvert will be installed at a small headwater stream and wet drain. Given the availability of more suitable habitat further away and downslope from these locations, impacts to Grey Heron are considered Negligible and Not Significant. In relation to Lesser Black-backed Gull, this species breeds in coastal habitats, and some inland habitats in Counties Mayo and Donegal, no breeding habitat occurs at the Project site. This species over-winters and forages in a wide range of habitats, including those at the Project site, however the Project site is not an important overwintering area, and given abundance of alternative habitat in the surrounding landscape, it is evaluated that potential impacts to Lesser Black-backed Gull as a result of habitat removal will be Negligible, and Not Significant. Due to the absence of suitable habitat for the other waterbird species recorded during surveys, no loss of suitable habitat will occur.
Construction Phase:	Not Likely: The only waterbird species recorded at, or in close proximity to, the Project site were Lesser Black-backed Gull and Grey Heron, which were recorded infrequently and in low

Physical injury, destruction of nests	numbers. Lesser Black-backed Gull breed at coastal locations. No Grey Heron were recorded breeding within, or in proximity to the Project site, and commercial forestry at the site is not considered suitable nesting habitat. Due to the unsuitability of the Project site for breeding waterbirds, including Lesser black-backed gull and Grey heron, it is evaluated that no impact to breeding birds, nests or chicks will occur, and that physical injury for foraging/overwintering individuals is unlikely to occur.
Construction Phase: Disturbance/displacement	No Likely Impact: Due to the low numbers of Lesser Black-backed Gull and Grey Heron recorded, and the availability of alternative habitats in the surrounding landscape, it is considered that any disturbance/displacement effects will be Negligible and Not Significant. Due to the distance of the other waterbirds recorded during surveys from the Project construction works areas, and taking into account the temporary duration of construction works, and absence of suitable habitat at the Project site, it is considered that disturbance or displacement is unlikely to occur.
Operation Phase: Collision risk	No Likely Impact: Due to the low numbers of Lesser Black-backed Gull and Grey Heron recorded on site, and the availability of alternative habitats in the surrounding landscape, it is considered that any collision effects will be Negligible and Not Significant. Due to both species being below the minimum activity threshold to trigger Collision risk analysis this group of species is Scoped Out. (see Appendix 13.5). In relation to the Tinnalintan Substation, Met Mast, Telecoms Relay Pole and Control Building, collision risk is considered highly unlikely due to the stationary nature of these facilities and therefore Not Significant. Due to the distance of other waterbirds recorded during surveys from the Turbines, and the absence of suitable habitat for Mallard, Coot, Wigeon, Mute Swan, Teal, Pochard, Whooper Swan, Little Grebe, and Moorhen at the windfarm site, it is considered that interaction with turbines is unlikely to occur, and the potential for significant effects via this impact can be excluded.
Operation and Decommissioning Phases: Physical injury, Disturbance/ displacement	No Likely Impact: Due to the discrete locations of works, mainly at turbines hardstands, the low numbers of Lesser black-backed gull and Grey heron recorded at the windfarm site during bird surveys, and the distance from the windfarm site of other waterbirds recorded, with waterbirds unlikely to occur in lands at or adjacent to works locations associated with the operational or decommissioning phases, and no suitable breeding habitat at the Project site, it is evaluated that disturbance or displacement effects are unlikely to occur during operational or decommissioning works or activities.
Operation Phase: Habitat enhancement	No Likely Impact: The biodiversity protection area will not provide habitat for breeding and foraging waterbirds. Similarly, the planting and enhancement of hedgerows will not provide habitat of potential use by waterbirds. No positive impact will occur.

EIAR 13.3.6.2.1 Birds of Prey: Collision risk	
Sensitive Aspect: Importance:	Birds – Birds of Prey **Local (High)** (as per Section EIAR 13.3.6.1)
Impact Source(s)	Collision with turbine structures or turbine blades
Impact Pathway(s)	Direct contact
Project Stage	Operation Phase

<u>Overview of Impact (general)</u>: Birds that are not displaced could potentially be vulnerable to collision with the proposed Ballynalacken Windfarm turbines. The level of collision with wind turbines is presumed to be dependent on the level of flight activity over the wind farm and the ability of various bird species to detect and manoeuvre around rotating turbine blades. Birds that collide with a turbine are likely to be killed or fatally injured, this may in turn potentially affect the maintenance of bird populations (ScottishPower Renewables, 2019).

Collision Risk Modelling has been carried out for the Ballynalacken Windfarm, using a mathematical model to predict the numbers of individual birds, of a particular species, that may be killed by collision with moving wind turbine rotor blades. The modelling method used in this collision risk calculation follows Scottish Natural Heritage (SNH) guidance which is sometimes referred to as the Band Model (Band *et al*. 2007).

The results of the Collision Risk Modelling is summarised below, and can be found in full in Appendix 13.5.

Due to the stationary nature of the met mast, collision related effects are not likely to occur.

<u>Examination of the Impact of the Proposed Ballynalacken Windfarm Project</u>:

Three Bird of Prey species were selected for assessment based on their presence at Ballynalacken Windfarm Project and their status. These were Kestrel, Buzzard and Sparrowhawk. Peregrine Falcon and Barn Owl were not selected for assessment due to low numbers or absence from the site.

During the breeding season, Buzzard was evaluated to have a collision risk of 0.2202 per annum, this equates to a potential collision every 4.54 years. Collision risk for Kestrel was assessed to be 0.0737 per annum, this equates to a potential collision every 13.57 years. Sparrowhawk had the lowest risk of collision for the three raptor species assessed with a collision risk of 0.0072 per annum, equating to potential collision every 139.03 years.

In winter, Sparrowhawk has the lowest risk of collision of the three species assessed with an estimated collision risk of approximately 0.0326 bird collisions per annum, equating to one collision every 30.64 years. Both Buzzard and Kestrel also had relatively low collision risk for their winter populations. Buzzard and Kestrel were assessed to have potential collision risks of 0.2379 and 0.1226 collisions per annum respectively. This equates to a collision once every 4.2 and 8.16 years respectively

The magnitude of impact of collisions on Kestrel is evaluated as **Low** given the low level of projected fatalities over the 35-year operational lifespan of the project and taking account of the **High** sensitivity of this species, the significance of impact is evaluated as be **Moderate/Low Significance**.

For Sparrowhawk and Buzzard, magnitude of impact is evaluated as **Low** with a **Negligible** sensitivity of these species, giving a **Not Significant** Impact.

Impact Magnitude	Low	Impact Significance: *(pre-mitigation)*	Slight/Moderate– Not Significant

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

MM38	A buffer area of 50m from the tips of Turbine blades to any trees or hedgerows, will be created through the felling of forestry and the removal of hedgerows and trees during the construction phase.
OMM13	The bat buffer zone will be maintained during operation by trimming existing trees and hedgerows, removing any scrub and additionally no new trees or hedgerows will be planted within the buffer zones. In the buffer zones in forestry areas, following the forestry felling and removal of the brash, the ground surface will be levelled, and the buffer zone will be sown with grass species. A low grass sward will be maintained within this zone to minimise its value as

	hunting habitat for Kestrel and other birds of prey. This will also minimise the value of these buffer zones to foraging bat species.
OMM05	Confirmatory bird activity surveys, including Fatality monitoring (carcass searches, carcass removal rates and detection efficiency) during Years 1, 2, 3, 5, and every 5 years thereafter of the operational phase. (SNH, 2009).
Effectiveness of Mitigation: 50m buffer from blade tip to trees and hedgerows, and the maintenance of a low grass sward around the turbines will significantly reduce bird of prey activity within the zone of influence of the turbine rotor. Post-construction monitoring surveys will be carried out to track the effectiveness of implemented mitigation measures, and fatality monitoring will be used to identify any mortality rates that exceed the collision rates projected for this impact by the Collision Risk Model Assessment. This monitoring will provide the evidence of effectiveness of the mitigation measures and provide a means to respond to changes and effects to the ecological baseline as a result of the project, should they occur. It is expected that with the implementation and maintenance of buffer zones around turbines, along with operational phase surveys and fatality monitoring and the implementation of other mitigation if required, that residual impacts to Birds of Prey will be Not Significant for Kestrel and Neutral for Buzzard and Sparrowhawk.	
Residual Impact Significance *(post-mitigation)*:	Not Significant (High Risk) – Neutral (Low Risk)

EIAR 13.3.6.2.2	Kingfisher - Reduction in foraging or nesting resource in downstream habitats
Sensitive Aspect: Importance:	Birds - Kingfisher **Very High Sensitivity** (as per Section EIAR 13.3.6.1)
Impact Source(s)	Decreases in downstream water quality due to sedimentation from earthworks, contamination from oils, fuels, cements, and erosion of banks due to changes in flow regimes, spread of invasive species
Impact Pathway(s)	Surface/groundwater flow, river waterbodies
Project Stage	Construction Phase

<u>Overview of Impact (general)</u>:

To feed, the Kingfisher needs clear, shallow water (streams, ponds, ponds, rivers, etc.). It feeds mainly on small fish (average size 4 to 6 cm, maximum 10 cm) (Cummins *et al*., 2010). It also catches tadpoles and other small aquatic invertebrates. The kingfisher is sensitive to the quality and turbidity of the water, the quantity of small fish available and especially the presence of banks favourable to nest construction.

<u>Examination of the Impact of the Proposed Ballynalacken Windfarm Project</u>:

There are 3 No. watercourse crossings and 4 No. drain crossings that intersect with the Ballynalacken Windfarm Project. None of these aquatic habitats were of high fisheries value where the works are planned. Three of these watercourses are upstream of the River Barrow and River Nore SAC. As such, primary concern for this impact is the degradation of these watercourses flowing downstream into the River Nore.

With regard to the availability of prey-item species in the larger downstream watercourses, significant reductions in downstream water quality are not expected to occur as a result of runoff from the Project construction site due to the separation distance of the construction works from watercourses (generally in excess of 90m from construction works areas), the small number of watercourses onsite, the installation of the windfarm site drainage network ahead of works, and the short-term duration (12-16 months) of the construction phase. As aquatic species (fish, crayfish) and other prey items can tolerate some reductions in water quality for short periods, the low Q-values and general riverine health at the watercourses connected to the Ballynalacken Windfarm Project indicate that that these reductions in water quality will not contribute to a significant change in the pre-existing baseline or differ from the receiving environment in a 'Do-Nothing' Scenario for kingfisher foraging habitat. It is therefore considered that any effects on prey item species availability will be Negligible. Therefore, secondary effects on local Kingfisher populations are unlikely to occur.

Overall, impacts to Kingfisher from a reduction in prey item species are Unlikely – Negligible.

Impact Magnitude	Negligible	Impact Significance: *(pre-mitigation)*	Slight

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

**See Chapter 19: Mitigation & Monitoring Arrangements for full wording of mitigation measure*

Design	Avoidance of on-site sensitive hydrology features by constraints mapping (i.e. buffer zones)
Design	Avoidance of areas of peat
Design	No temporary storage of overburden in the Owveg_Nore_040 Catchment
Design	Construction and installation of the site drainage network
Design	Implementation of the Surface Water Management Plan
Design	At D1, the existing wet drainage channel will be permanently diverted for a short distance so that it is at least 25m away from the turbine foundation, an interceptor drain will be constructed between the works area and the diverted section of the watercourse.
SM02*	Pre-construction confirmatory surface water quality monitoring and recording.
SM11	The construction Method Statements to be developed by the construction contractors will take full account of the EMP including the mitigation and monitoring measures and will be reviewed by the Environmental Manger prior to the commencement of construction works.
SM12	All construction works will be monitored for compliance with the Environmental Management Plan by the project Environmental Management Team which will include an Environmental Clerk of

	Works, the Project Ecologist and specialists such as a hydrologist, who are independent of the site contractors. The Environmental Management Team will report to the owner's Project Manager.
SM14	A suitably qualified engineer will supervise all windfarm site excavations and construction works.
SM15*	Regular inspection of the windfarm drainage network by the Contractor and Project Hydrologist.
SM16*	Regular surface water quality monitoring and recording during the Construction Phase in accordance with the Surface Water Management Plan
SM20	The Project Ecologist will liaise with the Contractors on a weekly basis regarding the upcoming schedule of works and will advise the Contractors of any particular ecological protection requirements at specific locations on site.
MM01	The boundaries of the Construction Works Area will be fenced to prevent the encroachment of construction phase personnel, machinery or materials beyond this boundary. In agricultural lands, livestock proof fencing will be used, with landowner access maintained through the provision of gates along the boundary fences.
MM02	Construction traffic, personnel and materials will be restricted to within the Construction Works Area Boundary fence. Machinery will be kept on the windfarm site roads and hardstanding areas, and, aside from advancing excavations, will avoid moving onto areas not delineated on the site drawings
MM03	Land reinstatement will not be carried out during very wet weather or when the soil is waterlogged. If any compaction has occurred along the construction works area, these areas will be ploughed with a sub-soiler to loosen the subsoil layer
MM05	During windfarm construction works, excavations will be backfilled as soon as is possible.
MM06*	Removal of excavated materials to designated berms more than 50m from watercourses or wet drainage features. Implementation of silt control measures and maintenance of vegetative buffers.
MM07*	Storage berms will be graded, sod to be retained and placed on berms and berms re-seeded, measures incorporated to prevent dust and soil erosion.
MM08	Along the cable route on the public road, there will be no storage of overburden and all excavations from road trenches will be removed to licensed waste facilities in accordance with the Waste Management Plan. The excavated material will be covered during transportation to prevent spillages and reduce dust.
MM09	All excavations which are unsuitable for use as construction/reinstatement material which arise within the catchment of the Owenbeg River (T9, T10, T11 and T12 and associated Windfarm Site Roads) will not be stored within the catchment, instead these arisings will be transported to the temporary deposition area at Borrow Pit No.2 and at Turbine T7 (both located outside of the Owenbeg River catchment). In addition, a Siltbuster or other suitable treatment train will be used to remove fine silt particles from site runoff in this catchment. The Siltbuster will be set up at works locations and used during groundworks and earthmoving activities.
MM10	At the windfarm site, at works locations within 50m of watercourses or existing drainage features there will be additional mitigation measures deployed including double silt fencing prior to the commencement of the works, temporary drain blocking in existing drains, placement of silt trapping arrangements along preferential surface water flowpaths and, where necessary, the use of matting to prevent ground erosion and rutting. Works will not take place within this zone during prolonged heavy or exceptional rainfall events.
MM11	Weather forecasts will be consulted in advance of works. If there is heavy prolonged rainfall or if an exceptional rainfall event occurs, then construction works will cease until peak flows have subsided.
MM12*	Site roads and hardstanding areas have a permanent surface water drainage network, the borrow pits will have a temporary surface water drainage network in place during works. The site drainage network will include check dam, settlement ponds and buffered outfall weirs.
MM13*	Site roads and hardstanding areas will be capped with clean high-grade bedrock, such as limestone
MM14*	At the windfarm site, there will be no direct discharge into any watercourses or drains or onto adjacent habitat. All pumped water from excavations will be treated prior to discharge.
MM15	Along the cable routes, where dewatering of trenches or excavations is required, there will be no direct discharge of treated water into any watercourse or drain. Rather, all pumped water will be discharged via a silt bag.

MM17	New culverts which will be installed at watercourses or wet drainage channels will be bottomless or clear spanning.
MM18*	In-stream works will not be undertaken without isolation of flow within the watercourse. The water will be isolated from the works by over pumping, flume (pipe) or channel diversion methods.
MM19*	At wet drainage channels, instream works will be followed by site-specific reinstatement measures to ensure the restoration of flow character and morphology within the affected reach.
MM20	Only precast concrete culverts will be used for new watercourse crossing structures on the windfarm site. Only precast concrete chambers will be used at Joint Bay locations.
SM18	The plant and machinery will be regularly inspected for leaks and maintained in good working order for the duration of the works.
SM19	Fuel, oil and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage.
MM21*	Concrete control procedures will be implemented including no batching; ready mixed concrete will be used for all foundations; work scheduled for dry days; experienced operators; run-off will be settled out and no concrete truck washing on-site.
MM22*	Fuel/oil control procedures will be implemented including control of on-site refuelling of plant and machinery; provision of spill kits. trained operatives, use of double-skinned mobile bowsers. Emergency Response Plan in place.
MM23	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse or wet drainage channel or local spring/well.
MM24*	All fuels or oils, will be stored in designated, bunded, locked storage areas and fitted with a storm drainage system and an appropriate oil interceptor. Emergency Response Plan in place.
MM25	Overnight parking of plant and machinery will only be permitted at locations which are greater than 50m from watercourse/drainage features and at an existing hard-core surface. Drip trays and fuel traps will be used under and around parked plant and machinery to contain any leaks.
MM26	All associated tree felling will be undertaken using good working practices as outlined by the Forest Service in their 'Forestry Harvesting and Environment Guidelines' (2000) and the 'Forestry and Water Quality Guidelines '(2000). Measures will include the protection of the riparian zones, installation of buffered drainage outfalls, installation of drains and silt traps as soon as possible once felling has been completed, and a regime of continued monitoring of silt traps and drainage outfalls will be implemented. All excess felled brash will be removed off site to avoid release and runoff of phosphorous into sensitive watercourses.
MM27	In-stream works in wet drainage channels (D1, D2) will only be undertaken during the IFI specified period (July, August and September) and will be carried out in accordance with the *Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters* (IFI, 2016).
MM28	Works at W2 and W3 will take place when the Rathduff_15 is in its dry state and the works at W2 or W3 will be planned for periods of dry weather.
SM05	No Kingfisher nests were recorded within the Construction Works Area Boundary or within 300m upstream or downstream of watercourse crossing locations during pre-planning surveys, however pre-construction surveys will be carried out in order to determine if any new nests have been established in the interim period. These pre-construction confirmatory surveys will be carried out by a suitably qualified Ornithologist within the Construction Works Area Boundary and within 300m upstream or downstream of watercourse crossing locations and will be undertaken between March and April (early visit) and again between May and June (late visit).
MM45	No Kingfisher nests were recorded within 300m upstream or downstream of watercourse crossing locations during pre-planning surveys (*see SM05*), however should a new nest be identified in the interim period during pre-construction surveys, then no construction activities will be permitted within 300m of Kingfisher nest locations during the bird breeding season (March – August inclusive) or until nesting is confirmed as complete following supervision by a suitably qualified Ornithologist.
Effectiveness of Mitigation: The above measures are proven and effective best practice measures which will avoid and minimise the risk of sediment or contaminant release by:	

- reducing the potential for sediment/contaminant release (limestone capping, weather related restrictions, management of overburden, no temporary storage of overburden in Owveg catchment, concrete controls, refuelling controls, containment bunds, use of shuttering at foundations, design of culverts, removal of brash),
- capturing and treating any sediment/fuel spills that are released (silt fencing, Siltbuster, drainage system, wheel washes),
- thereby breaking the pathway between the potential sources and the receptor.

Furthermore, the ongoing monitoring of water quality in downstream watercourses and the inspection of drainage systems and of the construction works by an Environmental Manager (with 'stop works' authority) will ensure that any decreases in water quality are identified and rectified at an early stage, and as a result would likely be short-term, temporary and reversible in nature.

Following the implementation of mitigation measures, minimal sediment or contaminants will enter downslope watercourses, habitats will be maintained through restoration and the construction and design of new culverts will ensure free passage of fish and aquatic species. Therefore, any potential negative impacts on downstream waterbodies, aquatic habitats or species will be Negligible.

Residual Impact Significance *(post-mitigation)*:	Neutral – Not significant

EIAR 13.3.6.2.3 Passerines: Physical injury/destruction of nests or chicks

Sensitive Aspect:	Birds - Passerines
Importance:	**Local (High)** (as per Section EIAR 13.3.6.1)
Impact Source(s)	Movement of machinery and soils, hedgerow trimming, tree felling
Impact Pathway(s)	Direct contact
Project Stage	Construction Phase

Overview of Impact (general):

Suitable breeding habitat exists at the Ballynalacken Project Site for Meadow Pipit and Skylark (Improved Grassland GA1, Wet Grassland GS4 and Wet Heath HH3) and Goldcrest (Conifer Plantation WD4), and Willow Warbler and Linnet (Scrub WS1 and Hedgerows/Treelines WL1/WL2)). These species could be affected by groundworks, vegetation clearance, hedgerow removal or forestry felling works during their breeding seasons (all of which occur during the period March to August).

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Removal of groundcover has potential to destroy nests and result in the mortality of ground nesting birds such as Meadow Pipit and Skylark. Tree-felling, scrub and groundcover removal in forestry areas could affect the nests of Goldcrest. While hedgerow and scrub removal has potential to affect nests of Willow Warbler and Linnet.

Starling and House Sparrow typically use cavities in buildings and other structures (including holes in trees), and Swallows also use buildings to construct their nests. Spotted Flycatcher also use crevices in garden walls and holes in trees. These species are unlikely to be affected by construction works, as no works to buildings are proposed.

Due to the low number of passerines recorded at the site and works only likely to affect nests established before groundworks, vegetation removal or felling commence in an area (as birds are likely to avoid nesting close to active construction works), it is evaluated that the magnitude of impact is Low with less than 5% of suitable habitat likely to be affected and therefore it is considered that effects to nests or chicks will be Slight for Meadow Pipit and Not Significant for the remaining passerine species.

The loss of a nest/mortality of chicks is unlikely to affect local populations to any significant degree, due to the extensive nature of suitable habitat and the widespread nature of the potentially affected species.

Impact Magnitude	Low	Impact Significance: *(pre-mitigation)*	Slight - Not Significant

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

MM42	Hedgerow removal, tree felling, and scrub clearance will take place outside of the bird breeding season (1st March to the 31st of August).
MM43	Surveys by the Site Ecologist of suitable habitat for active passerine and wader nests, prior to ground/vegetation clearance works in an area.
MM44	Where groundworks in grassland or groundworks or felling in forestry lands, are scheduled to take place during the Meadow Pipit, Curlew, Snipe, Lapwing, or Woodcock breeding season, and where active nests are present and the number of nests represents >1% of the local population, the works within close proximity to an active nest will not be carried out until fledging is completed.

Effectiveness of Mitigation:

With the adoption of appropriate vegetation clearance and/or pre-construction surveys residual impacts will be Neutral.

Residual Impact Significance *(post-mitigation)*: Following the implementation of mitigation measures, impacts will be Neutral.	Neutral

EIAR 13.3.6.2.4 Waders: Collision risk

Sensitive Aspect:	Birds – Waders (Golden Plover)
Importance:	High Sensitivity (as per Section EIAR 13.3.6.1)
Impact Source(s)	Collision with turbine structures or turbine blades
Impact Pathway(s)	Direct contact
Project Stage	Operation Phase

Overview of Impact (general): Birds that are not displaced could potentially be vulnerable to collision with the proposed Ballynalacken Windfarm turbines. The level of collision with wind turbines is presumed to be dependent on the level of flight activity of over the wind farm and the ability of various bird species to detect and manoeuvre around rotating turbine blades. Birds that collide with a turbine are likely to be killed or fatally injured, this may in turn potentially affect the maintenance of bird populations (ScottishPower Renewables, 2019).

Collision Risk Modelling has been carried out for the Ballynalacken Windfarm, using a mathematical model to predict the numbers of individual birds, of a particular species, that may be killed by collision with moving wind turbine rotor blades. The modelling method used in this collision risk calculation follows Scottish Natural Heritage (SNH) guidance which is sometimes referred to as the Band Model (Band *et al*. 2007).

The results of the Collision Risk Modelling are summarised below, and can be found in full in Appendix 13.5.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

One species of wader, Golden Plover, was selected for assessment based on their presence at Ballynalacken Windfarm Project and their status. Due to low/no numbers recorded at the site Woodcock, Snipe, Lapwing, and Curlew did not meet the threshold for collision risk assessment.

Golden Plover has an estimated collision risk of 0.3950 per annum, indicating a potential collision once every 2.53 years within the breeding season. Although an assessment of collision risk for Golden Plover in the breeding season was undertaken, the reality is that they do not occur as a breeding species in this area. The "breeding season" population was recorded in the months of April and September which represents migrating flocks returning to breeding and wintering sites. As the extent of this collision risk is isolated to migrating flocks, the magnitude of this impact is therefore more representative with consideration of the wintering population.

In winter, Golden Plover has an estimated collision risk of 2.4423 collisions per annum, indicating a potential collision once every 0.41 years within the winter period. Although an apparently high collision risk, the national wintering population of Golden Plover is c. 920,000 which, even if 3 collisions per year occurred over the 35-year operational life of the windfarm would result in a total loss of 105 birds which would be equivalent to 0.011% of the wintering population.

However, an unpublished review (Gittings, 2022) indicated that Golden Plover has an avoidance rate of over 99.5% rather than the 98% used here based on SNH 2018 (which did not specifically assess Golden Plover with 98% constituting the default avoidance rate). If the higher avoidance rate indicated by Gittings 2022 was adopted the collision risk would decrease by a factor of 10, e.g. 0.24423 collisions per annum.

As such, the impact is considered Negligible for national and international population present in Ireland as substantially less than 1% of the population is likely to be affected. The numbers recorded during VP surveys were determined to be migratory flocks, based on their presence only in March and April. Given this consideration, the significance of impact is only relevant to the national population, as this species was not identified as a resident of the receiving environment. Despite this negligible magnitude, there is still a risk of slight significant effect.

Impact Magnitude	Negligible	Impact Significance: *(pre-mitigation)*	Slight Significant

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

OMM05	Confirmatory bird activity surveys, including Fatality monitoring (carcass searches, carcass removal rates and detection efficiency) during Years 1, 2, 3, 5, and every 5 years thereafter of the operational phase. (SNH, 2009).

Effectiveness of Mitigation:

Confirmatory surveys will verify the flock behaviour after construction works are completed. Fatality monitoring will be used to identify any mortality rates that exceed the collision rates projected for this impact by the Collision Risk Model Assessment .This monitoring will provide the evidence of effectiveness of the mitigation measures and provide a means to respond to changes and effects to the ecological baseline as a result of the project, should they occur. It is expected that with the implementation of fatality monitoring that residual impacts to Golden Plover will be Not Significant.	
Residual Impact Significance *(post-mitigation)*:	Not Significant

EIAR 13.3.6.2.5 Birds of Prey: Disturbance/displacement from Operating turbines

Sensitive Aspect: Importance:	Birds – Birds of Prey (Kestrel, Buzzard, Sparrowhawk, Peregrine, Barn Owl) **Local (High)** (as per Section EIAR 13.3.6.1)
Impact Source(s)	Operating turbines - visual intrusion, increase in ambient noise levels,
Impact Pathway(s)	Air and visibility
Project Stage	Operational Phase

<u>Overview of Impact (general)</u>:

The presence and operation of turbines has the potential to cause an indirect loss of habitat if disturbance causes birds to avoid the wind farm site, potentially avoiding areas for foraging and/or breeding and potentially the abandonment of nests and mortality of eggs/chicks. Displacement can also include barrier effects in which birds are deterred from using their normal routes to feeding or roosting grounds.

Raptor studies have reported variable levels of turbine avoidance by raptor species, with some, including Kestrels, known to continue foraging activity in close proximity to operational turbines, while others, including Buzzard, show higher levels of turbine avoidance (Pearce-Higgins *et al*. 2009).

<u>Examination of the Impact of the Proposed Ballynalacken Windfarm Project</u>:

Birds of Prey recorded during VP, Transect and breeding bird surveys for the Ballynalacken Windfarm Project included Kestrel (200 times), Buzzard (294 times), Sparrowhawk (47 times), and Peregrine Falcon (2 times). While no Barn Owls were recorded during surveys, two Barn Owl were recorded in 2021 in the area (NBDC record). No nesting pairs of any bird of prey species were recorded within the ecological baseline study area.

Kestrel: Raptor studies have reported low levels of turbine avoidance (Hötker *et al*. 2006; Rasran & Mammen, 2017), with some raptors, including kestrels, known to continue foraging activity in close proximity to operational turbines (Pearce-Higgins *et al*. 2009). Given the availability of extensive alternative areas of suitable habitat, and the reported low avoidance of turbines by Kestrel, the magnitude of disturbance/displacement impact is evaluated as Negligible, and taking account the High sensitivity of this species, the significance of impact is evaluated as Not Significant.

Buzzard has been found to show strong turbine avoidance extending to at least 500m (Pearce-Higgins *et al*. 2009). As the range and number of Buzzards breeding in Ireland has been increasing steadily following a historical decline, the species favourable conservation status limits the potential for significant negative effects to occur. As Buzzards use a wide variety of open habitats for foraging e.g. agricultural grassland and heath and bog habitats, there is extensive alternative suitable habitat in the wider landscape; taking this into account and given that no buzzard nests were recorded within the study area, the magnitude of impact is evaluated as Low, and taking into account that this species is a Negligible-sensitivity bird receptor it is evaluated that significance of disturbance/displacement as a result of their avoidance of the turbines will be Not Significant.

Peregrine Falcon, Barn Owl and Sparrowhawk were not recorded as breeding species in the area and only recorded in low numbers. As these species use a variety habitats which are widespread in the area and their low levels of turbine avoidance, and it is evaluated that the magnitude of disturbance/displacement will be Negligible. Due to the High sensitivity of Peregrine Falcon (Annex I species) and Barn Owl (Red Listed) and the Negligible sensitivity of Sparrowhawk (Green listed) the significance of impact will be Not Significant.

Impact Magnitude	Negligible - Low	Impact Significance: *(pre-mitigation)*	Not Significant

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

MM38	A buffer area of 50m from the tips of Turbine blades to any trees or hedgerows, will be created through the felling of forestry and the removal of hedgerows and trees during the construction phase.
OMM13	The bat buffer zone will be maintained during operation by trimming existing trees and hedgerows, removing any scrub and additionally no new trees or hedgerows will be planted within the buffer zones. In the buffer zones in forestry areas, following the forestry felling and removal of the brash, the ground surface will be levelled, and the buffer zone will be sown with grass species. A low grass

	sward will be maintained within this zone to minimise its value as hunting habitat for Kestrel and other birds of prey. This will also minimise the value of these buffer zones to foraging bat species.
OMM05	Confirmatory bird activity surveys, including Fatality monitoring (carcass searches, carcass removal rates and detection efficiency) during Years 1, 2, 3, 5, and every 5 years thereafter of the operational phase. (SNH, 2009).
Effectiveness of Mitigation: These measures are implemented as part of the collision risk impact mitigation. These measures will contribute to reduce this impact which has already been identified to be low and not-significant. As such, there is likely to be no significant effect on any of the identified receptors as a result of this impact due to the nature of the receptors sensitivities on site and the measures to reduce the likelihood of the ecological baseline increasing in value to these species throughout the life-cycle of the proposed Ballynalacken Windfarm Project.	
Residual Impact Significance *(post-mitigation)*:	Not Significant

EIAR 13.3.6.2.6 Waders: Physical injury/destruction of nests or chicks

Sensitive Aspect:	Birds - Waders
Importance:	**Local (High)** (as per Section EIAR 13.3.6.1)
Impact Source(s)	Movement of machinery and soils, hedgerow trimming, tree felling
Impact Pathway(s)	Direct contact
Project Stage	Construction Phase

Overview of Impact (general):

Suitable breeding habitat exists at the Ballynalacken Project Site for Curlew (Wet Grassland GS4 and Wet Heath HH3), Woodcock (Conifer Plantation WD4), Snipe (Wet Grassland GS4 and Wet Heath HH3), and Lapwing (Wet Grassland GS4, Improved Grassland (GA1). All of these species nest on the ground, and they could be affected by groundworks, vegetation clearance or forestry felling works during their breeding seasons (all of which occur during the period April – July).

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

No species of wader, other than Woodcock, were recorded as breeding within the Ballynalacken Windfarm Project site or within its immediate environs. Golden Plover were only recorded flying through the receiving environment during the March and April months. The high numbers of individuals recorded across the two winter seasons were determined to be migratory flocks. The Ballynalacken Windfarm Project site is outside the breeding range for Golden Plover, therefore no impacts are likely to occur to nests or chicks of this species.

Woodcock is a red-listed bird species and also evaluated as a Medium/High sensitivity receptor. Woodcock were identified as likely breeding approximately c.328m from T6 and associated Windfarm Site road. The other possible location was located 315m North-East of T2. Given the distance of this potential breeding location from proposed works, it is possible that Woodcock may nest within 100m of the construction works area boundary during the construction phase. Given the extent of suitable habitat in the wider area, any impact to nesting woodcock would be low/negligible in nature as nesting sites change as the surrounding forestry matures and becomes less suitable.

In relation to Curlew, Snipe and Lapwing, the removal of groundcover has potential to destroy nests and result in the mortality of these ground nesting birds, with construction works occurring in c22.87% of suitable habitat (Wet Grassland) within the ecological baseline. Curlew has no known nesting sites in Co. Kilkenny.

However, the low number of Snipe (6 from VPs, 7 from winter transects, 1 from summer transects, 1 from breeding wader surveys) and Curlew (1 Incidental fly over sighting during Woodcock survey) observed onsite during surveys, with no Lapwing records onsite suggests that nesting waders have a Very Low likelihood of occurring within the construction works area boundaries, and the magnitude of impact is considered Negligible as less than 1% of the population is likely to be affected. When the High sensitivity of these wader species is taken into account the significance of the impact (pre-mitigation) is evaluated as Not Significant.

Sightings and records of waders within the wider receiving environment included a single instance of Snipe and a large number of Lapwing (200+), flying and utilising the River Nore and Owveg for foraging and resting. These Lapwing sightings were strictly between December 2023 and January 2024 survey efforts with no records of their flying through the windfarm site area.

Impact Magnitude	Negligible	Impact Significance: *(pre-mitigation)*	Not Significant

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

MM42	Hedgerow removal, tree felling, and scrub clearance will take place outside of the bird breeding season (1st March to the 31st of August).
MM43	Surveys by the Site Ecologist of suitable habitat for active passerine and wader nests, prior to ground/vegetation clearance works in an area.
MM44	Where groundworks in grassland or groundworks or felling in forestry lands, are scheduled to take place during the Meadow Pipit, Curlew, Snipe, Lapwing, or Woodcock breeding season, and where active nests are present and the number of nests represents >1% of the local population, the works within close proximity to an active nest will not be carried out until fledging is completed.

Effectiveness of Mitigation: Undertaking surveys ahead of works in forestry or grasslands will avoid impacts to potential nests/chicks of Woodcock, Snipe, Curlew or Lapwing, and minimise impacts to nesting populations. As such, given this measure it is expected that no impact will occur to this receptor group.	
Residual Impact Significance *(post-mitigation)*:	Neutral

EIAR 13.3.6.3 Cumulative Impact on Birds with Other Projects

EIAR 13.3.6.3.1 Introduction to the Cumulative Evaluation for Birds

The Ballynalacken Windfarm Project (*whose effects range from Neutral to Slight/Moderate (adverse) and Not Significant (positive), as per Section EIAR 13.3.6.2*) is examined hereunder for potential to have cumulative effects on Birds with other existing and permitted projects, and projects advanced in the planning system. These projects are referred to as 'Other Projects' herein.

A Cumulative Study Area is set out below and Other Projects located within this Study Area are identified and examined for in-combination effects with the Ballynalacken Windfarm Project. The potential for off-site and secondary consequential development is also considered.

EIAR 13.3.6.3.2 Scoping of the Cumulative Study Areas

The Cumulative Study Area comprises 4km around the construction works areas and 4km around the operating turbines (to identify other large above-ground structures, such as wind farms). It is considered that this area is sufficient to identify those Other Project or Activities which may cause cumulative effects to Birds with the Ballynalacken Windfarm Project.

EIAR 13.3.6.3.3 Evaluation of Cumulative Impacts

The Other Projects which occur within the Cumulative Study Area are identified in the table below and in Figure 13.11: Other Projects within the Birds Cumulative Study Areas *(included at end of this chapter).*

The Ballynalacken Windfarm Project is examined below for cumulative effects with each of the Other Projects within the Cumulative Study Area. An evaluation of the collective cumulative impact of the Ballynalacken Windfarm Project in-combination with all the Other Projects then follows. The evaluation takes into account any existing sources of pollution or damage identified in Section EIAR 13.3.6.1.2.

Table 13-21: Evaluation of Ballynalacken Windfarm Project cumulatively with Other Projects

Other Project	Status	Evaluation of Cumulative Impacts
Pinewood Windfarm	Consented	See Section EIAR 13.3.6.3.3.1 - in relation to cumulative collision risk or displacement during operation of wind farms. <u>No Cumulative Impact</u> in relation to disturbance/habitat loss due to the separation distances between these energy projects.
Farranrory Wind Farm Grid Connection Ballyragget & Parksgrove Solar Farms Grid Connection Battery Energy Storage Developments, Moatpark Tirlán Anaerobic Digestor	Consented	See Section EIAR 13.3.6.3.3.2 in relation to cumulative disturbance or displacement and cumulative habitat degradation for Kingfisher during construction works, given the proximity of these projects to the River Nore SPA. <u>No Cumulative habitat loss or collision risk Impact</u>: Due to the location of these projects within the public road corridor, improved agricultural grassland fields or existing hardcore compound areas and the underground nature of the grid connections or stationary nature of above ground structures associated with the solar farms and Tirlán infrastructure.
Laois-Kilkenny Grid Reinforcement Project Moatpark-Loan 38kV Overhead Line Telecom Masts,	Under Construction Existing	<u>Neutral Cumulative Impact</u>: due to the negligible footprint of the lattice towers and pole sets, which, for the most part do not interact with the Ballynalacken Project site; construction of the OHL will be completed within the study area or the structures already exist; and due to the location of the OHLs and stationary nature of the masts. In addition, due to the location of works,

Other Project	Status	Evaluation of Cumulative Impacts
Ballyouskill	Existing	effects to birds due to the extension of the Ballyragget Substation compound will be negligible.
Parksgrove Solar Farm Ballyragget Solar Farm Tirlán Solar Farm Tirlán Processing Plant and WWTP	Consented Existing	No Cumulative Impact: Due to the separation distances between the solar farms and the Ballynalacken Windfarm Project, the stationary nature of structures and buildings associated with the solar farms and Tirlán infrastructure, and the separation distance to the turbines and structures/buildings associated with the Ballynalacken Windfarm Project
Mixed Use Development, Castlecomer Hebron House Development, Kilkenny	Consented	No Cumulative Impact: No potential for significant cumulative habitat loss as the closest Ballynalacken Windfarm Project works relate to Haul Route Works HR2 (c.140m from Hebron House Development) and HR9 and HR10 (c.20m and c.100m from Mixed Use Development, Castlecomer respectively) which take place within and immediately adjacent to the public road corridor. Due to the stationary nature of these developments precluding collision, and the small scale of Ballynalacken Windfarm Project works in the vicinity, significant cumulative impacts are not likely to occur.
Offsite Project – Forestry Replant Lands	Future activity	Neutral Cumulative Impact: the afforestation of agricultural lands may result in loss of suitable habitats for some bird species (such as Golden Plover, Snipe, Curlew, Lapwing) and the creation of suitable habitats for others (such as Woodcock). However, the replanting area will be located outside the study area at a distance substantially greater than 4km from the proposed windfarm site, therefore there is no potential for cumulative impacts as a result of afforestation activities.
Secondary Project – Other Energy Projects connecting to Tinnalintan Substation	Potential Future project	It is assumed that the construction works for the proposed Ballynalacken Windfarm Project would be completed and therefore cumulative construction impacts are not predicted. In relation to cumulative collision risk with built structures at Tinnalintan Substation with potentially new structures, it is considered that the collision risk associated with the Tinnalintan Substation will be Negligible, and given the stationary nature and low heights of potential new above ground structures (e.g. overhead lines, lattice towers, control buildings), that cumulative impacts will also be negligible.

The consented Pinewood Wind Farm is examined hereunder for the potential cumulative collision risk with the Ballynalacken Windfarm, while the other Grid Connections and developments in close proximity to the River Nore at Moatpark and Ballyconra are examined the potential cumulative disturbance and habitat degradation impacts to Kingfisher with the Ballynalacken Windfarm Grid Connection.

- **Birds - Cumulative Collision Risk or Displacement**

Only four species (Kestrel, Buzzard, Sparrowhawk and Golden Plover) were active enough during the baseline surveys to trigger collision risk assessment at the Ballynalacken Windfarm site. Kestrel was the only bird to be considered at risk of a high impact from the Ballynalacken turbines in the absence of mitigation.

Pinewood Windfarm is located in County Laois, and is within 5km of the nearest Ballynalacken turbines. This project (Pinewood) did not identify any species to be of concern for the collision risk impact. The Pinewood

EIAR did acknowledge that Kestrel and Sparrowhawk were recorded flying through the Project Area baseline at turbine height, the extent of the impact was assessed as negligible in magnitude.

Kestrel are relatively loyal to their residential ranges for wintering and breeding and travelling within 10km for hunting habitat and typically within 2km from nesting sites during the breeding season. The Pinewood Windfarm project was submitted prior to Kestrel being upgraded from Amber to Red list. Despite this, given the extent of distance between the Pinewood and Ballynalacken wind farms (4km), it is unlikely for these projects to increase effects greater than those addressed by their respective impact evaluations. The cumulative effect between these projects is considered to be of low magnitude due to the separation distance (4km) between the nearest other windfarm project and the size of Kestrel ranges. <u>Cumulative impacts to Kestrel are therefore only likely to be Slight in a worse-case scenario</u> in the unlikely event that the baseline of Kestrel were to increase between the current baseline and the future receiving environment. Such an increase would be in contrast to the observed national decline of this species and no perceived enhancement of habitat to support a greater density of numbers.

Buzzard and Sparrowhawk were not considered at Pinewood to be at risk to collision. As such, any cumulative impact between these projects is likely to be low to Negligible. Given the impact significance of collision impacts assigned to these two species as a result of the Ballynalacken turbines, the significance of the cumulative impact to Buzzard or Sparrowhawk is unlikely to be increased as a result of both operational wind farms and is evaluated as <u>cumulatively Not Significant</u>.

Golden Plover was not identified as a sensitive receptor for this impact in the Pinewood Windfarm project EIAR, although it was recorded present in baseline surveys. Given this impact for Golden Plover for the proposed Ballynalacken turbines was identified as Not Significant based on the migratory nature of the species within the receiving environment, it is unlikely that the Pinewood Wind Farm project will contribute significantly to this impact. Under a precautionary principle, given the distance between the two projects and the range of wintering and migrating Golden Plover in Ireland, a <u>precautionary assignment of low magnitude and Slight cumulative significance is assigned</u>. This assessment is based on the possibility that flocks recorded may be displaced by the Ballynalacken turbines to fly closer to the Pinewood turbines, or *vice versa*. It is highly unlikely that this impact will occur but is considered to provide a robust consideration of potential cumulative impacts.

In relation to the other bird species it is considered that there is <u>no potential for significant cumulative collision risk impacts to the other Birds of Prey and Waders, or to Kingfisher, Passerines or Waterbirds</u> or based on the low/none records of these species flying through the proposed Ballynalacken windfarm site boundary at collision height, and due to the separation distance between the Ballynalacken and Pinewood projects.

- **<u>Kingfisher - Cumulative Disturbance & Habitat Degradation</u>**

In relation to cumulative disturbance or displacement; None of the aquatic habitats within the Ballynalacken Windfarm site provide suitable habitat for Kingfisher. The closest suitable habitat (low suitability) occurs downstream of the W3 bridge crossing over the Rathduff_15 stream along the Ballynalacken Grid Connection route on the regional road. Despite the proximity of the Rathduff_15 stream to the River Nore SPA, which is designated for Kingfisher, the non-perennial nature of this stream, which is often dry throughout the summer months, substantially reduces the suitability of this watercourse to nesting or foraging Kingfisher. As a result, disturbance or displacement of Kingfisher as a result of the Ballynalacken Windfarm Project is unlikely to occur. Given the separation distance between the Ballynalacken project works and the works associated with the two BESS projects or the grid connection projects in the Moatpark area and the works and activities associated with the Tirlán anaerobic digestor project on the far side of the River Nore, it is evaluated that significant cumulative disturbance or displacement impacts are unlikely to occur.

In relation to degradation of feeding resources; Watercourses are highly sensitive to changes in water quality, containing sensitive aquatic ecological receptors including salmonids, lamprey species and a diverse macroinvertebrate community on the River Nore. These receptors, juvenile/immature stages, make up a large portion of the Kingfisher diet. Where these receptors are impacted there is the potential for indirect impacts on Kingfisher. Reduction in water quality could potentially result from sediment and pollutants entering watercourses in water runoff from construction works areas. Instream works and works in riparian zones increase the risk of sediment and pollutants entering watercourses.

Two Battery Energy Storage Supply (BESS) developments are permitted to connect to the Ballyragget Substation. Both are located close to the existing 110kV substation at Ballyragget in agricultural lands to the east of the River Nore main channel. Neither project involves instream works.

Planning application for the Farranrory Windfarm grid connection element, and Parksgrove & Ballyragget Solar Farms Grid Connection have been consented. These grid connections will involve horizontal drilling under the River Nore to connect to the existing EirGrid Ballyragget Substation. Due to the proximity of works to the River Nore and the occurrence of three separate drills under the river, these projects have potential to adversely affect aquatic habitats and species, and potentially result in indirect effects to Kingfisher. Furthermore, an application for an Anaerobic Digester is consented at the existing Water Treatment Plant which is situated adjacent to the western bank of the River Nore.

Although the separation distance of the two BESS projects, the two grid connection projects and the Tirlán project, from the main Ballynalacken construction works at the windfarm site, is a mitigating factor, and further mitigation is afforded by the main windfarm works primarily draining into the Dinin River (not hydrologically connected with these Other Projects), there is potential for cumulative impacts from Ballynalacken Windfarm Project works within the Rathduff_15 catchment, should they be carried out during the wetter periods of the year. Without the implementation of the proposed mitigation measure MM28, and in a worst-case scenario, should the watercourse crossings at W2 and W3 (for Ballynalacken) be carried out during periods when the Rathduff_15 stream is flowing, and at the same time as the construction of the two BESS projects and the drilling works under the main River Nore channel for the other grid connections and the Tirlán works adjacent to the River Nore, then it is evaluated that there is potential for Moderate to Significant (unmitigated) cumulative impacts.

However, the non-perennial nature of the Rathduff_15 stream, which is dry for at least part of the year, enables the Ballynalacken Windfarm Project to commit (Mitigation Measures MM28) to the timing of works at W2 and W3 which will only be carried out when the Rathduff_15 stream is dry. The implementation of this mitigation measure for the Ballynalacken Windfarm Project removes the pathway for the impact and consequently the <u>Ballynalacken Windfarm Project will not contribute to cumulative impacts</u> with the other projects in the vicinity of Moatpark/Ballyconra.

EIAR 13.3.7 SENSITIVE ASPECT: AQUATIC HABITATS & SPECIES

This detailed evaluation section for Aquatic Habitats & Species is presented as follows:

- Section EIAR 13.3.7.1 - description of the baseline environment of Aquatic Habitats & Species;
- Section EIAR 13.3.7.2 - evaluation of the impacts of Ballynalacken Windfarm Project on Aquatic Habitats & Species; and
- Section EIAR 13.3.7.3 – evaluation of cumulative impacts.

EIAR 13.3.7.1 Baseline Environment – Aquatic Habitats & Species

The context, characteristics, importance, and sensitivity of *Aquatic Habitats & Species* are described in the subsections below. The trends and likely evolution (i.e. Do-Nothing scenario) for this Sensitive aspect are also considered.

As outlined in the Table below, the Ballynalacken Windfarm, Internal Cable Link, Tinnalintan Substation and Ballynalacken Grid Connection sites are drained by a number of 1st order headwater streams within several sub-basins and sub-catchments, all within the catchment of the River Nore Hydrometric Area 15.

Sub-Basin & (*Sub-catchment*)	**Watercourse Name Stream Order**	**Identification Code (EPA Code/EU Code)**	**Aquatic Survey Site ID**	**Downstream Distance from nearest works**
CLOGHNAGH_010 *Nore_SC_080*	Cloghnagh 1st Order	15C04 IE_SE_15C040400)	B6, B7	Crosses under Windfarm Site Road between T3 & T4
	Ballymartin_15 1st Order	15B72 IE_SE_15C040400		134m from Windfarm Site Road at site entrance 2
CASTLECOMER STREAM_010 *Dinin [North]_SC_010*	Castlecomer Stream 1st Order Stream	15C01 IE_SE_15C010100	B1, B2, B4, B5, B8	358m from deposition area at borrow pit no.2
	Unnamed tributary 1st Order	- IE_SE_15C010100	B3	476m from bat buffer zone at T5
	Unnamed tributary 1st Order	- IE_SE_15C010100		932m from hardstand of T1
Dinin(North)_040 *Dinin[North]_SC_010*	Dinin River 3rd Order	15D07 IE_SE_15D070400	B9	B9 570m from HR10
OWVEG (NORE)_040 *Nore_SC_060*	Kilcronan 1st Order	15K29 IE_SE_150010280	A1, A2, A3	209m from Windfarm Site Road to T2
NORE_120 *Nore_SC_060*	River Nore	15N01 IE_SE_15N011400	A5	180m from Ballynalacken Grid Connection on the R432
	Loughill 1st Order	15L13 IE_SE_15N011400	C3, C5	1.1km from T12
	Castlemarket_East 1st Order	15C89 IE_SE_15N011400	C1, C4	1km from public road widening works on the L5840
	Ballyoskill 1st Order	15B67 IE_SE_15N011400		951m from public road widening works on the L5840
	Ballynalacken_15 1st Order	15B69 IE_SE_15N011400		956m from public road widening works on the L5840
	Nicholastown_15 1st Order	15N06 IE_SE_15N011400	C2	824m from Internal Cable Link
	Sraleagh 1st Order	15S17 IE_SE_15N011400		161m from Internal Cable Link
	Rathduff_15 1st Order	15R24 IE_SE_15N011400	C6, C7	Crosses through the Internal Cable Link

Ground Waterbody	Kilkenny-Ballynakill Gravels	IE_SG_G_163		HDD works option at W3
Haul Route Works HR1 to HR9				
DININ(NORTH)_040	Donaguile, Glenmagoo or Firoda Lower (1st Order)	15C01 IE_SE_15C010100		HR11 - 72m
DININ(NORTH)_040	Castlecomer Stream (3rd Order)	15C01 IE_SE_15C010100		HR10 - 242m
DININ(NORTH)_040	Castlecomer Stream (3rd Order))	15C01 IE_SE_15C010100		HR9 - 222m
DININ (MAIN CHANNEL)_010	Damerstown West 2nd Order	15D37 IE_SE_15D020700		HR8 – 72m
NORE_160	Dunmore_15 2nd order	15D43 IE_SE_15N011750		HR7 – 527m
Haul Route Works HR1 to HR9				
NORE_170	Nore_Trib1 1st order	15N11 IE_SE_15N011950		HR6 – 309m
BROWNSTOWN (POCOKE)_010	Brownstown River 4th Order	15B04 IE_SE_15B041100		HR2 – 44m, HR3 - 142m, HR4 – 108m, HR5 – 350m
RATHGARVAN OR CLIFDEN_010	Rathgarvan_or_Clifden 1st Order	15R37 IE_SE_15R370950		HR1 – 581m

The following watercourses drained the proposed windfarm site: Kilcronan (15K29), Castlecomer Stream (15C01) and unnamed tributary, Cloghnagh (15C04), Castlemarket_East (15C89) and Loughill (15L13).

The following watercourses drained the proposed grid connection and internal cable route: Rathduff_15 stream (15R24).

The watercourses and aquatic survey sites in the vicinity of the proposed Ballynalacken Windfarm Project were typically small, upland eroding watercourses (FW1; Fossitt, 2000), and agricultural drainage ditches (FW4) (*see Terrestrial Habitats Section EIAR 13.3.1.1.1 for more details*). Land use practices at the windfarm site and in the wider survey area are dominated by agriculture, with land principally occupied by agricultural pastures. There are also localised areas of coniferous forestry and some areas of transitional woodland-shrub. Predominantly, the watercourses flow over areas of sandstones and shales, with areas of bedded limestones (with karsified features) at the Tinnalintan Substation and Ballynalacken Grid Connection locations. (Ch.7: Soils).

EIAR 13.3.7.1.1 Aquatic Habitat - Water Quality in Downstream Surface Water Bodies

The following outlines the available water quality data for the watercourses in the context of the proposed Ballynalacken Windfarm Project. Only recent water quality (i.e., since 2015) is summarised below. The EPA monitoring stations are identified on Figure 13.6: Aquatic Habitats.

There were no existing EPA biological monitoring data available for the Kilcronan (15K29), Castlemarket_East (15C89), Nicholastown_15 (15N06), Loughill (15L13) or Rathduff_15 (15R24) streams.

EIAR 13.3.7.1.1.1 Cloghnagh

The Cloghnagh stream rises in an upland area in Commons townland in the southern part of the proposed Ballynalacken Windfarm and flows southwards for approx. 9km before joining the Dinin River. There are three EPA water monitoring stations on the Cloghnagh downstream of the windfarm site:

RS15C040190: in the upper reaches 2.3km downstream of its source, at a bridge in Byrnesgrove, this watercourse has not received a Q-value water quality assessment.

RS15C040300: 3.6m further downstream at a bridge west of Maudlin, this watercourse has not received a Q-value water quality assessment.

RS15C040400: in the lower reaches, at a bridge 1km upstream of the confluence with the River Dinin, the river achieved **Q4** (Good status) water quality in 2022.

The Cloghnagh was of moderate WFD status in the 2016-2021 period and was considered 'under review'.

EIAR 13.3.7.1.1.2 Castlecomer Stream

The Castlecomer Stream rises in a small pond/wetland area (also location of survey site B1) at Ballynalacken townland before flowing eastwards for approx. 6.4km before joining the Dinin River north of Castlecomer Bridge. There are two EPA water monitoring stations on the Castlecomer Stream, downstream of the windfarm site:

RS15C010050: c.2.5km from its source at a bridge north-northwest of Glenmagoo, this watercourse has not received a Q-value water quality assessment.

RS15C010100: 4.2km further downstream at a bridge in Castlecomer town, the stream achieved **Q4** (Good status) water quality in 2022. This is also the location of aquatic survey site B5.

The Castlecomer Stream was of moderate WFD status in the 2016 - 2021 period and was considered 'at risk', primarily due to agricultural pressures (EPA).

EIAR 13.3.7.1.1.3 Owveg River

The Owveg River, also known as the Owenbeg River, rises near Fossy Hill, Co. Laois and flows in a south-westerly direction for approximately 28km before joining the River Nore in Coole townland, approx. 3.3km north of Ballyragget. There are three EPA water monitoring stations on the Owveg River, downstream of the windfarm site:

RS15O010280: at Castlemarket Bridge, approx. 2km downstream of survey site A3, the river achieved **Q4** (good status) at this station in 2022.

RS15O010300: at Rosconnell Bridge, this watercourse has not received a Q-value water quality.

RS15O010400: at a bridge east of Attanagh village and c.2.8km upstream of its confluence with the River Nore, the river achieved **Q4** (good status) water quality at this station in 2022.

The Owveg River (Owveg (Nore)_040 river waterbody) was of good WFD status in the 2016-2021 period and considered 'not at risk', however, some localised sections in the lower reaches of the Owveg River within the Nore_120 sub-basin downstream of Attanagh were of moderate WFD status in the 2016-2021 period and considered 'not at risk' at the time of report drafting (July 2024).

EIAR 13.3.7.1.1.4 River Nore

The River Nore rises on the eastern slopes of the Devil's Bit Mountain in the townland of Borrisnoe, County Tipperary. It then flows south-eastwards to County Laois and County Kilkenny before joining the River Barrow just north of New Ross near the Barrow Bridge. The river passes near Durrow, County Laois then through Ballyragget, the city of Kilkenny and then the villages of Bennettsbridge and Thomastown. There are numerous EPA water monitoring stations on the River Nore, and results from the following stations are included herein, as they are considered most relevant to the evaluation:

RS15N011300: at Tallyho Bridge, 3.9km upstream of the Owveg River confluence, the river achieved **Q4** (Good status) in 2022.

RS15N011380: 0.4km downstream of the Owveg River confluence and upstream of Tirlán, the river achieved **Q3-4** (Moderate status) in 2020.

RS15N011400: 0.5km upstream of Ballyragget town, the river achieved **Q3-4** (Moderate status) in 2020.

RS15N011700: at Threecastles Bridge, 2km upstream of the Dinin River confluence, the river achieved **Q3-4** (Moderate status) in 2022.

RS15N011700: ENE of Troyswood House, 3.9km downstream of the Dinin River confluence, the river achieved **Q4** (Good status) in 1991.

The River Nore was of Moderate WFD status in the 2016-2021 period at the section that has hydrological downstream connectivity with the Ballynalacken windfarm grid connection and considered 'not at risk' at the time of report drafting. Further downstream the River Nore was of Good WFD status in the 2016-2021 period. The value difference likely has connections to the Wastewater Treatment plant located at this section of the River.

EIAR 13.3.7.1.1.5 Dinin River

The Dinan rises in the southeast corner of County Laois, flowing westwards under the N78 at Ormond Bridge. It meets the Clogh River near the border with County Kilkenny and continues southwest under Massford Bridge. It flows through Castlecomer and continues southwest through the Kilkenny countryside, passing Jenkinstown Park and flowing under the N77 and meeting the River Nore at Dunmore West, upstream of Kilkenny City. There are numerous EPA water monitoring stations on the River Dinin, and results of the following stations are included herein, as they are considered most relevant to the evaluation herein:

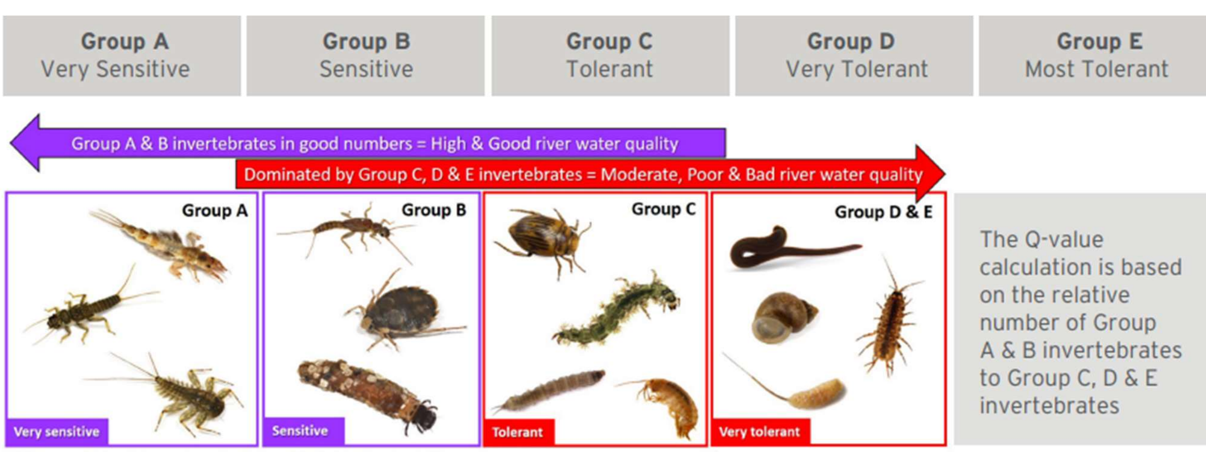
RS15D070300: Located at the bridge over the River Dinin on the N78 in Castlecomer, the river achieved **Q4** (Good status) water quality in 2022.

RS15D070350: Located 241m South of the L5904 bridge crossing over the Dinin River. The river achieved Q3-4 (moderate status) water quality in 1991. This is location is downstream of the aquatic survey site B8 & B9.

The Dinin River was of Moderate WFD status in the 2016-2021 period at the section that has hydrological proximity with the Ballynalacken windfarm Haul route works and considered 'at risk' at the time of report drafting.

EIAR 13.3.7.1.2 Aquatic Habitat - Biological Water Quality (macroinvertebrates)

Aquatic invertebrates are good at showing if the quality of the river water is good or bad. A biological index, known as the Q-value system, is used in Irish rivers. It gives a measure of the ecological health of each river stretch based on the known sensitivities and tolerances of each aquatic invertebrate to water pollution. Aquatic invertebrates are divided into 5 'Indicator Groups' based on their sensitivity to pollution. The Q-value calculation is based on the relative number of Group A & B invertebrates to Group C, D & E invertebrates. The values attributed to these sampling stations may be different from those described at the EPA monitoring stations due to the site specific location of the sampling station reflecting local conditions.



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Of the 22 survey sites *n*=14 sites in total were suitable for Q sampling. This took place at sites: A2 (Kilcronan), A3 (Owveg River), A4 (Owveg River), B4 & B5 (Castlecomer Stream), B8 (Castlecomer Stream, North Bridge) and B9 (Dinin River, Castlecomer Bridge) achieved **Q4** (**good status**) biological water quality and, therefore, met the good status requirements (i.e., ≥Q4 or EQR equivalent of 0.8) of the Water Framework Directive (2000/60/EC) and the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. No. 77/2019).

Sites A5 (River Nore, N77 Bridge), B7 (Cloghnagh) and C5 (Loughill) achieved **Q3-4** (**moderate status**). The remaining sampling sites (i.e., sites B2, B6, C3 and C4) achieved **Q3** (**poor status**). Thus, these sites failed to meet the good status requirements (i.e., ≥Q4 or EQR equivalent of 0.8) of the Water Framework Directive (2000/60/EC) and the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. No. 77/2019). Seven sites were not sampled for Q values due to unsuitable conditions to conduct the sampling.

The IUCN near-threatened water beetle *Gyrinus urinator* (Foster *et al*., 2009) was recorded from site C4 on the Castlemarket_East (Appendix 13.6). The nationally localised, non-native pygmy backswimmer (*Plea minutissima*) was recorded from an unnamed pond at site B1 and the adjacent Castlecomer Stream at site B2. B1 was not suitable for Q-sampling. No other rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from *n*=10 sites in September 2021 and n=4 sites in July/August 2023 (Figure 13.6).

The samples which achieved **Q3-4** (**moderate status**) supported low abundances of EPA group A (sensitive) species, low numbers of group B (less sensitive) species such as the stonefly *Leuctra hippopus*, and a dominance of group C (moderately pollution tolerant) species such as the caseless caddis *Hydropsyche instabilis*, the mayfly *Baetis rhodani*, the riffle beetle *Elmis aenea*, freshwater shrimp (*Gammarus duebeni*) and chironomid larvae. These sites were also often exposed to significant siltation and enrichment pressures in addition to poor/low flows.

Sites A2, A3, B4 and B5 were elevated to **Q4** (**good status**) water quality given the higher proportion of group A (pollution intolerant) species, namely the stonefly *Protonemura meyeri* and flattened mayfly species *Rithrogena semicolorata* and *Ecdyonurus dispar* (i.e. presence of at least one Group A taxon in at least fair numbers (5-10% of total abundance); Toner *et al*., 2005)

EIAR 13.3.7.1.3 Aquatic Habitats of Conservation Concern

EIAR 13.3.7.1.3.1 Qualifying Interest habitats of the River Barrow and River Nore SAC

Qualifying interest habitats of the SAC which could potentially occur within downstream watercourses in the sub-catchments associated with the Project include:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels, and
- Petrifying springs with tufa formation
- European dry heaths
- Killarney fern
- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles, and
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*.

A catchment-wide survey of *n*=18 sites in the vicinity of the proposed Ballynalacken Windfarm took place in 2021. An additional n=3 sites were sampled in July/August 2023 and April 2024. One example of the above qualifying interest habitats of the SAC was recorded during these surveys. 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' was recorded within the River

Nore near the N77 road bridge at Ballyragget town. This habitat is significantly downstream of any project element.

EIAR 13.3.7.1.4 Aquatic Species – Sensitive Species of Conservation Concern

The Ballynalacken Windfarm Project site is located within the River Nore catchment, draining into the main River Nore channel via a number of headwater streams and the Dinin and Owveg Rivers. The River Nore and also sections of the Dinin River and Owveg River form part of the River Barrow and River Nore SAC, which is designated for a number of aquatic species – Freshwater Pearl Mussel, White Clayed Crayfish, Lamprey species, Atlantic Salmon, and Twaite Shad. The riparian Desmoulins Whorl Snail is also a qualifying interest species of the SAC. Brown trout are also an important species within the SAC, being the main host species for Freshwater Pearl Mussel in the River Nore. European eel also occurs in low numbers.

A sensitive species data request was submitted (02/06/22) to the National Parks and Wildlife Service for the 10km grid squares containing and adjoining the proposed Ballynalacken Windfarm Project (i.e., S46, S47, S56, S57) and was received on the 23rd of June 2022. An updated request was submitted on June 5th of 2024 for more recent data and to include an additional grid square (S46, S47, S55, S56, S57). This request was received on June 11th of 2024, no significant change in records were present compared to the 2022 response. Records for a number of rare or protected aquatic species were available although most did not overlap directly with the 10km squares (i.e. S46, S47, S55, S56, S57). Records which occur within these 10km squares are included below.

EIAR 13.3.7.1.4.1 Freshwater Pearl Mussel

The freshwater pearl mussel *Margaritifera margaritifera* taxon is listed as critically endangered in Ireland (Byrne *et al*. 2009) and across Europe (Moorkens *et al*. 2017). Three Article 17 reports have been prepared for pearl mussel (to report on national status as part of the requirements of the Habitats Directive) with the overall conservation status being considered as 'Bad' on all three occasions (NPWS, 2019, 2013, 2008). During 2009, The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations S.I. No. 296/2009 were created to establish environmental quality objectives for SAC pearl mussel populations, including the preparation of sub-basin management plans. Due to water quality declines (primarily siltation pressures), the Nore is no longer considered to provide habitat suitable to support successful pearl mussel recruitment (NS2, 2010), which has led to attempts at assisted breeding (Moorkens, 2014).

A high number of records for the critically endangered hard-water form of the freshwater pearl mussel (*Margaritifera margaritifera durrovensis*) were available for the River Nore (S47, EPA 2007). This sub-species is primarily confined to two areas upstream and downstream of Durrow (Appendix 13.7), with known records spanning upstream of Ballyragget. Records stretch from Poorman's Bridge (S407859) (c.9km north of Durrow) to Lismaine Bridge (S442660) (c.5km south of Ballyragget), with most of the records found between Poorman's Bridge and the Tirlán Processing Plant (formerly *Avonmore Creamery*) which is c.2km north of Ballyragget (S440722) (NPWS, 2011a). The extant wild population of Nore freshwater pearl mussel is estimated as 300 adult individuals (Moorkens, 2009). For Nore pearl mussel distribution, please refer to DEHLG (2010) and map no. 7 within the conservation objectives document for the River Barrow and River Nore SAC (NPWS, 2011a). Potential hydrological connectivity to a known *M.m. durrovensis* population in the River Nore exists via the Rathduff_15 stream at the proposed Ballynalacken Grid Connection crossing W3 (c.90m upstream of the SAC).

In order to determine if Freshwater pearl mussel are present downstream of the Project, targeted surveys were carried out along a 15.6km of the River Nore between the confluence of the Owveg River to the confluence of the Dinin River. These surveys were carried out in August 2023 and April 2024 (Appendix 13.7). Live Freshwater Pearl Mussel was not recorded at any of the 32 sample points during the targeted surveys along a 15.6km stretch of the River Nore. The habitat condition was a majority of no suitability with High siltation overall with limited filamentous algae due to depths at multiple sample points. As outlined in the table below, four dead Margaritifera shells were identified during the survey. These were located upstream of the Owveg confluence (Section 1), upstream of the Old Bridge at Ballyragget (Section 8), Lismaine Bridge (Section 20) and in the vicinity of Inchmore Castle (Section 22). The few areas of low/poor suitability offered little in suitable habitat area for Freshwater Pearl Mussel.

Table 13-22: Counts of freshwater pearl mussel per ≤500m survey section along the River Nore

Watercourse	Survey section	No. live mussels	Relative abundance category	No. dead shells
River Nore	1	0	Absent	1
River Nore	2	0	Absent	None recorded
River Nore	3	0	Absent	None recorded
River Nore	4	0	Absent	None recorded
River Nore	5	0	Absent	None recorded
River Nore	6	0	Absent	None recorded
River Nore	7	0	Absent	None recorded
River Nore	8	0	Absent	1
River Nore	9	0	Absent	None recorded
River Nore	10	0	Absent	None recorded
River Nore	11	0	Absent	None recorded
River Nore	12	0	Absent	None recorded
River Nore	13	0	Absent	None recorded
River Nore	14	0	Absent	None recorded
River Nore	15	0	Absent	None recorded
River Nore	16	0	Absent	None recorded
River Nore	17	0	Absent	None recorded
River Nore	18	0	Absent	None recorded
River Nore	19	0	Absent	None recorded
River Nore	20	0	Absent	1
River Nore	21	0	Absent	None recorded
River Nore	22	0	Absent	1
River Nore	23	0	Absent	None recorded
River Nore	24	0	Absent	None recorded
River Nore	25	0	Absent	None recorded
River Nore	26	0	Absent	None recorded
River Nore	27	0	Absent	None recorded
River Nore	28	0	Absent	None recorded
River Nore	29	0	Absent	None recorded
River Nore	30	0	Absent	None recorded
River Nore	31	0	Absent	None recorded
River Nore	32	0	Absent	None recorded
	Total	**0**		**4**

eDNA sampling yielded positive results at one location, B8 (Castlecomer Stream), showing a 9/12 qPCR record. This location does not form part of the previously known distribution of this species along the watercourses in this area of Co. Kilkenny. It is noted that eDNA sampling yielded no positive results along the

Owveg river, the downstream Dinin River or along the Cloghnagh stream in April 2024 or on the Owveg River in August 2023 as part of the precautionary targeted Freshwater Pearl Mussel surveys (Appendix 13.7).

In April 2024, Castlecomer Stream underwent targeted pearl mussel surveys along 9 sample sections in order to identify the location of the population indicated by the positive eDNA record in 2023. No suitable habitat was observed along this watercourse. The positive eDNA result was determined to be false positive as a result of salmonids carrying traces of pearl mussel from other locations within the River Nore. As a result, Freshwater Pearl Mussel was determined to not be present within any watercourses that have hydrological or hydrogeological connectivity to the proposed Ballynalacken Windfarm Project.

Table 13-23: Counts of freshwater pearl mussel per ≤500m survey section along the Castlecomer Stream

Watercourse	Survey section	No. live mussels	Relative abundance category	No. dead shells
Castlecomer Stream	1	0	Absent	None recorded
Castlecomer Stream	2	0	Absent	None recorded
Castlecomer Stream	3	0	Absent	None recorded
Castlecomer Stream	4	0	Absent	None recorded
Castlecomer Stream	5	0	Absent	None recorded
Castlecomer Stream	6	0	Absent	None recorded
Castlecomer Stream	7	0	Absent	None recorded
Castlecomer Stream	8	0	Absent	None recorded
Castlecomer Stream	9	0	Absent	None recorded
	Total	**0**		**0**

EIAR 13.3.7.1.4.2 White Clayed Crawfish

Historical records for white-clawed crayfish (*Austropotamobius pallipes*) were available for the wider survey area, being located on the River Nore and several tributaries upstream and downstream of Ballyragget, including the Owveg River (also known as the Owenbeg River) (Appendix 13.6). A low number of records were also available for the Dinin River, as far upstream as Castlecomer (including the Castlecomer Stream tributary). These records spanned from 1987 to 2005. However, additional records were available on the Owveg from 2010 (NBDC data). Of the watercourses surveyed as part of this study, only the Owveg River (Nore tributary) and Castlecomer Stream (Dinin tributary) were known to support white-clawed crayfish (all records pre-2001). No white-clawed crayfish were recorded via hand-searching or sweep netting of instream refugia during the survey of three no. survey sites.

The Dinin River yielded positive eDNA results for this species at B9 (Positive 1/12) and the Owveg river yielded positive eDNA results as well at A4 (4/12). No crayfish eDNA was detected at site B8 on the Castlecomer Stream, and this was considered as evidence of the species absence at and/or upstream of the sampling location.Crayfish plague was tested for within three sites (A4, B8 & B9). Castlecomer Stream (B8) tested positive for crayfish plague in 2023.

EIAR 13.3.7.1.4.3 Lamprey Species

Brook Lamprey (*Lampetra planeri*) was known from the River Nore upstream of Ballyragget (S47), with historical Sea Lamprey (*Petromyzon marinus*) records available for the Nore at Ballyragget (from 1968 and 1972). River Lamprey records are limited to the southern reaches of the River Barrow and River Nore SAC, significantly downstream of Kilkenny city.

EIAR 13.3.7.1.4.4 Salmonoids – Atlantic salmon, Brown trout

Salmonids have been recorded throughout the OS grid squares that overlap with River Barrow and River Nore SAC. The presence and suitability for these species (at A3, A4, A5 and B9) was of a high enough level to be designated of international importance. A number of sites were of local importance (High value) for these species (A2, B4, B5, B8).

EIAR 13.3.7.1.4.5 Twaite Shad

Twaite Shad has been recorded along the Southern most reaches of the River Barrow and Nore SAC but not near Ballyragget town or Kilkenny city.

EIAR 13.3.7.1.4.6 European Eel

European Eel have been recorded throughout the OS grid squares that overlap with River Barrow and River Nore SAC. Two sites were of local importance (High value) for this species A2 (Kilcronan stream, Loughill) and B6 (Cloghnagh river, R694 road crossing).

EIAR 13.3.7.1.4.7 Desmoulins Whorl Snail

Whorl Snail was not recorded at any of the sites sampled for aquatic species and water quality. The NPWS consultation did not include any comment on this species but the data provided by NPWS did provide records of this species within one of the overlapping grid squares (S47). The Conservation Objective for the River Barrow and River Nore SAC maps this species for significantly upstream of the Nore within the S37 grid square.

EIAR 13.3.7.1.5 Aquatic Species - Fish Stock (Electro-Fishing Survey)

A catchment-wide electro-fishing survey of *n*=20 sites in the vicinity of the proposed Ballynalacken Windfarm Project was conducted on the 21st and 22nd September 2021 and 31st July to 3rd August 2023 following notification to Inland Fisheries Ireland. 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, European eel and lamprey species. A full description of the survey results on fish stocks and local habitats is presented in Appendix 13.6**.** The electro-fishing survey sites are identified on Figure 13.6: Aquatic Habitats.

EIAR 13.3.7.1.5.1 Salmonids

Atlantic salmon were recorded from seven sites downstream of the Ballynalacken Windfarm - on the River Nore (A5), Castlecomer Stream (B4, B5 & B8) and the Dinin River (B9). These sites supported parr of 0+ and ≥1+ size classes. Two sites on the Owveg River (A3, A4) recorded Atlantic Salmon.

Brown trout were recorded from a total of ten sites on the Kilcronan stream (A2), Owveg River (A3 & A4), River Nore (A5), Castlecomer Stream (B4, B5 & B8), Castlemarket_East (C4), Loughill river (C5) and Dinin River (B9).

The quality of salmonid habitat in the vicinity of the proposed Ballynalacken Windfarm Project varied considerably, with salmonids absent from the upper reaches of all surveyed watercourses due to poor or absent flows at the time of survey (i.e., dry or semi-dry channels). Furthermore, historical drainage pressures, low or intermittent/seasonal flows, siltation and eutrophication (primarily from agriculture) reduced the quality of habitat at those sites found to support salmonids. The best quality salmonid habitat, and highest salmonid densities, were present on the larger watercourses such as the Owveg River (A3 & A4), River Nore (A5), Castlecomer Stream (B4, B5 & B8) and the Dinin River (B9), where higher flow rates and volumes buffered against the aforementioned impacts.

The upper reaches of watercourses in the vicinity of the proposed Ballynalacken Windfarm Project (i.e., Kilcronan (A1), unnamed pond/wetland at B1, Castlecomer Stream at B2, unnamed tributary of the Castlecomer Stream (B3), Rathduff_15 (C6 and C7) Nicholastown_15 (C2) and Castlemarket_East stream (C1) offered little or often no fisheries value at the time of survey given the non-perennial nature of these streams – i.e. these streams have dry or semi-dry channels for part of the year and do not support salmonids.

Aquatic surveys at multiple points at Nore_120 (Rathduff_15) (C6 and C7), the Cloghnagh (B7), the Kilcronan (A1) and the Castlecomer Stream (B2, B3) were found to be of low seasonal water levels, typical of the catchment areas overlapping with the proposed Ballynalacken Windfarm Project. They were all of low fisheries value at their upper reaches, due to the low water levels observed during this survey season. Barriers were observed within the Cloghnagh, and smaller less significant barriers observed within the Owveg (A3) and Dinin River (B9).

Low seasonal water levels, typical of the catchment, were evidently a major issue for fish populations in the vicinity of the proposed Ballynalacken Windfarm, particularly in those watercourses draining to the west of the proposed wind farm. These resulted in degraded fisheries habitat, particularly due to low dissolved oxygen levels, high thermal stress and siltation. Low water levels also exacerbated known instream barriers (AMBER Consortium, 2020) on the Castlecomer Stream and Cloghnagh, as well as additional barriers recorded on the Cloghnagh (Site B7) and Kilcronan (at Owveg River confluence).

As such the watercourses in direct connectivity or in close proximity to the Ballynalacken Windfarm Project are not considered to be of high ecological value to salmonid receptors, as nurseries or as foraging habitat. Areas further downstream within these watercourses had higher suitability including A2, B4, B5, B6, C4 and C5.

EIAR 13.3.7.1.5.2 Lamprey

Lampetra sp. ammocoetes were recorded from five sites; on the Owveg River (A3), River Nore (A5), Castlecomer Stream (B5 & B8), and Loughill stream (C5). A moderate density population was recorded on the Loughill stream, where 15 per m^2 of targeted larval habitat were present. This density compares favourably with lamprey surveys undertaken on other Irish river catchments (e.g., O'Connor, 2004, 2006, 2007; King, 2006) and greatly exceeds the favourable conservation target of 2 per m^2 for *Lampetra* sp. within the River Barrow and River Nore SAC (002162) (NPWS, 2011), located c.1km downstream of the survey site. The River Nore (A5) site surveyed in 2021 yielded results in line with the conservation objective target (34 ammocoetes per m^2) (see the table in Section EIAR 13.3.7.1.5.4). A low density was recorded on the Castlecomer Stream at B5 (6 ammocoetes per m^2), with a single *Lampetra* sp. transformer recorded on the Owveg River (A3).

Suitability for lamprey was typically poor across the survey sites given low flows and or the predominance of hard substrata (i.e., mostly upland eroding/higher energy channels). Owing to their relatively small morphologies, *Lampetra* species such as brook lamprey require clean, fine gravels in which to dig their redds (Lasne *et al*. 2010; Rooney *et al*. 2013; Aronsuu & Virkkala, 2014; Dawson *et al*. 2015) although areas may also include fractions of sand, larger gravels, and cobble (Nika & Virbickas, 2010). Spawning habitat in the vicinity of the proposed Ballynalacken Windfarm was typically of reduced quality due to poor flows and, to a lesser extent, siltation and enrichment pressures. Furthermore, many of the aquatic survey sites were more representative of higher-energy, spate channels which do not provide suitable conditions for larval lamprey (i.e., requirement for soft sediment accumulations; Goodwin *et al*. 2008). Site A5 was of a higher suitability for lamprey compared to the other sites.

EIAR 13.3.7.1.5.3 European Eel

On both a global and Irish scale, the European eel is listed as 'critically endangered' (Pike *et al*., 2020; King *et al*., 2011). European eels were only recorded in low densities at sites on the Kilcronan stream (A2), River Nore

(A5) and Cloghnagh stream (B6). This was despite the presence of significant instream barriers to fish migration on two of these watercourses (A2 & B6) (e.g., ford crossings). No eels were recorded at the other 19 sites. B7 was the only site of good suitability for European eel that didn't record any individuals during surveys. Four sites were of moderate suitability (A2, A3, A4, B4) and another three were of low suitability (B5, C4, C5). As outlined above, this limited distribution was considered primarily as a result of poor/low seasonal flows, as well as instream migration barriers within the wider Nore_SC_060, Nore_SC_080 and Dinin_[North]_SC_010 river sub-catchments (AMBER Consortium, 2020). Nevertheless, even smaller channels with poor and or seasonal fisheries value can offer potential as European eel migratory pathways, provided they maintain downstream connectivity to larger channels (e.g., River Nore).

EIAR 13.3.7.1.5.4	Electrofishing Survey Results

Table 13-24: Fish species densities (per m²) recorded at sites in the vicinity of Ballynalacken Windfarm via electro-fishing in September 2021 and July, August 2023

Site	Watercourse	CPUE (Elapsed time)	Approx. area fished (m²)	Atlantic Salmon	Brown Trout	*Lampetra* sp.	European Eel	Three-Spined Stickle-back	Min-now	Stone Loach
A1	Kilcronan	n/a - Dry channel		0.000	0.000	0.000	0.000	0.000	0.000	0.000
A2	Kilcronan	10	187.5	0.000	**0.352**	0.000	0.005	0.000	0.000	0.000
				(*n*=0)	**(*n*=66)**	(n=0)	(*n*=1)	(*n*=0)	(*n*=0)	(*n*=0)
A3	Owveg [Nore]	10	270	**0.181**	0.207	0.004	0.000	0.000	**0.044**	0.000
				(*n*= 49)	(*n*= 56)	(*n*= 1)	(*n*=0)	(*n*=0)	**(*n*= 12)**	(*n*=0)
				(*n*= 1)	(*n*= 33)	(*n*=0)	(*n*=0)	(*n*=0)	(*n*=0)	(*n*=0)
A4	Owveg [Nore]	10	300	0.067	0.013	0.000	0.000	0.000	0.007	0.007
				(*n*=20)	(*n*=4)	(*n*=0)	(*n*=0)	(*n*=0)	(*n*=2)	(*n*=2)
A5	Nore	10	250	0.172	0.032	**34.0***	0.004	0.000	**0.044**	0.008
				(*n*= 43)	(*n*= 10)		(*n*= 1)	(*n*=0)	**(*n*= 10)**	(*n*= 2)
B1	Unnamed Pond	n/a Pond		n/a	n/a	n/a	n/a	n/a	n/a	n/a
B2	Castlecomer Stream	n/a Semi-Dry channel		0.000	0.000	0.000	0.000	0.000	0.000	0.000
B3	Unnamed tributary	n/a - Dry channel		0.000	0.000	0.000	0.000	0.000	0.000	0.000
B4	Castlecomer Stream	10	175	0.074	0.269	0.000	0.000	0.000	0.000	0.000
				(*n*= 14)	(*n*= 47)	(*n*=0)	(*n*=0)	(*n*=0)	(*n*=0)	(*n*=0)
B5	Castlecomer Stream	10	280	0.071	0.118	6*	0.000	0.007	0.000	0.000
				(*n*= 20)	(*n*= 33)	(*n*=9)	(*n*=0)	(*n*=2)	(*n*=0)	(*n*=0)
B6	Cloghnagh	5	100	0.000	0.000	0.000	**0.020**	0.000	0.000	0.060
				(*n*=0)	(*n*=0)	(*n*=0)	**(*n*=2)**	(*n*=0)	(*n*=0)	(*n*=6)
B7	Cloghnagh	10	162.5	0.000	0.000	0.000	0.000	0.000	0.000	**0.548**

Site	Watercourse	CPUE (Elapsed time)	Approx. area fished (m^2)	Atlantic Salmon	Brown Trout	*Lampetra* sp.	European Eel	Three-Spined Stickle-back	Min-now	Stone Loach
				(*n*=0)	(*n*=0)	(*n*=0)	(*n*=0)	(*n*=0)	(*n*=0)	**(*n*=89)**
B8	Castlecomer Stream	10	280	0.036	0.139	0.5*	0.000	0.000	0.004	0.004
				(*n*=10)	(*n*=39)		(*n*=0)	(*n*=0)	(*n*=1)	(*n*=1)
B9	Dinin [North]	10	350	0.14	0.057	0.000	0.000	0.000	0.000	0.003
				(*n*=49)	(*n*=20)	(*n*=0)	(*n*=0)	(*n*=0)	(*n*=0)	(*n*=1)
C1	Castlemarket_East	n/a - Dry channel		0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	Nicholastown_15	n/a - Dry channel		0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	Loughill	5	60	0.000	0.000	0.000	0.000	**0.200**	0.000	0.000
				(*n*=0)	(*n*=0)	(*n*=0)	(*n*=0)	**(*n*= 10)**	(*n*=0)	(*n*=0)
C4	Castlemarket East	5	100	0.000	0.020	0.000	0.000	0.070	0.000	0.000
				(*n*=0)	(*n*=2)	(*n*=0)	(*n*=0)	(*n*= 7)	(*n*=0)	(*n*=0)
C5	Loughill	10	150	0.000	0.007	15*	0.000	0.047	0.000	0.000
				(*n*=0)	(*n*=1)		(*n*=0)	(*n*=6)	(*n*=0)	(*n*=0)
C6	Rathduff_15	n/a - Dry channel		0.000	0.000	0.000	0.000	0.000	0.000	0.000
C7	Rathduff_15	n/a - Dry channel		0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: **Values in bold** represent the highest densities recorded for each species, respectively. Greyed out values indicate no fish recorded during the survey.
* = no. ammocoetes per m2 of targeted habitat fished.

EIAR 13.3.7.1.6 Existing Sources of Impacts to Aquatic Habitats & Species

The occurrence of existing pollution or environmental damage in the areas on or around the location of the Project have also been considered, and the following existing pollution/damage has been scoped in because it has potential to act as a 'source' of impact to Aquatic Habitats & Species:

- low or no water flows in upper reaches of watercourses;
- agricultural and forestry pressures (including but not limited to historical drainage, enrichment, siltation)

EIAR Figures: (included at the end of this Chapter)

Figure 13.6: Aquatic Habitats

EIAR Appendices: (included at the end of this Chapter)

Appendix 13.6: Aquatic Ecology Survey Results
Appendix 13.7: Freshwater Pearl Mussel Report

EIAR 13.3.7.1.7 Aquatic Ecological Value of Watercourses at Survey Locations

An aquatic ecological evaluation of *n*=21 survey sites was based on the results of electro-fishing, fisheries habitat appraisal, white-clawed crayfish, macrophyte/aquatic bryophyte and biological water quality surveys are summarised in **Table 13-25**.

Table 13-25: Aquatic ecological evaluation summary of the aquatic survey sites according to NRA (2009) criteria

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
A1	Kilcronan (1st order stream)	15K29	Local importance (lower value)	No fisheries or aquatic value due to non-perennial nature of stream (site 100% dry at time of survey, non-perennial watercourses do not flow continuously for the whole year); not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value
A2	**Kilcronan** (1st order)	15K29	**Local importance (higher value)**	Excellent-quality salmonid nursery with good-quality spawning and holding; site unsuitable for lamprey; brown trout & European eel recorded via electro-fishing; Q4 (good status) water quality (tentative rating due to poor flows); white-clawed crayfish remains recorded in otter spraint; no other aquatic species or habitats of high conservation value
A3	**Owveg River** 4^{th} order river	15O01	**International importance**	Located within the River Barrow and River Nore SAC (002162); excellent-quality salmonid nursery habitat with good-quality spawning and holding habitat; poor-quality *Lampetra* sp. habitat; Atlantic salmon, brown trout, minnow & *Lampetra* sp. recorded via electro-fishing; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
A4	Owveg River 4^{th} order river	15O01	**International importance**	Located within the River Barrow and River Nore SAC (002162); excellent-quality salmonid spawning & nursery habitat with good-quality holding habitat; localised but moderate-quality Lampetra sp. spawning & nursery habitat; brown trout, minnow, stone loach, rudd, Annex II Atlantic salmon, Annex II and Lampetra sp. recorded via electro-fishing; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
A5	River Nore	15N01	**International Importance**	Located within the River Barrow and River Nore SAC (002162); excellent-quality salmonid spawning & nursery habitat with good-quality holding habitat; localised but excellent-quality Lampetra sp. spawning & nursery habitat; brown trout, minnow, stone loach, rudd, Annex II

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
				Atlantic salmon, Annex II Lampetra sp. & Red-listed European eel, recorded via electro-fishing; otter prints recorded; Annex I habitat 'Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]' present; Q3-4 (moderate status) water quality; no other aquatic species or habitats of high conservation value
B1	Unnamed pond/wetland	15C01 (segment 15_13)	Local importance (lower value)	Poor-quality fisheries habitat; three-spined stickleback recorded via sweep netting; high suitability for common frog but low value for smooth newt[1] (neither species recorded present); no other aquatic species or habitats of high conservation value
B2	Castlecomer Stream (1st order)	15C01	Local importance (lower value)	Poor-quality salmonid habitat present, no suitability for lamprey; no fish recorded via electro-fishing; Q3 (poor status) water quality; no aquatic species or habitats of high conservation value. Channel semi-dry at time of visit, assessed to be a non-perennial watercourse.
B3	Unnamed tributary of the Castlecomer Stream (1st order)	n/a	Local importance (lower value)	No fisheries or aquatic value due to non-perennial nature of stream (site 100% dry at time of survey); not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value
B4	**Castlecomer Stream** (3rd order)	15C01	**Local importance (higher value)**	Excellent-quality salmonid nursery with good-quality spawning and holding; site unsuitable for lamprey; Atlantic salmon & brown trout recorded via electro-fishing; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
B5	**Castlecomer Stream** (3rd order)	15C01	**Local importance (higher value)**	Excellent-quality salmonid nursery with good-quality spawning but poor holding; moderate-quality lamprey habitat; Atlantic salmon, brown trout, three-spined stickleback & *Lampetra* sp. recorded via electro-fishing; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value

[1] Both smooth newt (Lissotriton vulgaris) and common frog (Rana temporaria) are protected under the Wildlife Act (1976-2021). Furthermore, common frogs are protected under Annex V of the Habitats Directive [92/42/EEC].

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
B6	**Cloghnagh** (1st order)	15C04	Local importance (lower value)	Moderate-quality salmonid habitat present (reduced by low flows); no suitability for lamprey; European eel & stone loach recorded via electro-fishing; Q3 (poor status) water quality; no other aquatic species or habitats of high conservation value
B7	Cloghnagh (2nd order)	15C04	Local importance (lower value)	Moderate-quality salmonid habitat present (reduced by low flows); no suitability for lamprey; stone loach only species recorded via electro-fishing; Q3-4 (moderate status) water quality; no other aquatic species or habitats of high conservation value
B8	Castlecomer Stream (2nd Order)	15C01	**Local importance (Higher value)**	Salmonids (including Atlantic salmon), Lampetra sp., Stone Loach and Minnow; Q4 (good status water quality)
B9	Dinin River (3rd Order)	15D07	**International importance**	Located within the River Barrow and River Nore SAC (002162); excellent-quality salmonid spawning & nursery habitat with good-quality holding habitat; localised but moderate-quality Lampetra sp. spawning & nursery habitat upstream of this location; brown trout, stone loach, Annex II Atlantic salmon recorded via electro-fishing; Q4 (good status) water quality; White-clawed crayfish present via eDNA sampling, no other aquatic species or habitats of high conservation value.
C1	Castlemarket_East (1st order)	15C89	Local importance (lower value)	Very low fisheries or aquatic value due to non-perennial nature of stream (site semi-dry at time of survey); not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value
C2	Nicholastown_15 (1st order)	15N06	Local importance (lower value)	No fisheries or aquatic value due to non-perennial nature of stream (site 100% dry at time of survey); no fish recorded via electro-fishing; not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value
C3	Loughill (1st order)	15L13	Local importance (lower value)	Poor fisheries or aquatic value due to non-perennial nature of stream (site semi-dry at time of survey); three-spined stickleback recorded via electro-fishing; Q3 (poor status) water quality (tentative rating due to poor flows); no other aquatic species or habitats of high conservation value

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
C4	**Castlemarket_East** (2nd order)	15L13	**Local importance (higher value)**	Moderate-quality salmonid nursery & spawning with poor-quality holding; site unsuitable for lamprey; brown trout and three-spined stickleback recorded via electro-fishing; Q3 (poor status) water quality (tentative rating due to poor flows); IUCN near-threatened water beetle *Gyrinus urinator* (Foster *et al.*, 2009) recorded; no other aquatic species or habitats of high conservation value
C5	**Loughill** (2nd order)	15L13	**Local importance (higher value)**	Moderate-quality salmonid nursery poor-quality spawning & holding; moderate-quality lamprey habitat; brown trout, three-spined stickleback & *Lampetra* sp. recorded via electro-fishing; Q3-4 (moderate status) water quality (tentative rating due to poor flows); no other aquatic species or habitats of high conservation value
C6	Rathduff_15 (1st order)	15R24	Local importance (lower value)	No fisheries or aquatic value due to non-perennial nature of stream (site 100% dry at time of survey); not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value
C7	Rathduff_15 (2nd order)	15R24	Local importance (lower value)	No fisheries or aquatic value due to non-perennial nature of stream (site 100% dry at time of survey); not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value

Conservation value: Atlantic salmon (*Salmo salar*), sea lamprey (*Petromyzon marinus*), brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*), white-clawed crayfish (*Austropotamobius pallipes*) and otter (*Lutra lutra*) are listed under Annex II of the Habitats Directive [92/42/EEC]. Atlantic salmon, river lamprey, white-clawed crayfish and otter are also listed under Annex V of the Habitats Directive [92/42/EEC]. Otters, along with their breeding and resting places, are also protected under provisions of the Irish Wildlife Acts 1976 to 2021. European eel are 'critically endangered' according to most recent ICUN red list (Pike *et al*. 2020) and listed as 'critically engendered' in Ireland (King *et al*. 2011). With the exception of the Fisheries Acts 1959 to 2019, brown trout and coarse fish species have no legal protection in Ireland.

EIAR 13.3.7.1.8 Importance of Aquatic Habitats & Species & Sensitivity to Change

Importance of Aquatic Habitats:

The River Nore is evaluated as **international/Very High importance** given its designation within the River Barrow and River Nore SAC (002162). This river is of high value to a number of Annex I EU Habitats. The habitats of conservation concern for this designated site include Estuaries [1130], Mudflats and sandflats not covered by seawater at low tide [1140], Reefs [1170], Salicornia and other annuals colonising mud and sand [1310], Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330], Mediterranean salt meadows (*Juncetalia maritimi*) [1410], Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260], European dry heaths [4030], Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430], Petrifying springs with tufa formation (Cratoneurion) [7220], Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0], Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0]. The extent of these habitats along the River Nore is not fully known and may be found in areas outside what the conservation objective report and NPWS indicate.

Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] was observed at the area near old bridge at Ballyragget within the River Nore (A5).

None of the other habitats listed for the SAC were recorded during survey efforts in areas that are in the immediate connection pathway to the Proposed Ballynalacken project.

The Owveg River was evaluated as **international/Very High importance** given its location within the River Barrow and River Nore SAC (002162). The river (at Site A3 and A4) was determined to have habitat features of high value for salmonids (both Atlantic salmon and brown trout) and also supported Annex II *Lampetra* sp. lamprey. This included good-quality spawning habitat and some localised but very good quality holding areas associated with bank undercuts and vegetation overhangs. A4 recorded Atlantic Salmon, Brown Trout, Minnow and Stone Loach from electrofishing. Sections also support *Fontinalis antipyretica* and the liverwort *Riccardia chamedryfolia* at this sample site.

The Dinin River which passes through Castlecomer before heading south to join the River Nore was sampled for Q values and electrofishing at Castlecomer just after the Castlecomer Stream confluence. The site was considered an excellent quality salmonid nursery, supporting a relatively high density of Atlantic salmon parr and juvenile brown trout. However, the weir present was considered a major barrier to fish during summer flows with no functioning fish pass (c. 2m vertical fall). Given the suitable habitat and the presence of this river within the River Barrow and River Nore SAC (002162), this river was evaluated as **international importance**.

The Rathduff_15 (C6, C7), along with the upper reaches of the Castlecomer Stream (B1, B2, B3), and the upper reaches of the Kilcronan (A1) 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.

Initial eDNA sampling at B8 (Castlecomer town) on the Castlecomer Stream (lower reaches) indicated the presence of Freshwater Pearl Mussel, with Site B8 a candidate of County Importance based on this positive eDNA result. This result was followed up with targeted surveys along the entirety of the main stream flow of the Castlecomer Stream. Based on the targeted surveys along the Castlecomer Stream, no suitable habitat, or individuals were present along this watercourse. The positive result was determined to be from trace carried upstream by salmonid species. The presence of salmonids (brown trout and or Annex II Atlantic salmon), Annex II Lampetra sp. and Red-listed European eel was confirmed in this watercourse. Evidence of Otter was also present. As such this watercourse was reduced to **local importance (higher value)**.

The lower reaches of the Kilcronan, Cloghnagh, Castlemarket_East and Loughill are evaluated as **local importance** (**higher value**), primarily due to suitable habitat for salmonid nurseries and good quality holding habitat present by way of bank undercuts and small scour pools scattered across these watercourses at differing levels. There was confirmed presence of salmonids (brown trout and or Annex II Atlantic salmon), Annex II *Lampetra* sp. and or Red-listed European eel at these watercourses. The upper stream areas of these watercourses were assessed to be of **local importance (lower value)** due to the shallower streams, lower Q-values and poorer fishery suitability.

The Dinin River which passes through Castlecomer before heading south to join the River Nore was sampled for Q values and electrofishing at Castlecomer just after the Castlecomer Stream confluence. The site was considered an excellent quality salmonid nursery, supporting a relatively high density of Atlantic salmon parr and juvenile brown trout. However, the weir was considered a major barrier to fish during summer flows with no functioning fish pass (c. 2m vertical fall).

In relation to biological water quality, Sites A2 (Kilcronan), A3 & A4 (Owveg River), B4, B5, B8 (Castlecomer Stream) and B9 (Dinin River) achieved **Q4** (**good status**) during aquatic surveys for the Ballynalacken Windfarm Project.

Sensitivity to Change– Aquatic Habitats:

The River Nore is a large river watercourse with sensitive habitats vulnerable to changes from pH and nitrate levels, temperature rises and changes in water levels along water transition areas. These changes have the potential to impact water quality, invertebrate and fishery stock levels across the watercourse. The spread of invasive species also carries significant threats to the habitats of conservation concern for this river watercourse, posing dangers to sensitive aquatic vegetation and fishery spawning areas.

The other rivers of international importance (Owveg river & Dinin river) share similar sensitivities as the River Nore. As such, any change to the mineral/nutrient levels poses the greatest risk to negatively impact these rivers and the conservation objectives of the River Barrow and River Nore SAC.

Importance of Aquatic Species:

In relation to macroinvertebrates, no rare macrophytes or rare aquatic bryophytes were recorded during the survey. Freshwater Pearl Mussel was only detected as either dead shell remains with the River Nore and a positive eDNA result within the Castlecomer Stream which was determined to be a false positive due to trace carried by salmon and trout.

Due to their inclusion as a Qualifying Interest species of the SAC, Freshwater Pearl Mussel, White-clayed crayfish, Atlantic salmon and Lamprey sp. are considered to be of International/Very High Importance, while the red-listed European eel is considered to be of National/High Importance. As native brown trout appear to be favoured by the Nore freshwater pearl mussel (as a host fish), it is considered to have High Importance herein. The Freshwater Pearl Mussel is also protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). Pearl mussel are protected in Ireland under the Wildlife Acts 1976 to 2023 (S.I. 112, 1990) and the species is listed on Annex II and Annex V of the EU Habitats Directive (92/43/EEC).

Three-spined stickleback, Stone loach and Minnow were also recorded during electro-fishing surveys, based their common occurrence and Least Concern conservation status, with Stone loach and Minnow both introduced (but ecologically benign) species, it is considered that these fish species are of Local value (lower importance), and are scoped out from further evaluation herein.

The IUCN near-threatened water beetle *Gyrinus urinator* (Foster *et al*., 2009) was recorded from site C4 on the Castlemarket_East stream. The nationally localised, non-native pygmy backswimmer *Plea minutissima* was recorded from an unnamed pond at site B1 and the adjacent Castlecomer Stream at site B2 and is considered as being of Local value (lower importance) due to its non-native status.

Sensitivity to Change – Aquatic Species:

Most aquatic species are sensitive to low/seasonal flows, fluctuating water levels, historic and current drainage activities, siltation and eutrophication associated with agricultural activities and intensification.

The presence of instream migration barriers can be of particular significance to eels and Atlantic Salmon and lamprey.

Freshwater Pearl Mussel are particularly sensitive to subtle changes in hydrology leading to erosion and permanent loss of juvenile substratum, as well as damage through habitat exposure during low flows. Sediment settling on and in the riverbed also results in habitat degradation for this species depriving them of oxygen as well as preventing new juveniles from colonising the substratum. Increased nutrient levels promote the growth of filamentous algae, diatoms and other algae acting as a physical barrier between the open water and the riverbed. Where mussel habitat is impacted by increases in sediment and nutrient levels, rooted plants expand and further compound the problems. The presence of organic matter results in severe deoxygenation of the riverbed, creating a barrier of fungal and bacterial biomass.

White-clawed crayfish have been particularly affected by the impact of introduced crayfish species as well as disease (crayfish plague).

Water beetle *Gyrinus urinator* is sensitive to water quality decline and loss of suitable breeding areas from drying out of smaller streams and ponds (Foster *et al.* 2009).

EIAR 13.3.7.1.9 Evolution of the Baseline Environment (the 'Do-Nothing' scenario)

Freshwater Pearl Mussel (*Margaritifera margaritifera*)

European freshwater pearl mussel populations have declined by 90% over the past century. In Ireland, 27 freshwater pearl mussel populations are protected within Special Areas of Conservation (SACs). Eight of these populations contain 80% of the total Irish freshwater pearl mussel population. The River Barrow and River Nore SACs population is not part of that 80%. Byrne et al. (2009) observed that the adult population within the River Nore was low and declining. This correlates with the absence of live specimens observed during the targeted surveys along the River Nore for the Ballynalacken Windfarm Project. As such, in a 'Do-Nothing' scenario, the Freshwater Pearl Mussel is expected to continue to decline.

White-clawed Crayfish (*Austropotamobius pallipes*)

The range of this species within Ireland covers a surface area of 40,200km² and is *decreasing* in the short-term (2007-2018). However, the range is *increasing* in the long-term (1994-2018).

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.

Atlantic Salmon (*Salmo salar*)

The range of this species 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).

The population size of the QI species within the range is estimated at 25,315 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 also *decreasing*.

The number of individuals returning to Irish rivers to spawn has declined by over 74% since 1975. The key threshold for waterbodies in Ireland is for the Q-value status be of good status. None of the river waterbody sections immediately connected to the proposed windfarm works were recorded to have this status during the aquatic baseline surveys.

Sea Lamprey (*Petromyzon marinus*)

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

The population size of the QI species within the range is estimated at 115 individuals per 1 x 1 km grid square. The short-term trend direction for the population size of the QI species is *stable*, while the long-term trend is unknown.

Brook Lamprey (*Lampetra planeri*)

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

The population size of the QI species within the range is estimated at 1,221 individuals per 1 x 1 km grid square. The short-term trend direction for the population size of the QI species is *stable*, while the long-term trend is unknown.

River Lamprey (*Lampetra fluviatilis*)

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

The population size of the QI species within the range is a minimum of 15 individuals per 1 x 1 km grid square. The short-term trend direction for the population size of the QI species is *uncertain*, while the long-term trend is unknown.

European Eel (*Anguilla anguilla*)

The European Eel is Critically Endangered (IUCN Irisha and Global Status). The 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.

Brown trout (*Salmo trutta*)

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.

Water Beetle: (Gyrinus urinator)

This water beetle is largely restricted to lowland, base-rich rivers and streams and its status may improve in response to climate change.

<u>Drivers of Change – Aquatic Habitats:</u>

The main drivers of change for Aquatic Habitats result from agricultural improvements and habitat loss/change resulting in the loss of habitat both locally and within a wider landscape. There are no current policies or initiatives that are likely to result in significant land-use change and therefore habitats prior to and during construction, operation and decommissioning of the proposed Ballynalacken Windfarm Project. Climate change with potentially warmer wetter winters and/or drier and hotter springs and summers may result in droughts and potentially reduce the availability of suitable substrate and hydrological conditions to support notable aquatic habitats, however, any such effects would be unlikely to occur significantly more often than is occurring at present prior to construction activities commencing. when impacts are Scoped in for these species.

Drivers of Change – Aquatic Species:

The main drivers of change for Aquatic species are largely as identified above for habitats and impacts to habitats has a consequent impact on species dependent on the aquatic environment. Some species-specific drivers of change are summarized below.

The Freshwater Pearl Mussel is a species that is highly sensitive to changes of sediment and water quality. Both Freshwater Pearl Mussel and White-clawed Crayfish require calm areas of running water with soft sediment. The noted moderate Q-value of the River Nore section mapped for Freshwater Pearl Mussel is indicative of the ongoing trend of water quality decline.

For all fish species scoped in as sensitive receptors, a decline in water quality and/or spawning habitat will contribute to reduction of distribution and abundance within the River Barrow and River Nore SAC. The various agricultural sources of fertilizers and other pollutants leads to changes in nutrient and sediment levels within the watercourses making them less suitable for invertebrate and fish species. These threats constitute an existing impact source on these receptors at present and are likely to continue into the future.

It is projected in the 'Do-Nothing' scenario that these identified ongoing threats will continue to be present and likely increase as the general area of Ballyragget is projected to increase in population size as will Kilkenny city and the surrounding area, as the population of Ireland increases and as climate change results in increasingly severe weather events (see below). As such, projects, and directives to reduce these threat sources including the EU Nature Restoration Law, and Agricultural Emissions Directive to reduce methane and nitrogen emissions as part of net zero aspirations, and reduced agricultural emissions commitments will contribute towards reducing these threats and their impacts on the aquatic receptors.

Driver of Change - Climate change**:**

Climate change has been identified as a threat to several aquatic species and habitats. Instances of major flooding and extremely warm summers places pressures on suitable nursery and redds habitats due to bank erosion and vegetation loss. Drivers of this threat are tied to greenhouse gas emissions and continued reliance on fossil fuels. These drivers are projected to remain sources for climate change pressures and threats to aquatics species for the foreseeable future as most developed nations are not on target to achieve the net zero carbon emissions by 2030.

None of the QI habitats or species within the River Barrow and River Nore SAC were identified specifically for being under threat from climate change. However, general vulnerability to increase temperature and extreme weather events such as storms, floods and droughts are likely to affect the aquatic habitat within the receiving environment in the vegetation and sediment compositions of rivers. As such, all of the QI habitats are likely to be affected as a result of climate change.

Water beetle *Gyrinus urinator* is noted to potentially benefit from the changes brought on by climate change (Foster *et al.*, 2009). Climate change is caused by the release of greenhouse gases. The EU Climate Action Plan for net zero by 2050 is a target to avoid a 2°C increase of global average temperature to prevent catastrophic changes to global climate causing extreme weather events triggering the irreversible chain of events causing life changing alternations to the world's ecosystem. At present, the temperature increase from pre-industrial era data was at +1.55°C for 2024 (WMO, 2025). The level of Carbon dioxide in the atmosphere has increased to 419.4 ppm as of 2023. These levels are likely to increase as long as fossil fuel consumptions and agricultural practices are in excess of carbon and nitrogen stores in the marine and terrestrial systems.

As such, this threat is likely to continue to contribute to the decline of Annex I EU Habitats and suitable habitat for Annex II EU species throughout their distribution in Ireland in a 'Do-Nothing' Scenario. The aquatic features connected to the proposed development are therefore likely to decline in condition and biodiversity in the future as a result of this driver.

Key areas that may be particularly adversely affected:

All aquatic species and habitats are likely to be vulnerable to the threats and drivers detailed above but the primary sensitivity pertains to the species and habitats listed as QIs for the River Barrow and River Nore SAC. As such, the waterbodies likely to be adversely affected are the Owveg river, River Nore and the Dinin River which are the primary watercourses within the surrounding receiving environment of the proposed Ballynalacken windfarm.

The species at the highest risk and sensitivity of being adversely affected are the Freshwater Pearl Mussel, Atlantic Salmon, and White-clawed Crayfish.

The Freshwater Pearl Mussel within the Nore was entirely absent of live individuals during the baseline aquatic surveys along a section of the River Nore that had previously mapped it present for the conservation objective for the River Barrow and River Nore SAC (NPWS, 2011). Based on the recorded absence of live individuals during surveys, the Freshwater Pearl Mussel is determined to have undergone severe decline in its distribution within the River Barrow and River Nore SAC from its Conservation Objectives baseline, likely due to the threats and drivers detailed above in a 'Do-Nothing' scenario.

Atlantic Salmon were recently recorded to have declined in individuals returning to rivers to spawn from 1.76 million in 1975 to 171,700 in 2022. As such, any areas suitable as nurseries for this species are the primary concern, where water quality decline or erosion in these areas could result in profound effects on the species.

White-clawed Crayfish has declined extensively due to the spread of crayfish plague within several river systems. This plague was recorded within a watercourse sampled via eDNA sampling at Castlecomer Stream.

The River Nore is hydrologically downstream of the Proposed Ballynalacken Windfarm Project. This river system is the area most at risk to be adversely affected by the drivers and threats identified above as it is host to the QI species and habitats sensitive to these drivers.

EIAR 13.3.7.2 Impact Evaluation – Aquatic Habitats & Species

This Section comprises an evaluation of the likely significant impacts of the proposed Ballynalacken Windfarm Project on the receiving environment. Moderate, Slight, Imperceptible and Neutral Impacts are also taken into consideration.

The impacts are presented/evaluated as follows:

a) Significant Impacts which are likely or have potential to occur, are subject to detailed evaluation;

b) Moderate or Slight Impacts, which are likely or have potential to occur, are subject to detailed evaluation;

c) Non-significant impacts of local concern or considered important enough to merit detailed evaluation;

d) Neutral or Imperceptible Impacts are scoped out from detailed evaluation, and a short evaluation is provided in the table below. Unlikely Impacts are also scoped out.

Table 13-26: Impacts to Aquatic Habitats & Species

Likely/Potential Impact	Evaluation	
Significant Impacts which are likely or have potential to occur – see detailed evaluation		
Construction Phase: Habitat Degradation Effects on Aquatic Habitats and Aquatic Species		*Section EIAR 13.3.7.2.1*
All Phases: Spread of aquatic & riparian invasive species		*Section EIAR 13.3.7.2.2*
Moderate or Slight Impacts, which are likely or have potential to occur - see detailed evaluation		
All Phases: Hydromorphological impacts to downstream waterbodies due to changes to drainage regimes and surface water runoff		*Section EIAR 13.3.7.2.3*
Non-significant impacts considered important enough (or of local concern) – see detailed evaluation		
All Phases: Hydromorphological impacts due to windfarm construction works at W1, D1, D2, D3, and D4		*Section EIAR 13.3.7.2.4*
Neutral or Imperceptible Impacts, or where no impact is likely to occur – evaluation below		
Construction Phase: Hydromorphological impacts to Kilcronan stream due to works at D4	No Impact: The Culvert which will be installed at wet drainage channel D4 will be bottomless. As such, no damming or flow alteration will occur at this water crossing. This crossing is 690m upstream before it joins the Kilcronan stream that was evaluated as local (low value) importance. Given the limited and short-term extent of instream works at this crossing and the absence of strong waterflow to bring any contaminants into watercourses of higher value, this impact is scoped out for these works.	
Construction Phase: Hydromorphological impacts to Rathduff_15 stream due to works at W2 and W3	Neutral Impact: The Rathduff_15 has been evaluated as Local Importance - Lower Value at both C6 and C7 survey sites due to its, non-perennial nature (i.e. it is dry for part of the year), and the absence of aquatic species or habitats of high conservation value. In addition, cabling works at the two crossing points (W2, W3) on this waterbody will involve no works to the watercourse itself. At W2 and W3, works will involve the installation of cables in the public road above the existing structure or directional drilling under the structure, with no instream works and no new crossing structure required, and no works will take place at this watercourse crossing point during the operational or decommissioning phases. A breach of the riverbed is unlikely to occur, however any effects to the morphology of the Rathduff_15 at this location will be negligible due to the narrow width and nature of this watercourse at the crossing location Therefore, impacts to the hydromorphology of the Rathduff_15 will be neutral.	

Construction Phase: Disturbance/displacement/ mortality of species of conservation importance	Neutral Impact: Considered unlikely to occur due to no instream works in natural watercourses, the limited 'instream' works in wet drainage channels, and limited extent of works which will all take place in close proximity to 1st order streams and drainage ditches in the higher reaches of waterbodies; the low quality of available aquatic habitat mainly due to the low seasonal flows or non-perennial nature of many of the watercourses and drains onsite; and the number (low/none) of fish or aquatic species likely to be affected. In addition, any works in proximity to watercourses or drains will be temporary in duration, and any potential effects will be reversible with the completion of construction works. Overall, the impact will be Neutral.
Operation & Decommissioning Phases: Decrease in water quality in downstream waterbodies	Neutral Impact: During the operational and decommissioning phases, the potential for silt-laden runoff is much reduced compared to the construction phase. Furthermore, no instream works will take place, no felling will be required, and the number of vehicles on-site will be very small. Some minor maintenance works will be required periodically during operation, such as maintenance of site entrances, internal roads and hardstand areas. These works would be of a very minor scale, brief duration and would be very infrequent. Potential sources of sediment laden water would only arise from surface water runoff from small areas where new material is added during maintenance works. It is considered that the levels of suspended sediment in surface water runoff will be negligible during the operational phase. The reopening of widened site entrances or haul route works locations to facilitate major component transport during the operational phase, and turbine removal during the decommissioning phase, will involve minor works, generally set in agricultural grassland fields, with any reopening of concealed turbine hardstand taking place inside the site drainage network, as a result, volumes suspended sediment in surface water runoff will be negligible. Also, during decommissioning, the reinstatement of the turbine hardstands and foundation areas will involve using the soil stored in the deposition area at each turbine to cover the hardstand and foundation area. Cables will be pulled from ducts at jointing chambers, and the ducts will remain in-situ to minimise the volume of exposed soils. Windfarm Site Roads will remain in-situ for use by the landowners. In relation to contamination by hydrocarbons, due to the very small number of vehicles associated with operational and decommissioning phase works, there is a very low risk associated with release of hydrocarbons from site vehicles, and it is not envisaged that any refuelling works will be undertaken on site during the operational phase. Therefore, the potential for contamination effects is negligible. Overall, the magnitude of potential decreases in water quality during the operational and decommissioning phases is evaluated as Negligible.

EIAR 13.3.7.2.1 Habitat Degradation Effects on Aquatic Habitats and Aquatic Species	
Sensitive Aspect: Importance:	Aquatic habitats & species **Very High to Low (Local Importance – Higher Value)** (per Section EIAR 13.3.7.1)
Impact Source(s)	Reduction in water quality from Excavation of soils, groundworks, overburden storage, presence/use of machinery, oils and fuels, concrete pours, directional drilling, forestry felling
Impact Pathway(s)	Surface water runoff, soil, groundwater flow paths
Project Stage	Construction Phase

Overview of Impact (general):

Watercourses are highly sensitive to changes in water quality, containing sensitive aquatic ecological receptors including salmonids, lamprey species and a diverse macroinvertebrate community including Freshwater Pearl Mussell on the River Nore. Reduction in water quality could potentially result from pollutants entering watercourses in water runoff from construction works areas. These pollutants include suspended solids (sediment) from excavation and movement of soils, hydrocarbons from fuel/oil spills or leaks, cementitious materials from concrete pours, potential drilling fluids (Bentonite) from potential frac-out during Horizontal Directional Drilling at W3 (if that crossing method is used), and phosphorus from forestry felling.

Suspended solids are small particles in water that neither dissolve nor settle by gravity, such as clay, silt, sand or organic matter and can lead to water turbidity. Erosion and deposition (of sediment) are natural processes in watercourses, varying naturally throughout the year, and although harmless in themselves, an increased content of suspended solids makes water cloudier and limits the sunlight reaching aquatic plants such as river macrophytes, affecting their growth. Additional sediment contributions entering the watercourse, such as from construction works, can have negative implications for fish and invertebrates due to physical damage and reduced feeding/foraging, reduced visibility for predatory fish, as well as negative impacts due to compaction of spawning gravels by sediment causing mortality impacts for salmonid eggs (affecting recruitment) and interfering with Freshwater Pearl Mussel life stages, and other invertebrate life stages within gravel substrates (interstitial spaces). These impacts may be mobilised downstream and affect river reaches at a distance from the physical works.

In addition, water quality effects due to contamination by fuel or oils has the potential to lead to direct toxicity events to aquatic species, or sub-lethal degradation of aquatic habitat quality. Hydrocarbons can also act as a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms.

Concrete or other cementitious materials are highly alkaline and corrosive, can change the pH levels within a watercourse as well as potentially physically damaging fish by burning their skin and blocking their gills.

Phosphorus losses from forestry can arise from the decomposition of brash left on former conifer clear-fell sites. Nutrient enrichment of aquatic habitats can result in changes to the make-up of the plant species, such as river macrophytes within a watercourse, with secondary effects on vegetation communities, invertebrates and fish.

Reductions in water quality can result in the reduction or loss of aquatic habitats, and in a reduction or loss of feeding, resting or breeding habitat for aquatic species. Furthermore, reductions in water quality can lead to reductions in population distribution or structure of important aquatic species and could result in a downgrading of the Q-status of a waterbody under the Water Framework Directive.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

The impact on Water Quality, as evaluated in Chapter 8 Water (Sections EIAR 8.3.1.2.2 and EIAR 8.3.1.3.3) are presented: Due to the extent of groundworks and excavations, the extent of forestry felling, and the volumes of overburden to be moved/stored, it is considered that there is high sediment runoff potential at the proposed Project site and, as a result, if mitigation is not put in place - downstream river waterbodies will be potentially at risk of Significant impacts in the Cloghnagh_010, Castlecomer Stream_010, Owveg(Nore)_040, and Nore_120 sub-basins. In relation to contamination by hydrocarbons or cementitious material, only relatively small volumes of fuels / oils will be on-site at any one time and therefore any impacts that do arise (worst case) will be very localised to the source / works activity area, limited to small, isolated, low volume spills of oils/fuels; Most cement will be used for turbine base construction with cementitious material poured at the turbine base area which will be contained by an underlying binding layer and temporary shuttering while the cementitious material around the grid connection cable ducting will be contained within the trench, therefore it is considered that any water quality impacts due to contamination will be of Negligible to locally Small Adverse magnitude equating to Imperceptible to Moderate significance impacts to water quality. Due to the spread-out nature of the proposed forestry felling area within 3 no. sub-catchments and the fact that all felling operations must conform to current best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and DAFM guidance documents, overall, the magnitude of impact is considered to be Small Adverse, in the absence of any additional mitigation measures. Haul route works, including HR8, comprise minor works at discrete locations and will have negligible/imperceptible impacts on water quality in the downstream Castlecomer Stream, Dinin River or River Nore catchments.

<u>Aquatic habitats</u>: The southern half of the windfarm site, which includes the construction of 6 turbines, 1 borrow pit, the windfarm control building and associated works, and also the watercourse/drain crossings D1 to D3, drains into the Dinin River via the Cloghnagh stream which is of Local Importance (higher value). The Cloghnagh waterbody is the closest to the windfarm site works, with W1 (new crossing structure) located at the start of this waterbody in Commons townland. D1 (new bottomless crossing structure and diversion of channel) is located on a wet drainage channel located c.143 m upstream of the Cloghnagh. The wet drainage channel at D2 (8m extension of the existing culvert), is c.148m upstream of the Ballynalacken_15 1st order stream, which drains into the Cloghnagh 450m further downstream. Given the potential for Significant impacts (unmitigated) to downstream water quality, it is evaluated that the WFD status and biological value (Q-status) could be adversely affected and could reduce to Q3 or lower, and it is evaluated that the magnitude of impact to aquatic habitats within the Cloghnagh and Ballymartin_15 watercourses has potential to be of Medium magnitude should works cause large sediment run-off.

The mid/eastern part of the windfarm site (2 turbines, 1 borrow pit, construction compound and associate works and also HR9 to HR11) also drains into the Dinin catchment via the Castlecomer Stream, no instream works or loss of instream habitats will occur in the Castlecomer Stream, however in the absence of mitigation, reductions in water quality could result in Low/Medium magnitude impacts to aquatic habitats in the Castlecomer Stream, should works cause large sediment run-off.

The northern part of the windfarm site, which includes 4 turbines and associated works, and the met mast, drains into the Kilcronan stream, and a new culvert crossing D4 is also proposed at a wet drainage channel in Ballyouskill townland (c.660m) upstream of the Kilcronan 1st order stream. There will be no works within or in close proximity to this waterbody, and the magnitude of deterioration of aquatic habitats based on the reductions in water quality are evaluated as being negligible magnitude due to this area of the Kilcronan stream being of local importance (Low value) and the works making no significant increase to the baseline sources of this impact The neighbouring fields to this drainage ditch pathway are mostly agricultural grassland used for grazing. Given the works will not involve damming the watercourse or changing its flow, the Kilcronan is unlikely to undergo a significant effect as a result of this impact.

The majority of the Internal Cable Link drains into the Rathduff_15 1st order stream, with works for 1 day at W2 to install the cable ducting over an existing culvert in the public road. No instream works will be required. It is noted that this watercourse is of Local Importance (lower) value, due to the non-perennial nature of this stream and would have no aquatic value during dryer periods of the year. It is evaluated that in the absence of mitigation, reduction in water quality could result in Low/Negligible magnitude impacts to aquatic habitats should works be carried out during very wet weather and cause sediment run-off (i.e. worst-case scenario).

The Ballynalacken Grid Connection will also cross the Rathduff_15 stream, further downstream not far from its confluence with the Nore (c.180m downstream). The works will take place in the deck of the existing bridge on the regional road or installed by directional drilling under the bridge along the road corridor. No instream works will be required. It is noted that this watercourse is of Local Importance (lower) value, due to the non-perennial nature of this stream and would have no aquatic value during dryer periods of the year. It is evaluated that in the absence of mitigation, reduction in water quality could result in Low/Negligible magnitude impacts to aquatic habitats should works be carried out during very wet weather and cause sediment run-off (i.e. worst-case scenario).

Overall, the magnitude of impact to aquatic habitats in the waterbodies will be as follows: Cloghnagh (Medium), Castlecomer Stream (Low/Medium), Kilcronan (Low), Rathduff_15 (Low). However, due to the Local importance of these watercourses, the significance of impact will be Not Significant.

Aquatic Species: additional sediment presents the largest risk to downstream water quality, and when the sensitivity of Freshwater pearl mussel to sedimentation is taken into consideration, it is evaluated that the magnitude of (unmitigated) impacts could be potentially Medium to High in a worst-case scenario. Magnitude of impacts to other sensitive receptors, White-clayed crayfish, Atlantic salmon, brown trout and Lamprey species, are assessed as Medium. The magnitudes listed above for these species are assigned under the precautionary principal to address any potential of significant effect occurring, given the sensitivity and conservation status of these species under the habitat's directive. However, it should be noted that no Freshwater Pearl Mussel were recorded on any of the watercourses surveyed as part of the Freshwater Pearl Mussel surveys (Appendix 13.7).

While Atlantic Salmon and Brown Trout were recorded at seven and ten sites downstream of the Project respectively, the watercourses in direct contact or in close proximity to the Ballynalacken Windfarm Project are not considered to be of high ecological value to salmonids,. In relation to Lamprey species, *Lampetra sp*. ammocoetes were recorded from five sites (see table in Section EIAR 13.3.7.1.5.4), it is considered that habitat suitability was poor across the survey sites.. White-clawed Crayfish was also not recorded during aquatic ecological surveys, though the Dinin River and Owveg did yield positive crayfish eDNA results, as per Section EIAR 13.3.7.1.4.2.

Water beetle is likely sensitive to this impact since its presence contributes Q-Values of watercourses. Lower quality would equate to a Medium magnitude but only a slight significance due to it not being list as protected species.

The new culverts at D1 and W1 on the Cloghnagh and the extended culvert at D2 upstream of the Ballymartin_15 could potentially affect the passage of European eel, Lamprey species or Atlantic salmon, although the numbers of salmon/eel likely to utilise the upper reaches of the Cloghnagh or Ballymartin_15 are expected to be very low.

The crossing at D4 is upstream of the section of the Kilcronan stream that was identified to only have local importance (low value). This confluence is 690m downstream of the D4 location. Further downstream of the confluence is a section of the stream that was identified to be of Local importance (High value) based on the presence of Otter spraint containing crayfish remains, eel and trout and its close proximity to the River Barrow and Nore SAC.

The crossing at W2 involves the installation of the Internal Cable Link in the public road over an existing culvert on the upper reaches of the Rathduff_15 stream, while the grid connection cabling will be installed either over the existing road bridge (option a – in the deck of the bridge), or under the bridge and under the watercourse (option b- directional drilling). While the magnitude and likelihood of effects is reduced due to the absence of instream works, there are likely to be low levels of sediment released to surface waters during unmitigated works for either crossing method, particularly during wet weather periods. In addition, there are underground interactions to consider with the drilling option. Directional drilling is an accepted method for watercourse crossings as it requires no instream works. Bentonite, which is non-toxic, will be used as the drilling fluid. It is expected that there will be some localised turbidity effects in the groundwater during works, but these effects will be brief-temporary in duration, with the completion of the drilling, and the installation of the ducting into the borehole. Although unlikely, should a riverbed breach occur during the directional drilling, this would result in drilling lubricant and sediment to be released onto the bed of the watercourse, and potentially washed downstream into the River Nore, however any volumes of sediment or the non-toxic lubricant (Bentonite) would be negligible.

Overall, the magnitude of impact to aquatic species is potentially High for Freshwater pearl mussel due to its sensitivity to this type of impact, Medium for white-clayed crayfish, Medium for Atlantic salmon, Brown trout, Lamprey species, and European eel.

In relation to the Rathduff_15, as this waterbody has been evaluated as Local Importance-Lower Value at both C6 and C7 survey sites due to its non-perennial nature (i.e. it is dry for part of the year), and due to the absence of aquatic species or habitats of high conservation value, the magnitude of impact to aquatic habitats or species will be Negligible.

Impact Magnitude	Low to Medium (aquatic habitats) Medium to High (aquatic species)	**Impact Significance: *(pre-mitigation)***	**Not Significant** *(habitats)* **Potentially Significant** *(species)*

Mitigation and Monitoring Measures which will be implemented are presented along with a brief description of their effectiveness in avoiding, reducing or otherwise ameliorating the potential Significant impact **See Chapter 19: Mitigation & Monitoring Arrangements for full wording of mitigation measure*	
Design	Avoidance of on-site sensitive hydrology features by constraints mapping (i.e. buffer zones)
Design	Avoidance of areas of peat
Design	No temporary storage of overburden in the Owveg_Nore_040 Catchment
Design	Construction and installation of the site drainage network
Design	Implementation of the Surface Water Management Plan
Design	At D1, the existing wet drainage channel will be permanently diverted for a short distance so that it is at least 25m away from the turbine foundation, an interceptor drain will be constructed between the works area and the diverted section of the watercourse.
SM02*	Pre-construction confirmatory surface water quality monitoring and recording.
SM11	The construction Method Statements to be developed by the construction contractors will take full account of the EMP including the mitigation and monitoring measures and will be reviewed by the Environmental Manger prior to the commencement of construction works.
SM12	All construction works will be monitored for compliance with the Environmental Management Plan by the project Environmental Management Team which will include an Environmental Clerk of Works, the Project Ecologist and specialists such as a hydrologist, who are independent of the site contractors. The Environmental Management Team will report to the owner's Project Manager.
SM14	A suitably qualified engineer will supervise all windfarm site excavations and construction works.
SM15*	Regular inspection of the windfarm drainage network by the Contractor and Project Hydrologist.
SM16*	Regular surface water quality monitoring and recording during the Construction Phase in accordance with the Surface Water Management Plan
SM20	The Project Ecologist will liaise with the Contractors on a weekly basis regarding the upcoming schedule of works and will advise the Contractors of any particular ecological protection requirements at specific locations on site.
MM01	The boundaries of the Construction Works Area will be fenced to prevent the encroachment of construction phase personnel, machinery or materials beyond this boundary. In agricultural lands, livestock proof fencing will be used, with landowner access maintained through the provision of gates along the boundary fences.
MM02	Construction traffic, personnel and materials will be restricted to within the Construction Works Area Boundary fence. Machinery will be kept on the windfarm site roads and hardstanding areas, and, aside from advancing excavations, will avoid moving onto areas not delineated on the site drawings
MM03	Land reinstatement will not be carried out during very wet weather or when the soil is waterlogged. If any compaction has occurred along the construction works area, these areas will be ploughed with a sub-soiler to loosen the subsoil layer
MM05	During windfarm construction works, excavations will be backfilled as soon as is possible.
MM06*	Removal of excavated materials to designated berms more than 50m from watercourses or wet drainage features. Implementation of silt control measures and maintenance of vegetative buffers.
MM07*	Storage berms will be graded, sod to be retained and placed on berms and berms re-seeded, measures incorporated to prevent dust and soil erosion.
MM08	Along the cable route on the public road, there will be no storage of overburden and all excavations from road trenches will be removed to licensed waste facilities in accordance with the Waste Management Plan. The excavated material will be covered during transportation to prevent spillages and reduce dust.

MM09	All excavations which are unsuitable for use as construction/reinstatement material which arise within the catchment of the Owenbeg River (T9, T10, T11 and T12 and associated Windfarm Site Roads) will not be stored within the catchment, instead these arisings will be transported to the temporary deposition area at Borrow Pit No.2 and at Turbine T7 (both located outside of the Owenbeg River catchment). In addition, a Siltbuster or other suitable treatment train will be used to remove fine silt particles from site runoff in this catchment. The Siltbuster will be set up at works locations and used during groundworks and earthmoving activities.
MM10	At the windfarm site, at works locations within 50m of watercourses or existing drainage features there will be additional mitigation measures deployed including double silt fencing prior to the commencement of the works, temporary drain blocking in existing drains, placement of silt trapping arrangements along preferential surface water flowpaths and, where necessary, the use of matting to prevent ground erosion and rutting. Works will not take place within this zone during prolonged heavy or exceptional rainfall events.
MM11	Weather forecasts will be consulted in advance of works. If there is heavy prolonged rainfall or if an exceptional rainfall event occurs, then construction works will cease until peak flows have subsided.
MM12*	Site roads and hardstanding areas have a permanent surface water drainage network, the borrow pits will have a temporary surface water drainage network in place during works. The site drainage network will include check dam, settlement ponds and buffered outfall weirs.
MM13*	Site roads and hardstanding areas will be capped with clean high-grade bedrock, such as limestone
MM14*	At the windfarm site, there will be no direct discharge into any watercourses or drains or onto adjacent habitat. All pumped water from excavations will be treated prior to discharge.
MM15	Along the cable routes, where dewatering of trenches or excavations is required, there will be no direct discharge of treated water into any watercourse or drain. Rather, all pumped water will be discharged via a silt bag.
MM17	New culverts which will be installed at watercourses or wet drainage channels will be bottomless or clear spanning.
MM18*	In-stream works will not be undertaken without isolation of flow within the watercourse. The water will be isolated from the works by over pumping, flume (pipe) or channel diversion methods.
MM19*	At wet drainage channels, instream works will be followed by site-specific reinstatement measures to ensure the restoration of flow character and morphology within the affected reach.
MM20	Only precast concrete culverts will be used for new watercourse crossing structures on the windfarm site. Only precast concrete chambers will be used at Joint Bay locations.
SM18	The plant and machinery will be regularly inspected for leaks and maintained in good working order for the duration of the works.
SM19	Fuel, oil and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage.
MM21*	Concrete control procedures will be implemented including no batching; ready mixed concrete will be used for all foundations; work scheduled for dry days; experienced operators; run-off will be settled out and no concrete truck washing on-site.
MM22*	Fuel/oil control procedures will be implemented including control of on-site refuelling of plant and machinery; provision of spill kits. trained operatives, use of double-skinned mobile bowsers. Emergency Response Plan in place.
MM23	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse or wet drainage channel or local spring/well.
MM24*	All fuels or oils, will be stored in designated, bunded, locked storage areas and fitted with a storm drainage system and an appropriate oil interceptor. Emergency Response Plan in place.
MM25	Overnight parking of plant and machinery will only be permitted at locations which are greater than 50m from watercourse/drainage features and at an existing hard-core surface. Drip trays and fuel traps will be used under and around parked plant and machinery to contain any leaks.
MM26	All associated tree felling will be undertaken using good working practices as outlined by the Forest Service in their 'Forestry Harvesting and Environment Guidelines' (2000) and the 'Forestry and Water Quality Guidelines '(2000). Measures will include the protection of the riparian zones, installation of buffered drainage outfalls, installation of drains and silt traps as soon as possible once felling has

	been completed, and a regime of continued monitoring of silt traps and drainage outfalls will be implemented. All excess felled brash will be removed off site to avoid release and runoff of phosphorous into sensitive watercourses.
MM27	In-stream works in wet drainage channels (D1, D2) will only be undertaken during the IFI specified period (July, August and September) and will be carried out in accordance with the *Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters* (IFI, 2016).
MM28	Works at W2 and W3 will take place when the Rathduff_15 is in its dry state and the works at W2 or W3 will be planned for periods of dry weather.
MM71	The horizontal directional drilling works at W3 will be carried out when the Rathduff_15 is in its dry state, to ensure that the works are carried out under a dry stream bed. The drilling works will be carried out by an experienced Drilling Contractor and supervised and managed by a competent and experienced Mud Engineer who understands the technicalities and challenges of drilling works. The Mud Engineer will advise the Construction Manager on the selection of competent drillers for the HDD works; monitor the watercourse bed during drilling works, and will supervise the drilling works including the drilling pressures and the implementation of any contingency measures. From a surface water quality protection perspective, the area around the launch/reception pit, bentonite batching, pumping and recycling plant will be bunded using appropriate terram geotextile and/or sandbags in order to contain any spillages. Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area. Spills of drilling fluid will be cleaned up immediately and stored in an adequately sized watertight skip before being taken off-site to a suitably licensed waste facility. In the event of a break-out occurring, the Environmental Emergency Response Procedure for Frac-Out will be implemented which includes the following contingency measures; • In the event of break-out occurring in the stream bed, the rig will immediately shut off the pumps and the drilling assembly will be pulled off to reduce annular pressures; • In the event of break-out on the road an excavator will be available to dig a pit to contain fluid with vacuum trucks/pumps available to transfer drill fluid from the containment point back to the recycling point; and in either scenario, drilling fluid additives designed to plug the formation will be introduced to the circulation system and let set. Environmental Emergency Response Procedures are included in the Ballynalacken Grid Connection Environmental Management Plan.

Effectiveness of Mitigation:

The above measures are proven and effective best practice measures which will avoid and minimise the risk of sediment or contaminant release by:

- reducing the potential for sediment/contaminant release (limestone capping, weather related restrictions, management of overburden, no temporary storage of overburden in Owveg catchment, concrete controls, refuelling controls, containment bunds, use of shuttering at foundations, design of culverts, removal of brash),
- capturing and treating any sediment/fuel spills that are released (silt fencing, Siltbuster, drainage system, wheel washes),
- thereby breaking the pathway between the potential sources and the receptor.

Furthermore, the ongoing monitoring of water quality in downstream watercourses and the inspection of drainage systems and of the construction works by an Environmental Manager (with 'stop works' authority) will ensure that any decreases in water quality are identified and rectified at an early stage. as a result, would likely be short-term, temporary and reversible in nature.

Following the implementation of mitigation measures, minimal sediment or contaminants will enter downslope watercourses, habitats will be maintained through restoration and the construction and design of new culverts will ensure free passage of fish and aquatic species. Therefore, any potential negative impacts on downstream waterbodies, aquatic habitats or species will be Negligible.

The directional drill related measures are accepted best practice to prevent and manage any breach to a riverbed during direction drilling works. Given the timing of the works will be at a period when this stream is dry, these measures are unlikely to be needed but will be sufficient to mitigate any potential breach or

contamination event. As such, given these measures being part of an emergency response event, any significant effect related to directional drilling works will be negligible to neutral in nature.	
Residual Impact Significance *(post-mitigation)*:	**Neutral - Not significant**

EIAR 13.3.7.2.2 Spread of aquatic & riparian invasive species	
Sensitive Aspect:	Aquatic habitats & species
Importance:	**Very High to Low (High)** (as per Section EIAR 13.3.7.1)
Impact Source(s)	Construction activities including vegetation removal and groundworks and other construction activities
Impact Pathway(s)	Movement of soils and surface water containing invasive species
Project Stage	All phases – construction, operation, decommissioning

Overview of Impact (general):

Invasive aquatic species include non-native invasive species such as fish and mobile invertebrate fauna (such as Asian clam, Signal crayfish, or non-native shrimp species).

Invasive riparian species include non-native, terrestrial invasive species such as Japanese knotweed or Himalayan balsam and invasive riparian vegetation such as Water Fern or waterweeds.

Aquatic and riparian invasive species have the potential for significant ecosystem disturbance, disrupting the predator/prey balance or causing habitat disruption within aquatic systems. The spread of invasive species is not restricted in extent to the footprint of construction/instream works but can be transported both upstream (mobile species and 3rd party transport) and downstream (hydrological transport) within a watercourse, potentially extending throughout the catchment.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Invasive species may be introduced to unaffected catchments or spread within infected watercourses during the course of works in wet drainage channels or in close proximity to natural watercourses or transported via excavated material by site machinery.

There is only one incidence of invasive species recorded within the Ballynalacken Windfarm Project construction works area boundary, or within 7m of this boundary. Cherry Laurel was located in a single patch at ITM (648283, 647063), which is located at a junction of works between T3 and T4. No other invasive species were observed or recorded within 50m of the project works but due to the movement of machinery and vehicles onto the site from other locations, the risk of introduction of invasive species into the river catchment cannot be excluded.

Although the presence of vehicles on the windfarm during the Operational Phase and during Decommissioning Works will be negligible, and groundworks/movement of soils will be at discrete locations at the windfarm site and remote at haul route works locations, with no requirement for instream works, the risk of movement/introduction of invasive species cannot be excluded.

Without mitigation in place, given the absence of invasive species onsite, but taking into account the risk of introduction of invasive species with site vehicles/machinery entering the site, and the potential for effects both upstream and downstream in a catchment, the magnitude of unmitigated impacts could potentially be High in smaller watercourses and Medium/Low in the larger rivers, due to the potential for loss of larger sections of habitat / species within the smaller watercourses.

Impact Magnitude	Medium – High	**Impact Significance: *(pre-mitigation)***	**Slight to Potentially Significant**

Mitigation and Monitoring Measures which will be implemented are presented along with a brief description of their effectiveness in avoiding, reducing or otherwise ameliorating the potential Significant impact.

SM03	No invasive species, other than Cherry Laurel, were recorded within the Construction Works Area Boundary during pre-planning surveys, however pre-construction surveys of the Construction Works Areas plus 7m will be carried out in order to determine if any new infestations have been established in the interim period. These pre-construction confirmatory surveys for invasive species will be carried out by the Project Ecologist to accurately determine the extent of new invasive species infestations. Mapping, showing the most up to date distribution and extent of each infestation, will be distributed to the Environmental Clerk of Works and to the Project Engineer.

SM20	The Project Ecologist will liaise with the Contractors on a weekly basis regarding the upcoming schedule of works and will advise the Contractors of any particular ecological protection requirements at specific locations on site.
SM21	No invasive species, other than Cherry Laurel, were recorded within the Construction Works Area Boundary during pre-planning surveys, however should a new infestation of invasive species be established in the interim period, any excavation works in close proximity (7m) to the new infestation location will be carried out under the direct supervision of an ecologist with prior experience of this type of work.
SM22	Visual inspections will be carried out by the Contractor on all machinery and equipment (particularly for machinery and equipment which has come into contact with water or soils) for evidence of attached plant or animal material, or adherent mud or debris. Any attached or adherent material will be removed before entering or leaving the site, securely stored away from traffic for removal to the waste storage area in the temporary construction compound at the Ballynalacken site.
MM02	Construction traffic, personnel and materials will be restricted to within the Construction Works Area Boundary fence. Machinery will be kept on the windfarm site roads and hardstanding areas, and, aside from advancing excavations, will avoid moving onto areas not delineated on the site drawings
MM29	The infestation of Cherry Laurel will be removed prior to the commencement of construction works. Any plant material and stems and roots treated with herbicide and any remains disposed of via biohazard best practice with regards to managing invasive plant species in accordance with Maguire *et al. (*2008).
MM30	No Japanese Knotweed was recorded within the Construction Works Area Boundary during pre-planning surveys, however, should a new infestation of Japanese knotweed within 7m of works, then the infestation will be covered with high density polyethylene grass carpet terram prior to any works commencing at the location. The covering of any new infestations will only be carried out under the direct supervision of an ecologist with prior experience of this type of work, and the works within 7m of the infestation will also be under the direct supervision of an ecologist with prior experience of invasive species.
OMM06	Prior to works along cable routes or public road works for turbine component transportation, the works locations will be surveyed for invasive plant species. Should a new infestation be identified, then the works within 7m of the infestation will also be under the direct supervision of an ecologist with prior experience of invasive species.
DMM02	Before any reopening/re-widening of site entrances, haul route works locations or turbine hardstands to accommodate the removal of large turbine components, the works locations will be surveyed for invasive plant species infestations and should any be present within 7m of the works, then the works within 7m of the infestation will be under the direct supervision of an ecologist with prior experience of invasive species.

Effectiveness of Mitigation:

The above measures are proven and effective best practice measures which will prevent the risk of spreading invasive species by:

- Identifying any new infestations which may have established in the interim,
- Management and supervision of works in close proximity to any new infestations by experienced ecologist.

Following the implementation of mitigation measures, the spread of invasive species is not likely to occur.

Residual Impact Significance *(post-mitigation)*:	**No Impact**

EIAR 13.3.7.2.3	**Hydromorphological impacts to downstream waterbodies due to changes to drainage regimes and surface water runoff**
Sensitive Aspect:	Aquatic habitats & species
Importance:	**Very High and Low (High)** (as per Section EIAR 13.3.7.1)
Impact Source(s)	Development site runoff (access roads, hardstands, reinstated areas)
Impact Pathway(s)	Runoff, drainage routes and surface water flow paths
Project Stage	All phases – construction, operation, decommissioning

<u>Overview of Impact (general):</u>

Runoff is a natural process where rainfall, not infiltrated into the soil, finds its way naturally from the catchment areas into the streams and rivers. Replacement of vegetation surface with impermeable surfaces could potentially decrease the permeability of surfaces with resulting increased surface water volumes or flow rates into downstream waterbodies. Inappropriate drainage works could change local drainage regimes and could also increase flow rates into downstream watercourses during high/prolonged rainfall events.

Increased flow rates can cause significant erosion and changes to geomorphology in downstream waterbodies.

<u>Examination of the Impact of the Proposed Ballynalacken Windfarm Project:</u>

At the Ballynalacken Windfarm site, aggregate will be used on hardcore areas on the hardstanding areas at the wind turbines, for the windfarm site roads and the compounds at the Tinnalintan Substation, around the Windfarm Control Building and for the temporary site compounds and temporary crane set up areas. These hardcore areas will be constructed using aggregates and therefore not be impermeable and will have a similar permeability to the underlying soils. However, it is conservatively assumed in this assessment that these hardstand areas are impermeable. The permeability along the internal underground cable route through the windfarm site and along the Internal Cable Link will not be significantly altered, as the backfill material will comprise excavated soils and not be compacted. Hardstand areas at Haul Route Works locations (mainly at HR8) will be temporary, being reinstated or covered over following the transportation of large components, and will have no impact on drainage regimes, or surface water runoff volumes/flow rates.

According to Chapter 8: Water (Section EIAR 8.3.1.2.5), the existing runoff from the windfarm site is relatively high (85%) due to the prevailing baseline hydrogeological conditions. A calculation is provided in the Water chapter which demonstrates that the emplacement of hardstanding areas at the windfarm site and at the Tinnalintan Substation represent a very small proportion of the sub-catchment areas, and based on an impermeable footprint, will result in 1% increase in runoff volumes. It is considered that the magnitude of any increases in surface water flows or volumes from the windfarm footprint will, under conservative conditions (impermeable surfaces), be Low in waterbodies closest to the windfarm site (i.e. Cloghnagh, Castlecomer Stream, Kilcronan) and Negligible in river waterbodies further downstream (i.e. Dinin River, Owveg River, River Nore).

Given the location of the windfarm at the upper reaches of sub-basins, changes to drainage regimes into the individual sub-basins will be Low.

The grid connection cabling will be installed either over the existing road bridge (option a – in the deck of the bridge), or under the bridge and under the watercourse (option b- directional drilling). Due to the location of the works on the public road, there will be no effect on surface water drainage regimes. Should option-b directional drilling be used to cross the Rathduff_15 at W3, due to the shallow nature of the drill (c.3-5m below bed level), and the brief/temporary duration that the borehole will be open, before being sealed and the ducting installed, any changes to groundwater flow will be negligible and reversible. Directional drilling is an accepted method for watercourse crossings as it requires no instream works. Bentonite, which is non-toxic, will be used as the drilling fluid. It is expected that there will be some localised turbidity effects in the groundwater during works, but these effects will be brief-temporary in duration, with the completion of the drilling, and the installation of the ducting into the borehole. The pre-mitigation effects of directional drilling works to local groundwater will be negligible with no likely effects on downstream receptors such as the River Barrow and River Nore SAC.

Impact Magnitude	Negligible to Low	**Impact Significance: *(pre-mitigation)***	**Slight**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management	
Design	Proposed windfarm drainage plan/surface water management plan
Design	Use of aggregate (gravel) to construct and surface windfarm site roads, compounds and turbine hardstanding areas.
Design	Construction and installation of the site drainage network
Design	Implementation of the Surface Water Management Plan
MM11	Weather forecasts will be consulted in advance of works. If there is heavy prolonged rainfall or if an exceptional rainfall event occurs, then construction works will cease until peak flows have subsided.
MM12	Windfarm site roads and hardstanding areas are designed to have a permanent surface water drainage network in place. Temporary works areas, including the borrow pits and temporary compounds will have a temporary surface water drainage network in place during works. The drainage infrastructure will not be installed during heavy or prolonged rainfall events or when the soil is waterlogged. The site drainage network will ensure that all surface water runoff from upgraded roads and new road surfaces (including hardstand areas) will be captured and treated prior to discharge/release. Transverse drains ('grips') will be constructed, where appropriate, in the surface layer of access tracks to divert any runoff into swales/track side drains; The site drainage network will include check dams and settlement ponds which will settle suspended solids in water runoff while also slowing down the rate of water run-off from these areas. Water will be released to surrounding vegetation at regular intervals via buffered outfall weirs, which also form part of the drainage network.
MM16	All new watercourse crossing structures will be sized to cope with a minimum 100-year flood event. In all cases, culverts will be oversized to allow mammals to pass through the culvert. The construction of new watercourse crossing structures will be carried out in accordance with the Office of Public Works (OPW) Guidelines Construction, Replacement or Alteration of Bridges and Culverts (2013), and also with the Department of Transport, Tourism & Sport Guidelines for Managing Openings in Public Roads (April 2017).

<u>Effectiveness of Mitigation</u>:

The site drainage network which is proposed at the windfarm site (MM12) has been designed by Hydro Environmental Services, specialists in windfarm hydrogeology and hydrological engineering. The site drainage network will deploy proven and effective measures to attenuate runoff and mitigate the risk of flooding. Attenuation will be provided using check dams, settlement ponds, and outfall weirs. All development drainage water captured within individual river/stream catchments will be attenuated and released within the same catchments that it was captured. The use of aggregates for hardstanding areas, installation of the site drainage network, and the implementation of the surface water management plan will ensure that no increases to surface water runoff rates occur, when compared to baseline conditions.

Following the implementation of design measures and mitigation measures, increases in surface runoff rates or volumes or changes to drainage regimes will be Neutral (i.e. not likely to occur/imperceptible).

Residual Impact Significance *(post-mitigation)*:	**Neutral**

EIAR 13.3.7.2.4	**Hydromorphological impacts due to wind farm construction works at W1, D1, D2, D3, and D4**
Sensitive Aspect:	Aquatic habitats & species
Importance:	**Low - Local Importance (Higher Value)** (as per Section EIAR 13.3.7.1)
Impact Source(s)	Instream works at D1, D2, new crossing structure at W1, D3 and D4
Impact Pathway(s)	Direct contact
Project Stage	Construction Phase

Overview of Impact (general):

At wet drainage channels, instream works will require direct excavation of the banks and bed of the drainage channel which can change the physical character of the channel and has the potential to degrade the quality of the baseline habitat which supports the structure, function, and diversity of aquatic species. Instream works also potentially can reduce/fragment or cause the loss of instream and riparian habitat, with secondary effects on flow regimes and aquatic species. The emplacement of new culverts can potentially impede the movement of water, sediment and aquatic species (notably fish) along the watercourse.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Cloghnagh/Ballymartin_15: In order to construct the wind turbines and access roads in the Byrnesgrove/Commons/Ballymartin forestry area, it will be necessary to carry out works in close proximity to a small 1st order stream and at wet drainage channels upstream of the Cloghnagh and Ballymartin_15 streams.

W1 involves the crossing of the Cloghnagh stream, at its rising point, where it is c.1m wide. Works will involve the installation of a new bottomless culvert crossing, Windfarm Site Road and Internal Windfarm Cabling.

D1 involves the crossing of a small 0.5m wide drainage channel which follows an old (pre-afforestation) field boundary and drains into the Cloghnagh stream c.260m downstream of the new D1 crossing point. The works will involve the installation of a new culvert crossing, Windfarm Site Road and Internal Windfarm Cabling. It is also proposed to permanently modify the alignment of c.50m of this drain/watercourse so that it is at least 25m away from the turbine foundation at T3.

D2 involves the extension of an existing culvert crossing of a small 0.7m wide historical drainage channel which follows the field boundaries and drains into the Ballymartin_15 stream c.130m downstream of the D2 crossing point. The Ballymartin_15 drains into the Cloghnagh stream, c.600m downstream of D2.

D3 involves the crossing of a small c.0.5m wide wet field drainage channel which follows the field boundaries and drains into the Ballymartin_15 stream. Works will involve the installation of a new bottomless culvert crossing, Windfarm Site Road and Internal Windfarm Cabling.

D1, W1, D2 and D3 are in the higher reaches of the Cloghnagh and Ballymartin_15 watercourses, these watercourses are seasonally low flowing. During aquatic surveys on the Cloghnagh waterbody (B6) (which includes the Ballymartin_15), moderate-quality salmonid habitat was recorded, and in addition both European eel and stone loach were recorded during electro-fishing. No other aquatic species or habitats of high conservation habitat were recorded at B6.

Kilcronan: D4 involves the crossing of a small c.0.5m wide wet field drainage channel which follows the field boundaries and drains into the Kilcronan stream. Works will involve the installation of a new bottomless culvert crossing, Windfarm Site Road and Internal Windfarm Cabling. During aquatic surveys on the downstream Kilcronan waterbody (A1, A2), the upper reaches of this stream at A1 were found to have no fisheries value due to the non-perennial nature of the upper reaches, while downstream at A2 excellent quality salmonid habitat was recorded, and in addition both European eel and brown trout were recorded during electro-fishing. Crayfish remains were also recorded in Otter spraints.

Overall, the magnitude of hydro-morphological impacts is considered to be Low, due to the Local Higher Value of the watercourses, the minor shift away from baseline conditions resulting from the realignment of the channel at D1, the negligible extent of instream works at D2, and the avoidance of the channel due to the bottomless design of the new culverts at W1, D1, D3, and D4.

Impact Magnitude	Low	**Impact Significance: *(pre-mitigation)***	**Imperceptible**

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management to ensure fish passage and restoration of the banks and beds of watercourses/wet drainage channels:

MM17	New culverts which will be installed at watercourses or wet drainage channels will be bottomless or clear spanning.
MM11	Weather forecasts will be consulted in advance of works. If there is heavy prolonged rainfall or if an exceptional rainfall event occurs, then construction works will cease until peak flows have subsided.
MM16	All new watercourse crossing structures will be sized to cope with a minimum 100-year flood event. In all cases, culverts will be oversized to allow mammals to pass through the culvert. The construction of new watercourse crossing structures will be carried out in accordance with the Office of Public Works (OPW) Guidelines Construction, Replacement or Alteration of Bridges and Culverts (2013), and also with the Department of Transport, Tourism & Sport Guidelines for Managing Openings in Public Roads (April 2017).
MM17	New culverts which will be installed at watercourses or wet drainage channels will be bottomless or clear spanning.
MM18	In-stream works will not be undertaken without isolation of flow within the watercourse. A pre-works survey will be carried out by the Project Ecologist and any fish, if present, within the isolated section will be removed using electrofishing and transferred immediately downstream of the crossing point and placed back in the water. The water will be isolated from the works by over pumping, flume (pipe) or channel diversion methods.
MM19	At wet drainage channels, instream works will be followed by site-specific reinstatement measures to ensure the restoration of flow character and morphology within the affected reach. Measures will include: bank stabilisation using boulder armour or willow/brush bank protection; reinstatement of bank slope and character, creation of compound channels where necessary; reinstatement of instream flow features such as boulder substrates, pool / riffle sequences, or spawning cobbles; and planting along the riparian margin to stabilise banks, add flood protection and provide riparian buffer.
MM27	In-stream works in wet drainage channels (D1, D2) will only be undertaken during the IFI specified period (July, August and September) and will be carried out in accordance with the *Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters* (IFI, 2016).
MM28	Works at W2 and W3 will take place when the Rathduff_15 is in its dry state and the works at W2 or W3 will be planned for periods of dry weather.

Effectiveness of Mitigation:

The above measures are proven and effective best practice measures which will avoid and minimise the risk of the new/extended culverts impeding the movement of water, sediment and aquatic species through the design of the crossing structures and will minimise long term loss of instream or riparian habitats and channel morphological features through appropriate reinstatement.

Following the implementation of mitigation measures, any impacts will be negligible or not likely to occur.

Residual Impact Significance *(post-mitigation)*:	**Neutral**

EIAR 13.3.7.3 Cumulative Impact on Aquatic Habitats & Species with Other Projects

EIAR 13.3.7.3.1 Introduction to the Cumulative Evaluation for Aquatic Habitats & Species

The Ballynalacken Windfarm Project (*whose effects range from Neutral to Potentially Significant, as per Section EIAR 13.3.7.2*) is examined hereunder for potential to have cumulative effects on Aquatic Habitats & Species with other existing and permitted projects, and projects advanced in the planning system. These projects are referred to as 'Other Projects' herein.

A Cumulative Study Area is set out below and Other Projects located within this Study Area are identified and examined for in-combination effects with the Ballynalacken Windfarm Project. The potential for off-site and secondary consequential development is also considered.

EIAR 13.3.7.3.2 Scoping of the Cumulative Study Areas

Firstly, a hydrological cumulative impact assessment is carried out on a regional catchment scale for other large projects such as other wind farm developments and large-scale infrastructure developments located inside the River Nore catchment. Other smaller developments have been excluded at this regional scale as cumulative effects are likely to be Neutral at this (regional) scale. This is described below.

<u>Regional Cumulative Study Area</u>: This area comprises all sub-catchments of the River Nore as far as south of Kilkenny City (Nore SC_100) The large up-stream catchment of the River Nore at Kilkenny City (1,745km^2) and high flows (50%ile – 19m^3/sec) means potential cumulative effects downstream of the Nore SC_100 will not be perceptible.

The Regional Cumulative Study Area comprises the following sub-catchments:

- Nore_SC_010
- Nore_SC_020
- Nore_SC_030
- Nore_SC_040
- Nore_SC_050
- Nore_SC_060
- Nore_SC_070
- Nore_SC_080
- Nore_SC_090
- Nore_SC_100
- Dinin[North]_SC_010
- Dinin[South]_SC_010
- Erkina_SC_010
- Goul_SC_010

<u>Local Cumulative Study Area:</u> A hydrological cumulative impact assessment is then undertaken on a more local scale using WFD sub-catchments (in which the Ballynalacken Windfarm Project is located) as the Cumulative Study Area. Other smaller private and commercial developments are considered at this more sub-catchment scale. The sub-catchments occupied by the project site include the Nore_SC_060, Dinin(North)_SC_010, Nore_SC_080 and Nore_SC_100. The Nore_SC_070 is also included in the Local Cumulative Study Area due the close downstream proximity to the Ballynalacken Grid Connection and Tinnalintan Substation.

EIAR 13.3.7.3.3 Evaluation of Cumulative Impacts

The Other Projects which occur within the Cumulative Study Area are identified in the table below and in Figure 13.12: Other Projects within the Aquatics Habitats and Designated Sites Cumulative Study Areas *(included at end of this chapter).*

The Ballynalacken Windfarm Project is examined below for cumulative effects with each of the Other Projects within the Cumulative Study Area. An evaluation of the collective cumulative impact of the Ballynalacken Windfarm Project in-combination with all the Other Projects then follows. The evaluation takes into account any existing sources of pollution or damage identified in Section EIAR 13.3.7.1.6.

Table 13-27: Evaluation of Ballynalacken Windfarm Project cumulatively with Other Projects

Other Project	Status	Evaluation of Cumulative Impact
Laois-Kilkenny Grid Reinforcement Project (including recently consented extension to Ballyragget compound) – parts located in: Nore_120 and Owveg (Nore)_040	Under Construction	Scoped Out: The Laois-Kilkenny Grid Reinforcement Project OHL passes through the Nore_120 and Owveg(Nore)_040, however due to the OHL nature of the project, with works spread across a large distance, and the fact that the Laois-Kilkenny Grid Reinforcement Project is currently under construction and groundworks within the Study Area will be completed by the time the Ballynalacken Project commences construction, and considering that any areas of exposed soil (source of sediment runoff) will have revegetated before Ballynalacken commences constructed, it is evaluated that there is no potential for cumulative impacts. Due to the small footprint of works and separation distance from watercourses, effects to aquatic species or habitats due to the extension of the Ballyragget Substation compound will be negligible. Any operational activities will have negligible impacts on water quality in downstream waterbodies, and the potential for significant cumulative impacts can be excluded.
Moatpark - Loan 38kV overhead line Telecom Masts, Ballyouskill	Existing	Scoped Out: The overhead line and the telecom masts are already constructed and the lands around the polesets and the masts have revegetated. Therefore, as sources are absent, there is no potential for cumulative construction related impacts. Any operational activities will have negligible impacts on water quality in downstream waterbodies, and the potential for significant cumulative impacts can be excluded.
Pinewood Wind Farm – parts located in: Owveg (Nore)_040	Consented	See Section EIAR 13.3.7.3.4
Monaincha Wind Farm –located in: Nore_SC_010	Existing	See Section EIAR 13.3.7.3.4
Cullenagh Wind Farm – Parts located in Nore_SC_040 and Nore_SC_060	Consented	See Section EIAR 13.3.7.3.4
Lisheen (III) Wind Farm – Parts located in Erkina_SC_010	Existing	See Section EIAR 13.3.7.3.4
Bruckana Wind Farm – Parts located in Erkina_SC_010	Existing	See Section EIAR 13.3.7.3.4

Other Project	Status	Evaluation of Cumulative Impact
Lisdowney Wind Farm –located in Nore_SC_070	Existing	See Section EIAR 13.3.7.3.4
Gortahile Windfarm – Located in Dinin[South]_SC_010	Existing	See Section EIAR 13.3.7.3.4
Bilboa Wind Farm – Located in Dinin[South]_SC_010	Consented	See Section EIAR 13.3.7.3.4
White Hills Wind Farm – Located in Dinin[South]_SC_010	Consented	See Section EIAR 13.3.7.3.4
Farranrory Wind Farm Grid Connection - parts located in: Nore_120	Consented	See Section EIAR 13.3.7.3.4
Parksgrove & Ballyragget Solar Farms Grid Connection - parts located in: Nore_120	Consented	See Section EIAR 13.3.7.3.4
Battery Energy Storage Developments, Moatpark	Consented	See Section EIAR 13.3.7.3.4
Mixed Use Development, Castlecomer - entirely located in: Castlecomer Stream_010	Consented	Scoped Out: Development works will take place adjacent to the Castlecomer Stream. Nearest Ballynalacken project works (haul route works HR10) will involve small scale and very shallow excavation of soils at HR10, which will have negligible effects on the river waterbody. Potential for significant cumulative impacts with the main Ballynalacken construction works at the windfarm site can be excluded due to separation distances and dilution factors.
Hebron House Development, Kilkenny	Consented	*Scoped in for cumulative assessment with Haul Route Works only. See Section EIAR 13.3.7.3.4* Scoped out for cumulative impacts with the windfarm: Due to the small size and scale of this project and the distance from the wind farm site, cumulative impacts with the Ballynalacken Windfarm Project at local scale will not be perceptible. *Due to the size and scale of this project, cumulative impacts at regional scale will not be perceptible.*
Tirlán Milk Processing Plant, Water Treatment Plant, Solar Farm, Anaerobic Digestor	Existing Consented	See Section EIAR 13.3.7.3.4
Wastewater Treatment Plants (including upgrade works*)	Existing	Scoped Out: Existing WWTPs are considered to form part of the baseline environment – i.e. they are already included in water quality measurements which contribute to WFD status and risk assessments. In any case, when the separation distances (dilution factor) between the subject development and the

Other Project	Status	Evaluation of Cumulative Impact
Tirlán – Ballyconra* Sion Road Purcellsinch Castlecomer Deerpark		WWTPs and the water quality protection which would form part of their discharge licenses, are taken into account, it is considered that the potential for measurable cumulative impacts with the Ballynalacken Windfarm Project can be excluded.
Existing Quarries Quarry at Ironmills-or-Kilrush in *Owveg* (Nore)*_040* Murphys Quarry-Firoda in Castlecomer Stream_010 McKeons & Kilkenny Block in Nore_160	Existing	Scoped Out: This activity is considered to form part of the baseline environment. Also, if quarries are discharging to local watercourses, they will do so under a discharge license, and therefore significant impacts from quarries to downstream waterbodies is unlikely to occur. Limited pressure on water quality with one quarry in a sub-basin also associated with windfarm works, and while there are two quarries in the Nore_160 the subject development works in this sub-basin relate to haul route works on roundabouts along the national public road network. When considered with the separation distances (dilution factors) between the subject development and these quarries, the potential for measurable cumulative impacts with the Ballynalacken Windfarm Project can be excluded.
Agriculture	Ongoing	Scoped Out: This activity is considered to form part of the baseline environment and is contributing to the current WFD status of the local waterbodies at the windfarm and grid connection sites, no material change in landuse practices is expected within the construction period of the subject development.
Forestry	Ongoing	Scoped Out: This activity is considered to form part of the baseline environment and is contributing to the Moderate WFD status of the local waterbodies at the windfarm and grid connection sites, no material change in landuse practices is expected within the construction period of the subject development.
Offsite Project – Forestry Replant Lands (outside of cumulative geographical boundary)	Future activity	Scoped Out: The afforestation of 19.9ha of lands will only be carried out on licenced lands, which were subject to an afforestation license application. The application would have examined the potential for significant impacts to aquatic habitats and species, appropriate mitigation measures and constraints would have been proposed and the license would only have issued where there would be no likely significant impacts on the environment, including on the water environment, as a result of the afforestation. Therefore, it can be assumed that the afforestation of the Replant Lands will not cause significant impacts to Aquatic Habitats and Species on its own. In relation to cumulative impacts, The Promoter of Ballynalacken Windfarm Project is committed to replanting 19.9ha of forestry on lands outside of the River Nore and River Barrow catchments, therefore there is no potential cumulative impact to Aquatic Habitats & Species within the study area.
Secondary Projects / Consequential Developments – Other Energy Projects connecting to Tinnalintan Substation (potential future works located in the Nore_120)	Future project, unknown	Scoped Out: Future connections of other energy projects, which may arise due to the existence of the Tinnalintan Substation (if built), are currently not known and in any case are likely to be constructed after the Tinnalintan Substation exists – i.e. during the operational phase of the Ballynalacken Windfarm Project, therefore it is considered that there will be no overlap of construction periods, and the potential for cumulative construction phase effects can be excluded.

EIAR 13.3.7.3.4 Aquatic Habitats and Species - Cumulative Evaluation

Introduction

Firstly, as per Chapter 8 Water, in terms of cumulative hydrological effects arising only from elements of the proposed project (wind farm site infrastructure, grid connection, met mast, substation, haul route works), found no *likely* significant effects are expected due to the construction methodologies, construction programme and the transient nature of the works across several sub-basins, significant surface water quality effects are not anticipated as a result of the construction methodologies to be implemented, the surface water control measures to be put in place and the general adherence to the 50m hydrological buffer.

Watercourses are highly sensitive to changes in water quality, containing sensitive aquatic ecological receptors including salmonids, lamprey species and a diverse macroinvertebrate community including Freshwater Pearl Mussel on the River Nore. Reduction in water quality could potentially result from pollutants entering watercourses in water runoff from construction works areas. These pollutants include suspended solids (sediment) from excavation and movement of soils, hydrocarbons from fuel/oil spills or leaks, cementitious materials from concrete pours, and phosphorus from forestry felling.

Reductions in water quality can result in the reduction or loss of aquatic habitats, and in a reduction or loss of feeding, resting or breeding habitat for aquatic species. Furthermore, reductions in water quality can lead to reductions in population distribution or structure of important aquatic species and could result in a downgrading of the Q-status of a waterbody under the Water Framework Directive.

Due to the separation distance of the other projects to the works in wet drainage channels associated with Ballynalacken Windfarm Project, (i.e. Cloghnagh), no cumulative hydro-morphological impacts will occur. Given the separation distances between construction works areas and likely haulage routes for the other projects, with no instream works for the other projects in any of the watercourses/wet drainage channels associated with the Ballynalacken Windfarm Project, the nature of the deliveries for the Ballynalacken Windfarm Project in the Rathduff_15 catchment (concrete, asphalt, substation materials, cabling materials), it is evaluated that the risk of invasive species spread as a result of multiple projects is unlikely to occur.

It is considered that the potential for cumulative impacts relates to cumulative reductions in water quality as a result of sediment or contaminant laden runoff from multiple projects as a result of excavations, earthworks and overburden storage, instream works, use of concrete, oils and fuels, and forestry felling. The potential for cumulative reductions in water quality is evaluated below:

EIAR 13.3.7.3.4.1 Pinewood Wind Farm (consented):

The consented, but not yet built, Pinewood Wind Farm project is partially located within the Owveg River catchment. Although there is some potential sediment run-off into the Owveg River from construction works areas associated with this wind farm project together with the Ballynalacken Windfarm - the sources of impacts associated with the Ballynalacken Windfarm would be greater than 13km downstream from the nearest impact sources associated with the Pinewood project. Furthermore, no instream works in the Kilcronan stream are proposed for the Ballynalacken Windfarm Project, which minimises the risk of invasive species spread. As such, it is considered that the cumulative effects of the Ballynalacken Windfarm Project in-combination with the consented Pine Wood Windfarm project would be Negligible in magnitude and Not Significant.

EIAR 13.3.7.3.4.2 Other Projects in the vicinity of the existing EirGrid Ballyragget substation:

Two Battery Energy Storage Supply (BESS) developments are permitted to connect to the Ballyragget Substation. Both are located close to the existing 110kV substation at Ballyragget in agricultural lands to the east of the River Nore main channel. Neither project involves instream works but are located in relatively close proximity to the Nore river bank.

Planning applications for the Farranrory Windfarm grid connection and Ballyragget & Parksgrove Solar Farms Grid Connection have been consented. These grid connections will involve horizontal drilling under the River Nore to connect to the existing EirGrid Ballyragget Substation. Due to the proximity of works to the River

Nore and the occurrence of two separate drills under the river, these projects have potential to adversely affect aquatic habitats and species.

There is a significant separation distance of the two BESS projects and the two grid connection projects from the main Ballynalacken construction works at the windfarm site, which has hydrological connectivity via the lower order Kilcronan stream which drains into Owveg and in turn into the River Nore significantly downstream of the windfarm works. As such, the extent of downstream separation makes any potential cumulative or in-combination effects with the Ballynalacken Windfarm works highly unlikely to exceed negligible levels of change to the receiving environment.

However, there is potential for cumulative impacts with the Ballynalacken Windfarm Project works - Internal Cable Link, Tinnalintan Substation and Ballynalacken Grid Connection, which occur within the Rathduff_15 catchment, with works occurring in the public road above existing culvert at W2 in the upper reaches of the Rathduff_15 stream and works occurring either in the deck of the existing bridge which will require works to raise the height of the parapet walls, or installed by directional drilling under the bridge (and no works to parapet walls) at W3 in the lower reaches of the Rathduff_15 stream. While none of these crossings will result in significant impacts on their own, there is potential for cumulative impacts should these watercourse crossing works be carried out during periods of the year when this watercourse has flowing water in it. Should the watercourse crossings at W2 and W3 be carried out during periods when the Rathduff_15 stream is flowing, and at the same time as the construction of the BESS projects and the drilling works and works in proximity to the River Nore associated with the two grid connection projects, then it is evaluated that there is potential for significant (unmitigated) cumulative impacts.

However, the non-perennial nature of the Rathduff_15 stream, which is dry for at least part of the year, enables the Ballynalacken Windfarm Project to commit (Mitigation Measures MM28) to the timing of works at W2 and W3 which will only be carried out when the Rathduff_15 stream is in its dry state. The implementation of these mitigation measures for the Ballynalacken Windfarm Project removes the pathway for impact and consequently the Ballynalacken Windfarm Project will <u>not contribute</u> to cumulative impacts with the other projects in the vicinity of the existing EirGrid substation.

Other windfarm projects within the wider receiving landscape considered for in-combination effects to the wider receiving subcatchment environment are listed in the table below. None of the other windfarm projects are in close proximity to aquatic receptor effects sources related to the proposed Ballynalacken Windfarm Project. As such, these projects cumulative effects on the water quality and aquatic habitats or species are unlikely to occur due to the absence of in-combination interactions present between their respective impact sources and the proposed Ballynalacken Windfarm Project sources.

Catchment Area	Wind Farm Name	Status	Potential No. of Turbines <u>in Nore Catchment</u>
Nore	Pinewood	Consented	11
	Cullenagh	Consented	13
	Lisdowney	Constructed	4
	Lisheen	Constructed	4
	Bruckana	Constructed	2
	Gortahile	Constructed	8
	Bilboa	Consented	4
	White Hills	Consented	7
	Monaincha	Constructed	15
Potential Total			**68**

When the effects of the Ballynalacken Windfarm Project, are considered collectively with all of the Other Projects and existing sources of impacts within the Cumulative Study Area, it is evaluated that due to:

- the separation distance between the sources of impacts associated with the Ballynalacken Windfarm and the nearest impact sources associated with the Pinewood Windfarm and other windfarm projects;
- No instream works in the Kilcronan, Cloghnagh or Rathduff_15 streams are proposed for the Ballynalacken Windfarm Project, which minimising the risk of invasive species spread;
- the location and nature of works associated with grid connections and energy projects in the vicinity of Moatpark substation compound, and the separation distance of projects in the Moatpark area, including their river crossing points, from the main windfarm works; and
- the protection measures which will be implemented during crossing works of the Rathduff_15 for the Ballynalacken Grid Connection,

that **the collective cumulative impact on Aquatic Habitats & Species will not be significant**.

EIAR 13.3.8 SENSITIVE ASPECT: DESIGNATED SITES

This detailed evaluation section for Designated Sites is presented as follows:

- Section EIAR 13.3.8.1 - description of the baseline environment of Designated Sites;
- Section EIAR 13.3.8.2 - evaluation of the impacts of Ballynalacken Windfarm Project on Designated Sites; and
- Section EIAR 13.3.8.3 – evaluation of cumulative impacts.

EIAR 13.3.8.1 Baseline Environment – Designated Sites

The context, characteristics, importance and sensitivity of *Designated Sites* are described in the subsections below. The trends and Do-Nothing scenario for this Sensitive aspect are also considered.

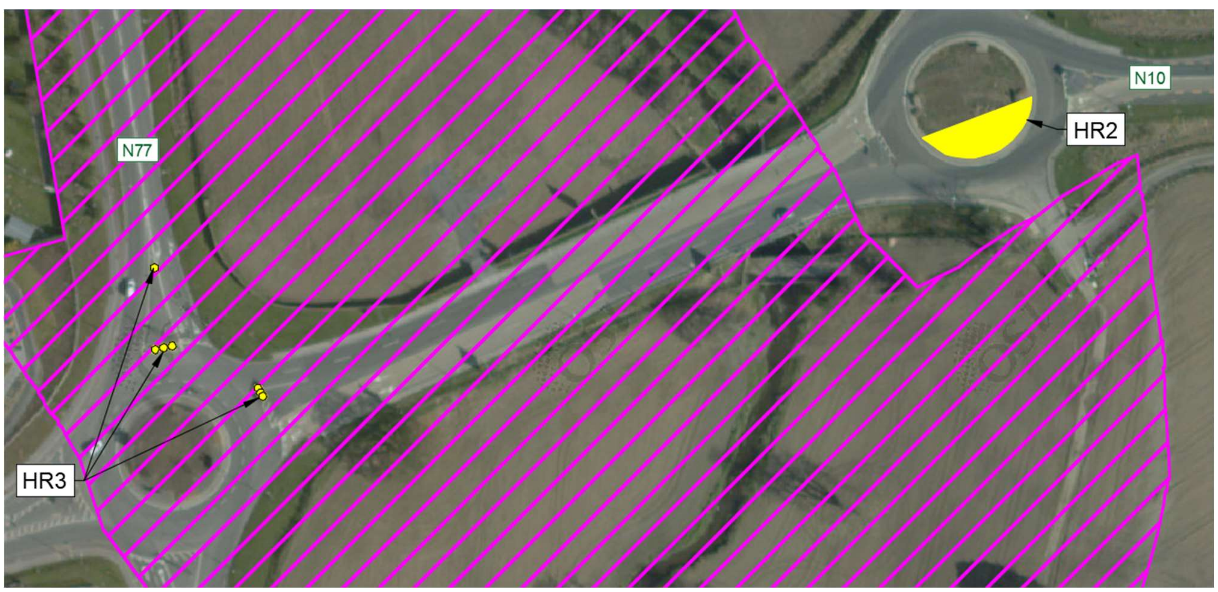
Designated Sites include Natura 2000 sites and Sites of National Importance.

EIAR 13.3.8.1.1 European Sites within the Zone of Influence– SACs, SPAs

European designated sites relate to Natura 2000 network Special Protection Area (SPA) and Special Area of Conservation (SAC) sites. These Natura 2000 sites are addressed fully in the Appropriate Assessment (AA) Report 2025 which accompanies this application and the evaluation is summarised herein for ease of reference.

The proposed Ballynalacken Windfarm site, the met mast, ancillary works, Internal Cable Link, Tinnalintan Substation, Ballynalacken Grid Connection, and Haul Route Works at HR8 do not overlap the boundary of any SPA or SAC boundary.

The haul route works at HR3 will take place within the boundary of the River Barrow and River Nore SAC, while HR2 will take place in close proximity. However, all works will be on the public road corridor on the Ring Road around Kilkenny City, as illustrated below.



The Zones of Influence (ZoI) for the proposed Ballynalacken Windfarm Project have been established taking into account the guidance set out by the National Roads Authority (NRA, 2009) and the OPR Guidance note (2021). The study area or Zone of Influence for Natura 2000 sites. There are 2 Natura 2000 sites within the study area – 1 Special Protection Area and 1 Special Area of Conservation. See Figure 13.7: Designated Sites – (SPA and SAC).

Candidate SACs (cSACs) and proposed SPAs (pSPAs) were also considered for this Source-Pathway-Receptor (SPR) model as these sites have the potential to become classified as statutory sites of international importance (Natura 2000 sites) in the future. This included important bird areas (IBAs), as per the European ruling Case C-418/04. No IBAs or pSPAs were within 15km of the proposed Ballynalacken Windfarm Project. In addition, no cSACs have potential connectivity with the proposed Ballynalacken Windfarm Project.

The distances of the Natura 2000 sites from the nearest works/activities associated with the proposed Ballynalacken Windfarm Project are outlined in Table 13-28 below.

Table 13-28: Proximity of Natura 2000 sites to the proposed Ballynalacken Windfarm Project

	Natura 2000 site	**Approximate Distance of the Natura 2000 site from the nearest works location associated with the proposed Ballynalacken Windfarm Project**
1	River Nore SPA [004233]	c.1.8km to nearest Ballynalacken Windfarm turbine (as the crow flies) c.120m to Ballynalacken Grid Connection (as the crow flies) c.180m downstream of W3. c.1.37km to closest Haul Route Works (HR2) (as the crow flies)
2	River Barrow and River Nore SAC [002162]	c.1.6km to nearest Ballynalacken Windfarm turbine (as the crow flies) c.75m to Ballynalacken Grid Connection (as the crow flies) c.90m downstream of W3. c.18m to closest Haul Route Works (HR2) (as the crow flies)

EIAR 13.3.8.1.1.1 Results of Stage I Screening

In the AA Report 2024, each of the Natura 2000 sites within the study area were initially screened for connectivity with the proposed Ballynalacken Windfarm Project. All phases of the proposed Ballynalacken Windfarm Project were considered- i.e. construction, operational, and decommissioning phases.

There is potential connectivity between the proposed Ballynalacken Windfarm Project and the River Barrow and River Nore SAC [Site Code: 002162] and the River Nore SPA [Site Code: 004233], and therefore the potential for adverse effects to the conservation objectives of these two Sites cannot be excluded.An overview of the context and characteristics of these Natura 2000 sites is provided below.

EIAR 13.3.8.1.1.1.1 River Barrow and River Nore SAC – Context & Characteristics

<u>Context</u>: The River Barrow and River Nore SAC (Site Code: 002162) consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and also includes the tidal elements and estuary as far downstream as Creadun Head, Co. Waterford.

The River Barrow and River Nore SAC is 192km long, spanning eight counties designated for a variety of niche habitats that support a wide range of terrestrial, riparian, and marine flora and fauna. This following section has been subdivided into sub-groups to provide a clearer picture of the characteristics present within the River Barrow and Nore SAC.

<u>Terrestrial habitats and species:</u> The Barrow/Nore river system contains a considerable amount of woodland, particularly in the lower reaches where the rivers leave the central limestone lowlands and wind through steep sided valleys. The slates, shales, and granites in these valleys produce relatively well-drained, poor, acidic soils which favour the development of sessile oak woodlands on the steep valley sides. The valley floors are narrow, and the floodplains are only poorly developed so that alluvial woodland is restricted and

localised, although locally ash woodlands occur on more fertile soils. In many places, conifer plantations have been planted.

There are five principal woodland types present within the SAC: alluvial woodland; old oak woodland; ash woodland; mixed deciduous woodland usually with abundant beech and/or sycamore; and conifer plantations. Of the native woodlands, ash and alluvial woodland occur along the length of the river but oak woodland is largely confined to the lower reaches.

Upstream the rivers flow through fertile lowlands which have been drained to some extent. In general, there is very little native woodland, even in the headwater streams in the Slieve Bloom Mountains where extensive areas have been afforested with conifers. The exception are the stretches of the Erkina and Nore rivers between Durrow and Abbeyleix in Laois, where some of the most extensive and important alluvial woodlands in the country are to be found.

This SAC has been selected for two woodland types listed in Annex I of the Habitats Directive:

- 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno padion*, *Alnion incanae*, *Salicion albae*)

The total area of native woodland within the SAC is unknown. However, it should be noted that some sites extend beyond the SAC boundary.

Riparian habitats and species: Floating river vegetation is well represented in the Kings River tributary of the Nore, in the Barrow and in the many tributaries of the SAC. The Barrow supports water-starworts, crowfoots and eight pondweed species. A rare priority status Annex I habitat, petrifying springs with tufa formations occurs at Dysart Wood along the Nore between Thomastown and Inistioge. These hard water springs are characterised by lime encrustations, often associated with small waterfalls. A rich bryophyte flora is typical of the habitat and two diagnostic species, *Palustriella commutata* and *Eucladium verticillatum*, have been recorded.

Dry heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the riverbank. Close to the Blackstairs Mountains, in the foothills associated with the Aughnabrisky, Aughavaud and Mountain Rivers there are small patches of wet heath dominated by Heathers and deciduous and herbaceous perennial species.

The site is very important for the presence of a number of E.U. Habitats Directive Annex II animal species including Freshwater Pearl Mussel (FPM) (both *Margaritifera margaritifera*, and *M. m. durrovensis,)*, White-clawed Crayfish, Atlantic Salmon, Twaite Shad, Sea Lamprey, Brook Lamprey and River Lamprey, the whorl snail *Vertigo moulinsiana* and Otter. This is the only site in the world for the hard water form of the Freshwater Pearl Mussel, *M. m. durrovensis*, and one of only a small number of spawning grounds in the country for Twaite Shad.

The freshwater stretches of the River Nore main channel is a designated salmonid river. The upper stretches of the Barrow and Nore, particularly the Owenass River in the Barrow catchment, are very important for spawning. The rare fish species Smelt (*Osmerus eperlanus*) occurs in estuarine stretches of the site.

Several industrial developments, which discharge into the river, border the site. New Ross is an important shipping port. Shipping to and from Waterford and Belview ports also passes through the estuary.

Marine/Coastal habitats and species: Saltmarshes are stands of vegetation that occur along sheltered coasts, mainly on mud or sand, and are flooded periodically by the sea. They are restricted to the area between mid-neap tide level and high-water spring tide level. In Ireland, there are four saltmarsh habitats listed under

Annex I of the EU Habitats Directive (92/43/EEC) three of which occur within the River Barrow and River Nore SAC:

- *Salicornia* and other annuals colonising mud and sand [1310];
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]; and
- Mediterranean salt meadows (*Juncetalia maritimi*) [1410]

Salt meadows occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House. In the larger areas of salt meadow, notably at Carrickcloney, Ballinlaw Ferry and Rochestown on the west bank; Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub types are generally intermixed.

At the upper edge of the salt meadow in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected species Borrer's Saltmarsh-grass (*Puccinellia fasciculata*), Meadow Barley (*Hordeum secalinum*) and rare Divided Sedge (*Carex divisa*) are found. Glassworts (*Salicornia spp*.) and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at the seaward edges of them. The habitat also occurs in small amounts on some stretches of the shore free of stones.

Accretion and erosion are natural elements of saltmarsh systems. Maintaining the sediment supply is vital for the continued development and natural functioning of a saltmarsh system. Interruption to the sediment circulation through physical structures can starve the system and lead to accelerated erosion rates.

The estuary and the other E.U. Habitats Directive Annex I habitats within it form a large component of the site. Extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6km between Passage East and Creadaun Head, over 1km wide in sections. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves.

An extensive area of honey-comb worm biogenic reef occurs adjacent to Duncannon, Co. Wexford on the eastern shore of the estuary. This intertidal *Sabellaria alveolata* reef is formed by the polychaete worm *S. alveolata* as a sheet of interlocking tubes over a considerable area of exposed bedrock. This biogenic reef forms prominent three-dimensional structures from the grains of sand where suitable substrate is available, playing host to a wide range of sessile and pelagic species.

The dunes that fringe the strand at Duncannon are dominated by Marram (*Ammophila arenaria*) towards the sea. Other rare Red Data Book species present include Wild Clary/Sage (*Salvia verbenaca*). The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support many coastal species on ledges.

Ornithology: The site is of ornithological importance for a number of E.U. Birds Directive Annex I species, including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bar-tailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois, and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country. The old oak woodland at Abbeyleix has a typical bird fauna including Jay, Long-eared Owl, and Raven. The reedbed at Woodstown near the Estuary/bay area of the SAC supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler, and Water Rail.

Qualifying Interests: A summary of the Qualifying Interests of the River Barrow and River Nore SAC is presented in the table below. Full details are available in the AA Report 2024.

Qualifying Interest	Is the QI mobile? If yes, is there suitable habitat?	Recorded during Ballynalacken Windfarm Project surveys? Yes/No
Desmoulins Whorl Snail [1016]	**Yes**, mobile -	**No -** Not observed during aquatic surveys. Closest record c.16km upstream at Boston Bridge, Co. Laois.
Freshwater pearl mussel [1029]	**Yes**, mobile -	**No.** Four dead individuals recorded along the River Nore. No live individuals. 15km stretch of Nore including historic distribution assessed as unsuitable for this species. **Note:** eDNA only weakly positive within the Castlecomer stream (Determined to be trace carried by salmonids from downstream areas), no individuals or suitable habitat found.
White-clawed Crayfish [1092]	**Yes**, mobile – Suitable habitat on the Owveg River and Castlecomer Stream	**No -** Not recorded during aquatic surveys. Crayfish remains identified in Otter spraint on the Kilcronan stream (A2).
Sea Lamprey [1095]	**Yes**, mobile -	**Yes -** At sites A3, A5, B5, B8 & C5 during aquatic surveys.
Brook Lamprey [1096]		
River Lamprey [1099]		
Twaite Shad [1103]	**Yes**, mobile -	**No -** Not observed during aquatic surveys. Closest record is substantially downstream in the southern-most reaches of the River Nore
Atlantic Salmon [1106]	**Yes**, mobile –	**Yes** - At sites A3, A4, A5, B4, B5, B8 & B9 during aquatic surveys. Assumed to be present in suitable watercourses within the SAC
Estuaries [1130]	**No**	**No -** Not recorded during habitat surveys. Located approx. 51,565m hydrologically downstream
Mudflats and sandflats not covered by seawater at low tide [1140]	**No**	**No -** Not recorded during habitat surveys. Located approx. 70,705m hydrologically downstream
Salicornia and other annuals colonising mud and sand [1310]	**No**	**No** – Not recorded during habitat surveys. Located approx. 76,546m hydrologically downstream
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	**No**	**No** – Not recorded during habitat surveys. Located approx. 76,016m hydrologically downstream
Otter [1355]	**Yes**	**Yes –** Four records of secondary evidence (e.g. spraints) recorded. Evidence of Otter (couch and spraint, spraint sites, crayfish remains) also recorded 1.6km from windfarm. No signtings.
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	**No**	**No** – Not recorded during habitat surveys. Located approx. 76,506m hydrologically downstream
Killarney fern [1421]	**No**	**No** – Not recorded during habitat surveys. Located c.50km downstream on the River Nore.
Nore freshwater pearl mussel [1990]	**Yes**	

Water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	**No**	**Yes** – Recorded at Ballyragget Old Bridge on the River Nore, c.2.3km downstream of watercourse crossing W3
European dry heaths [4030]	**No**	**No** – Not recorded during habitat surveys. Located c.38km southeast of the Project site
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	**No**	**No** – Not recorded during habitat or aquatic surveys
Petrifying springs with tufa formation (*Cratoneurion*) [7220]	**No**	**No** – Not recorded during habitat or aquatic surveys. Located c.35km downstream on the River Nore
Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]	**No**	**No** – Not recorded during habitat surveys. Located approx. 39km hydrologically downstream
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	**No**	**No** – Not recorded during habitat or aquatic surveys. Located c.8km and c.10km upstream, and c.23km downstream on the River Nore

EIAR 13.3.8.1.1.1.2 River Nore SPA – Context & Characteristics

Context: The River Nore SPA [Site Code: 004233] is a long, linear site that includes the River Nore from Borris in Ossory in County Laois to Inistioge in Co. Kilkenny, along with sections of the Owveg River, Delour River, Erkina River, Goul River and the Kings River. The boundary of the SPA is overlapped by the River Barrow and River Nore SAC.

The River Nore SPA is c.1.8km from the windfarm site (as the crow flies, from the nearest turbine hardstand) and 0.18km from Ballynalacken Grid Connection watercourse crossing works at W3. The SPA is located downstream from the main wind farm works – 4km from the SPA via the Owveg River, and 16km from the SPA along the main River Nore channel via the Cloghnagh River/Dinin River.

Characteristics: The River Nore SPA includes the river channel and marginal vegetation. This SPA site supports a nationally important population of Kingfisher. A survey in 2010 recorded 22 pairs of Kingfisher (based on 16 probable and 6 possible territories) within the SPA (Cummins *et al.* 2010).

Other species which occur within the site include Mute Swan, Mallard, Cormorant, Grey Heron, Moorhen, Snipe and Sand Martin.

Special Conservation Interest	**Is the SCI mobile? If yes, is there suitable habitat?**	**Recorded during Ballynalacken Windfarm Project surveys? Yes/No**
Kingfisher [A229]	**Yes**, mobile – The Rathduff_15 is of low suitability while the River Nore c.450m downstream of the closest Project works is of intermediate suitability	**No -** Not observed during surveys.

EIAR 13.3.8.1.2 Ramsar Sites

Ramsar sites are classified under the Convention on Wetlands of International Importance.

The proposed Ballynalacken Windfarm Project does not overlap the boundary of any Ramsar site, and there are no Ramsar sites within 15km of the proposed Ballynalacken Windfarm Project.

The nearest Ramsar Site is the Slieve Bloom Mountains (Site number: 335) which is 32km away from the proposed Ballynalacken Windfarm Project. Due to separation distance, and the absence of hydrological and hydrogeological pathways between the proposed Ballynalacken Windfarm Project and this, or any other, Ramsar site, it is considered that the potential for significant impacts arising as a result of the Project can be excluded.

Therefore, Ramsar sites are not considered further herein.

EIAR 13.3.8.1.3 National Sites – Natural Heritage Areas, proposed Natural Heritage Areas

Natural Heritage Areas (NHA) are fully protected under the Wildlife (Amendment) Act 2000, whereas 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. pNHAs were considered for the scoping of National sites as these sites may be promoted in the future.

The proposed Ballynalacken Windfarm Project does not overlap the boundary of any NHA or pNHA site.

Adopting the precautionary principle for identifying any NHA or pNHA sites that may be potentially affected by the proposed Ballynalacken Windfarm Project, as with the Natura 2000 sites the Source-Pathway-Receptor model was applied to determine the reasonable zone of influence for national sites (OPR Practice Note, PN01). This included considering hydrological connectivity via watercourse pathways, mobile species, accepted distribution ranges and any other potential pathways or interactions that could lead to a potential impact.

These sites are listed in **Table 13-29** and delineated on Figure 13.8: Designated Sites – (pNHA).

Table 13-29: Sites of national importance following the Source-Pathway-Receptor model

Name	Site code	Main features	Separation Distance	Hydrological Connectivity - Yes/ No?
River Nore/Abbeyleix Woods Complex pNHA *(also a Wildfowl Santuary)*	002076	Stretching from Shanahoe in County Laois southwards along the River Nore to Ballyragget, County Kilkenny, Ancient woodlands Rare and Protected Plant species, lichens, mosses Rare invertebrates Birds: Jay, Long-Eared Owl, Raven Fauna: Otter, Freshwater Pearl Mussel (*Margaritifera durrovensis*), spawning area for Twaite Shad	• 90m to Grid Connection • 3.8km to nearest turbine (T7) • 3.5km to HRW (HR13) • 200m to works at the Eirgrid Ballyragget Substation	Yes, 3.3km from W2 & 90m from W3.
Inchbeg pNHA	000836	Wetland area along River Nore Birds: Golden plover, lapwing, whooper swan, bewicks swan.	• 6.6km to Grid Connection • 7.8km to nearest turbine (T1) • 4.6km to HRW (HR7) • 6km to works at the Eirgrid	Yes, 6.6m from W3.

Name	Site code	Main features	Separation Distance	Hydrological Connectivity - Yes/ No?
			Ballyragget Substation	
Ardaloo Fen pNHA	000821	Wetland area beside the River Nore Wetland flora Birds – wildfowl and waders, passerines (warblers)	• 12.8km to Grid Connection • 10.4km to nearest turbine (T1) • 2.3km to HRW (HR7) • 12.3km to works at the Eirgrid Ballyragget Substation	Yes, 12.8km to W3.
Dunmore Complex pNHA	001859	Natural depressions in the gravels and boulder clays wetland and woodland and old meadow habitats protected plant species	• 17.6km to Grid Connection • 12.8km to nearest turbine (T1) • 1.2km to HRW (HR7) • 17.2km to works at the Eirgrid Ballyragget Substation	Yes, 0.13km from HR6

EIAR 13.3.8.1.3.1 Scoping of National Sites

The **River Nore/Abbeyleix Woods Complex pNHA** is scoped in for further evaluation due to proximity and hydrological connectivity. Similarly, **Inchbeg pNHA** and **Ardaloo Fen pNHA,** are scoped in due to hydrological connectivity. Although there was potential connectivity for mobile species from these sites, they are 7.8km and 10.4km from the nearest turbine location. The max range is considered 8-10km for waterbird species to traverse in winter for foraging and roost sites (8-10km White-fronted Goose; NatureScot, 2022). As such, the ornithological receptors were only considered for the in-situ water quality impact pathways. Under a precautionary principle **Dunmore Complex pNHA** is scoped in for further evaluation due to hydrological connectivity. These sites overlap with the River Barrow and Nore SAC. As no site conservation objectives are provided for these, they can be inferred to share QI/SCIs with these sites based on the SAC site synopsis and conservation objectives.

The context and characteristics of the scoped in National Sites (pNHAs) is described below.

EIAR 13.3.8.1.3.1.1 River Nore/Abbeyleix Woods Complex pNHA – Context and Characteristics

<u>Context</u>: The River Nore/Abbeyleix Woods Complex pNHA (Site Code 002076) stretches from Shanahoe in County Laois southwards along the River Nore to Ballyragget, County Kilkenny. For the most part, this site is overlapped by the River Barrow and River Nore SAC.

The Ballynalacken Grid Connection watercourse crossing works at the existing bridge W3, is c.90m upstream of the pNHA. The main construction works at the windfarm site are significantly upstream of the River Nore/Abbeyleix Woods Complex pNHA, where works occur in the Owveg(Nore)_040 catchment at D4, which flows into the Kilcronan stream, the pNHA is 12km downstream from the drain crossing works planned upstream of the Kilcronan stream.

Characteristics: This large proposed Natural Heritage Area (pNHA) encompasses several features of scientific importance. Between the Abbeyleix estate and Attanagh Bridge, the River Nore contains a large population of the rare and protected Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*). The River Nore is also important spawning area for the vulnerable Irish Red Data Book Twaite Shad.

The margins of the River Nore contain a good diversity of habitats which are host to several plant species of interest including a damp meadows and riverbank species Meadow Saffron (*Colchicum autumnale),* a legally protected Irish Red Data Book species (Flora Protection Order 2022).

Abbeyleix Woods is a large tract of mixed deciduous woodland. It contains 6 epiphytic lichen species, including *Lobaria laetevirens* and *Lobaria pulmonaria*, which are indicators of ancient woodland. Abbeyleix Woods also supports a variety of woodland habitats and an exceptional diversity of species including 22 native trees, shrubs and woody climbers, 66 flowering herbs, 44 bryophytes and 92 lichens.

A swamp woodland known as Lowlands has developed on alluvial soils liable to flooding near the River Nore. It also contains several plant species of interest including the protected Bird Cherry (*Prunus padus*) and Nettle-Leaved Bellflower (*Campanula trachelium*), a threatened species which is listed in the Red Data Book. As with many other old and intact Irish woodlands, the fauna is of considerable interest.

EIAR 13.3.8.1.3.1.2 Inchbeg pNHA – Context and Characteristics

Context: Inchbeg pNHA (Site Code 000836) is located in the floodplain of the River Nore, 4km downstream of Ballyragget town and extends as far as the confluence of the Nuenna River with the River Nore. The boundary of the pNHA is overlapped (entirely) by the River Barrow & River Nore SAC.

Inchbeg pNHA is 18.6km downstream from the closest turbine works (which is via the Nore_SC_060 sub-catchment) and 6.6km downstream of Ballynalacken Grid Connection works at W3. The pNHA is c.7.8km *(as the crow flies)* from the nearest proposed Ballynalacken turbine (T1).

Characteristics: Inchbeg is a pNHA located in the floodplain of the River Nore several kilometres south of Ballyragget. This site overlaps with the larger River Barrow and River Nore SAC. The main habitat of interest here is lowland wet grassland, with some ponds, streams, freshwater marshes, semi-natural deciduous woodland, hedges and scrub. Much of the site is under water during the winter and it provides a habitat for bird species not commonly seen in this area. Golden Plover and Lapwing occur in large numbers; Whooper Swans and Bewick's Swans also use the site in the winter. This site is primarily of ornithological interest although it is also of local importance for its flora because it represents one of the few places in this area which has not been intensively farmed and thus the vegetation remains relatively undisturbed.

EIAR 13.3.8.1.3.1.3 Ardaloo Fen pNHA – Context and Characteristics

Context: Ardaloo Fen pNHA (Site Code 000821) is located in the floodplain of the River Nore, 10km downstream of Ballyragget, and upstream of the confluence point of the Dinin River with the River Nore. The boundary of the pNHA is overlapped entirely by the River Barrow and River Nore SAC.

Ardaloo Fen pNHA is 12.8km downstream of Ballynalacken Grid Connection works at W3, and c.10.4km *(as the crow flies)* from the nearest proposed Ballynalacken turbine (T1).

Characteristics: Ardaloo Fen is a wetland area beside the River Nore. There is a transition from improved grassland to Common reed (*Phragmites australis*) swamp encompassing a diverse wetland flora. The wetland is in a fairly natural condition and the whole site is valuable for birds: the winter flooded grassland supports wildfowl and waders. The reedbed provides habitat for breeding warblers.

EIAR 13.3.8.1.3.1.4 Dunmore Complex pNHA – Context and Characteristics

Context: Dunmore Complex pNHA comprises seven fragments of lands on the northern outskirts of Kilkenny City, with some fragments adjacent/close proximity to the River Nore main channel. The majority of the boundary of the pNHA is overlapped by the River Barrow & River Nore SAC, including that part of the pNHA closest to the Project (HR6).

The Dunmore Complex pNHA is located c.19.6km downstream of the main works at the Ballynalacken Windfarm (*via the Cloghnagh*), the closest Project works relate to Haul Route Works HR6 which involves the removal of street furniture at a roundabout on the N77 c.150m upslope of the pNHA.

Characteristics: A series of natural depressions in the gravels and boulder clays supports an interesting diversity of wetland and woodland and old meadow habitats. In addition, in places the secondary vegetation of abandoned gravel workings is of interest and included within the site. The area is a mix of woodland (wet Alder (*Alnus glutinosa*) and Willow (*Salix cinerea*)) with an understorey of grasses and reeds, areas of nutrient poor acidic mire, typified by grasses and sedge (*Carex panicea*). There are areas of more nutrient rich and more species rich freshwater marsh species, and locally wetter areas with swamp species. The whole complex is developed partly in a disused sand pit.

The smallest block to be designated is a much modified dry embankment, colonised by calcium demanding species. This area's special qualification in the pNHA is the common occurrence of the legally protected plant, Basil thyme (*Acinos arvensis*).

The woods are mainly well drained although they do have wet marginal areas. They tend to be scrubby, with a variety of hardwood tree species and the occasional Oak (*Quercus robur*). The rare Red Data Book species, Nettle-leaved bellflower (*Campanula trachelium*) grows commonly in these woods along with a range of more common woodland herbs. Three further blocks to the south continue the theme of wetlands developing in depressions with some nutrient poor areas. This supports an impressive array of rare plant species mentioned above, plus a rare liverwort species (*Ricciocarpus fluitans*).

EIAR 13.3.8.1.4 Existing Sources of Impacts to Designated Sites

The occurrence of existing pollution or environmental damage in the areas on or around the location of the Project has also been considered, and the following existing pollution/damage has been scoped in because it has the potential to act as a 'source' of impact to the Designated Sites:

River Barrow & River Nore SAC: Water quality within the River Nore is likely being impacted by high inputs of nutrients into the river system from intensive cattle grazing and other agricultural run-off, nutrient runoff from forestry area (from use of fertilizer), waste water from sewage plants and household sewage systems, over-grazing within the woodland areas, and invasion by non-native species, drainage, and man-made barriers in watercourses.

River Nore SPA: Water quality within the River Nore is likely being impacted by various sources of pollutant and sediment type run-off. Agricultural practices are taking place along the riverbank (Cummins *et al*., 2010) and in fields with hydrological connectivity to this site. Sewage source points are present downstream of the Ballyragget N77 bridge.

River Nore/Abbeyleix Woods Complex pNHA: The quality and naturalness of this site have been affected by several factors. The woods at Abbeyleix have been extensively cleared and replanted with conifers. The ground flora has also been altered by the annual clearance of undergrowth and also by occasional grazing. Much of the wet grassland along the margins of the River Nore has been altered by agricultural improvement and intensive grazing. The semi-natural woodland along the riverbanks have also been felled and replanted with conifers in many areas. The water quality of the River Nore has been affected by agricultural and some industrial pollution. Livestock also pose a threat to the mussel beds in areas where they have open access to the river.

Dunmore Complex pNHA: The wetland basins are vulnerable to infilling, as has happened extensively already, such as at the Rich View block which is the southern most of the seven blocks. A large area in the centre of the cluster has been infilled and now accommodates a concrete works; disposal of wastewater from this industry also threatens the site.

Inchbeg pNHA & Ardaloo Fen pNHA: Inchbeg pNHA represents a relatively undisturbed area that has not been intensively farmed, while large sections of Ardaloo Fen pNHA are inaccessible. It is considered that there is no existing pollution or environmental damage in these pNHA sites.

EIAR Figures: (included at the end of this Chapter)

Figure 13.7: Designated Sites – (SPA and SAC)
Figure 13.8: Designated Sites – (pNHA)

EIAR 13.3.8.1.5 Importance of Designated Sites & Sensitivity to Change

Importance of Natura 2000 sites: The EU Habitats Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora formed a basis for the designation of Special Areas of Conservation (SACs). Similarly, Special Protection Areas (SPAs) are legislated under the Birds Directive (Council Directive 79/409/EEC on the Conservation of Wild Birds). Collectively SACs and SPAs are referred to as Natura 2000 sites, or 'European' sites. For the purposes of this report, they are considered to be of **International Importance**.

Importance of National Sites: Wildlife sites that are of **National Importance** (and, in practice, many sites of regional importance) can be designated as Natural Heritage Areas (NHAs) under the Wildlife (Amendment) Act 2000. Sites that have been identified but not yet designated as NHAs are known as 'proposed Natural Heritage Areas' (pNHAs). These sites are protected from development only by the relevant development plan (e.g. the County Development Plan).

Sensitivity to Change: SAC, SPA and pNHA sites are sensitive to hydrological changes to groundwater and surface water quality which may affect water dependant ecosystems, and habitat disturbance or loss. Land-use change, primarily through agricultural intensification and changes to grazing and cropping regimes also has the potential to affect these sites. Within individual Designated Sites, specific species may be sensitive to disturbance, displacement, habitat loss or a reduction in prey item species or accidental mortality, which could reduce their favourable conservation status. Designated sites are also sensitive to encroachment by invasive species.

EIAR 13.3.8.1.6 Evolution of the Baseline Environment (the 'Do-Nothing' scenario)

EIAR 13.3.8.1.6.1 Trends in Key Indicators over time: Designated Sites

Special Protection Areas (SPAs): River Nore SPA

Trends in respect of taxa designated under the EU Birds Directive (SPAs) are reported to the EU under Article 12 of said directive (2009/147/EC) (EU, n.d. a). The most recently available trend information covers the period 2008-2012. Longer term trends regarding wintering and breeding taxa across the SPA network are largely unknown (EU, n.d. b).

The 2008-2012 Report[2] covers 196 bird species, including species which live in Ireland all year round and others which migrate here for summer or winter. It provides a picture of both short-term and long-term trends for some species, and similarly a view of the breeding range trends in some species. However, there is an absence of long-term data for some species. The report was required to provide information on trends rather than a conclusive assessment of status, as is the case in the Article 17 report. In summary, 58% of species populations were stable or increasing in the short term, while 27% were decreasing. However, looking at long term data (where available) 36% were stable or increasing, while 28% were decreasing (EU, n.d. b). The only SPA within the zone of influence was the River Nore which holds only one Species of Conservation Interest, Kingfisher.

Species

Kingfisher [A229]

Reporting on trends with regard to protected species under the EU Birds Directive is provided to the EU under Article 12 of said directive (2009/147/EC). The most recently available trend information in respect of individual species was published for the 2008-2012 period. Kingfisher was identified to have a declining population with 358-1081 recorded breeding pairs in Ireland. It is considered widespread in Ireland with the population of international importance. Specific details and trends of national population are provided in Section EIAR 13.3.6.1.4.2. Cummins *et al*. (2010) noted the occurrence of Kingfisher was never higher than 0.50 per km across the site visits along the river Nore, Barrow and its tributaries. The updated conservation objective from July 2024 cited the site to be “supporting 16-22 breeding pairs or 1.7% of the national population” (NPWS, 2024).

Special Areas of Conservation (SACs): River Barrow & River Nore SAC

Reporting on trends with regard to protected habitats and species under the EU Habitats Directive is provided to the EU under Article 17 of said directive (92/43/EEC). The most recently available trend information in respect of individual habitats and species was published in 2019 (EU, n.d. b).

Qualifying Interest	Habitat/Species Range		Habitat Area/Population Size	
	Short-term Trends	Long-term Trends	Short-term Trends	Long-term Trends
Desmoulins Whorl Snail [1016]	Decreasing	Decreasing	Decreasing	Decreasing
Freshwater pearl mussel [1029]	Stable	Decreasing	Decreasing	Decreasing
White-clawed Crayfish [1092]	Decreasing	Increasing	Decreasing	Unknown
Sea Lamprey [1095]	Stable	Not specified	Stable	Unknown
Brook Lamprey [1096]	Stable	Not specified	Stable	Unknown
River Lamprey [1099]	Uncertain	Not specified	Uncertain	Unknown
Twaite Shad [1103]	Stable	Not specified	Stable	Unknown

[2] https://www.npws.ie/status-and-trends-ireland%E2%80%99s-bird-species-%E2%80%93-article-12-reporting

Atlantic Salmon [1106]	Stable	Not specified	Decreasing	Decreasing
Estuaries [1130]	Stable	Stable	Stable	Stable
Mudflats and sandflats not covered by seawater at low tide [1140]	Stable	Stable	Stable	Stable
Salicornia and other annuals colonising mud and sand [1310]	Stable	Stable	Stable	Stable
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	Stable	Stable	Decreasing	Decreasing
Otter [1355]	Stable	Stable	Stable	Stable
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Stable	Stable	Decreasing	Decreasing
Killarney fern [1421]				
Nore freshwater pearl mussel [1990]	Decreasing	Decreasing	Decreasing	Decreasing
Water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	Stable	Not recorded	Stable	Not recorded
European dry heaths [4030]	Stable	Stable	Decreasing	Decreasing
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	Decreasing	Decreasing	Decreasing	Decreasing
Petrifying springs with tufa formation (*Cratoneurion*) [7220]	Stable	Not defined	Stable	Not specified
Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]	Stable	Stable	Decreasing	Decreasing
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion,*	Stable	Stable	Decreasing	Decreasing

Alnion incanae, Salicion albae) [91E0]				

Conclusion:

Most Irish habitats listed on the Habitats Directive are in Unfavourable status and almost half are demonstrating ongoing declines. The majority of species (also listed on the Habitats Directive) are, however, in a Favourable status and stable in Ireland, with a small number considered to be in Bad status and continue to require concerted efforts to protect and restore them.

Most aquatic species are considered to be in decline across Irish watercourses as a result of agricultural impact sources and human based pollution.

Species listed under the Habitats directive for the River Barrow and River Nore SAC have been identified to be decreasing and are likely to continue to decline in future baselines as result of human activity and practices.

River Nore/Abbeyleix Woods Complex pNHA, Inchbeg pNHA, Ardaloo Fen pNHA, Dunmore Complex pNHA:

These sites overlap either entirely (Inchbeg pNHA and Ardaloo Fen pNHA) or partially overlap (River Nore/Abbeyleix Woods Complex pNHA and Dunmore Complex pNHA) with the River Barrow and Nore SAC along the Northern parts of the River Nore. They cover sections of aquatic and terrestrial habitat. No marine or coastal habitats overlap with these pNHA sites.

As such the general trends and threats to the ecological baseline of these sites is likely to be the same as the River Barrow and River Nore SAC.

The Dunmore Complex pNHA is not a single boundary area but multiple points of scattered habitat in the area north of Kilkenny city. Most of these overlap with the River Barrow and River Nore SAC but some sections are outside the SAC site. The large area in the centre of this complex has been infilled and now accommodates a concrete works; careless disposal of waste water from this industry also threatens the site and is likely to continue to deteriorate the pNHA site.

The species and habitats for the pNHA sites are likely to undergo similar trends in the future baseline environment as stated above for the SAC site.

EIAR 13.3.8.1.6.2 **Drivers of Change**

The main drivers of change for Designated Sites result from agricultural improvements and habitat loss/change resulting in the loss of habitat both locally and within a wider landscape. There are no current policies or initiatives that are likely to result in significant land-use change and therefore habitats prior to and during construction, operation and decommissioning of the proposed Ballynalacken Windfarm Project.

Climate change:

Climate change with potentially warmer wetter winters and/or drier and hotter springs and summers may result in droughts and potentially change the nature of semi-natural habitats, however, any such effects would be unlikely to occur prior to construction activities commencing.

As per the Climate Action Plan 2024 (Annex of Actions), forestry plantations are serving as a carbon source instead of a sink. As such, the likelihood for the receiving environment in a 'Do-Nothing Scenario' is that these habitats will contribute to the country's overall carbon emission.

None of the QI habitats or species within the River Barrow and River Nore SAC were identified specifically for being under threat from climate change. However, general vulnerability to increase temperature and extreme weather events such as storms, floods and droughts are likely to affect the aquatic habitat within the receiving environment in the vegetation and sediment compositions of rivers. As such, all of the QI habitats are likely to be affected as a result of climate change.

Climate change is caused by the release of greenhouse gases. The EU Climate Action Plan for net zero by 2050 is a target to avoid a 2°C increase of global average temperature to prevent catastrophic changes to global climate causing extreme weather events triggering the irreversible chain of events causing life changing alterations to the world's ecosystem. At present, the temperature increase from pre-industrial era data was at +1.55°C for 2024 (WMO, 2025). The level of carbon dioxide in the atmosphere has increased to 419.4 ppm as of 2023. These levels are likely to increase as long as fossil fuel consumptions and agricultural practices are in excess of carbon and nitrogen stores in the marine and terrestrial systems.

As such, this threat is likely to continue to contribute to the decline of Annex I EU Habitats and suitable habitat for Annex II EU species throughout their distribution in Ireland in a 'Do-Nothing' Scenario. The aquatic features connected to the proposed development are therefore likely to decline in condition and biodiversity in the future as a result of this driver.

EIAR 13.3.8.1.6.2.1 Key areas that may be particularly adversely affected:

All aquatic species and habitats are likely vulnerable to the threats and drivers detailed above but the primary sensitivity pertains to the species and habitats listed as QIs for the River Barrow and River Nore SAC. The species at the highest risk and sensitivity of being adversely affected are the Freshwater Pearl Mussel, Atlantic Salmon and White-clawed Crayfish.

The Freshwater Pearl Mussel within the Nore was entirely absent of live individuals along a section of the River Barrow and River Nore SAC that had previously mapped it present for its conservation objective during the baseline aquatic surveys (NPWS, 2011).

Atlantic Salmon were recently recorded to have declined in individuals returning to rivers to spawn from 1.76 million in 1975 to 171,700 in 2022. As such, any areas suitable as nurseries for this species are the primary concern, where sources of water quality decline or erosion in these areas could result in profound effects on the species. These sources are present across the River Nore.

White-clawed Crayfish has declined extensively due to the spread of crayfish plague within several river systems. This plague was recorded within a watercourse sampled via eDNA sampling at Castlecomer stream.

EIAR 13.3.8.2 Impact Evaluation – Designated Sites

This Section comprises an evaluation of the likely significant impacts of the proposed Ballynalacken Windfarm Project on the receiving environment. Moderate, Slight, Imperceptible and Neutral Impacts are also taken into consideration.

The impacts are presented/evaluated as follows:

a) Significant Impacts which are likely or have potential to occur, are subject to detailed evaluation;

b) Moderate or Slight Impacts, which are likely or have potential to occur, are subject to detailed evaluation;

c) Non-significant impacts of local concern or considered important enough to merit detailed evaluation;

d) Neutral or Imperceptible Impacts are scoped out from detailed evaluation, and a short evaluation is provided in the table below. Unlikely Impacts are also scoped out.

Table 13-30: Impacts to Aquatic Habitats & Species

Likely/Potential Impact	**Evaluation**	
Significant Impacts which are likely or have potential to occur – see detailed evaluation		
<u>Construction Phase</u>: Habitat Degradation Effects to downstream Designated Sites (SAC, SPA and pNHA) due to sedimentation and reductions in water quality.		*Section EIAR 13.3.8.2.1*
<u>All Phases</u>: Indirect effects to Designated Sites (SAC, SPA and pNHA) due to the spread of invasive species		*Section EIAR 13.3.8.2.2*
Non-significant impacts considered important enough to merit detailed evaluation – see detailed evaluation		
<u>All Phases:</u> Disturbance / displacement effects to the River Barrow & River Nore SAC (QI: Otter)		*Section EIAR 13.3.8.2.3*
Neutral or Imperceptible Impacts, or where no impact is likely to occur – evaluation below		
<u>All Phases:</u> River Barrow & River Nore SAC: Adverse effects to the conservation objectives of coastal/tidal QI habitats due to direct loss, degradation, fragmentation or indirect effects as a result of the spread of invasive species	<u>No likelihood of adverse effects</u> to the following Qualifying Interests: Estuaries (1130); Mudflats and Sandflats not covered by seawater at low tide (1140); Salicornia and other annuals colonising mud and sand (1310); Atlantic salt meadows (Glauco-Puccinellietalia maritimae) (1330); Mediterranean salt meadows (Juncetalia maritimi) (1410); due to (i) No overlap of the proposed Ballynalacken Windfarm Project with the boundary of the SAC; (ii) No records/evidence of these QI habitats within the Project site boundary; (iii) the separation distance of the nearest Project impact source to nearest known/potential locations of habitats via hydrological pathways (53.3km downstream of W3 [Start of transitional waterbody New Ross Port (IE_SE_100_0200)]); and (iv) Any change to sediment would be significantly below even a negligible extent compared to levels of sedimentation that forms part of normal tidal processes at these QI habitat locations.	
<u>All Phases:</u> River Barrow & River Nore SAC: Adverse effects to the conservation objectives of terrestrial QI habitats and species due to direct loss, degradation, fragmentation or indirect effects as a result of the spread of invasive species	<u>No likelihood of adverse effects</u> to the following Qualifying Interests: European dry heaths (4030); Petrifying springs with tufa formation (Cratoneurion) (7220); due to (i) No overlap of the proposed Ballynalacken Windfarm Project with the boundary of the SAC; (ii) No records/evidence of these QI habitats/species within the Project site boundary; (iii) The separation distance of the Project to known/potential QI habitat/ species locations; and (iv) The negligible extent of sediment deposition that could result in a worst case scenario from the Project during its Construction, Operational and Decommissioning phases.	

<u>All Phases:</u> River Barrow & River Nore SAC: Adverse effects to the conservation objectives of terrestrial QI habitats or floral QI Species due to direct loss or fragmentation; Due to Degradation	No likelihood of adverse effects to the following Qualifying Interests: Old sessile oak woods with Ilex and Blechnum in the British Isles (91A0) and Killarney Fern (1421); due to: (i) the proposed Ballynalacken Windfarm Project does not overlap the boundary of the SAC, (ii) The nearest known locations for these habitats are greater than 10km from the nearest excavation works related to the project (iii) Neither habitat was recorded within the baseline of the receiving environment during surveys. (iv) Due to the distance from known/potential locations of Old sessile oak woods and the lack of hydrological or other pathways from potential Project impacts to the known locations and the absence of records of this QI habitat within the Project site or at aquatic survey locations (which included a 15km stretch of the River Nore; (v) Killarney Fern has some sensitivity to changes in water quality but due to the extent of downstream dissolution from the nearest source point (W3) and the nearest known area for Killarney Fern - degradation related adverse effects are not likely to occur. Neither species have any likely or unlikely pathways to result in impact to their area coverage or distribution.
<u>All Phases:</u> River Barrow & River Nore SAC: Adverse effects to the conservation objectives of QI species Desmoulin Whorl Snail due to direct loss, degradation, fragmentation or indirect effects as a result of the spread of invasive species	<u>No likelihood of adverse effects</u> to the following Qualifying Interests: Desmoulin's whorl snail (1016); due to (i) No overlap of the proposed Ballynalacken Windfarm Project with the boundary of the SAC; (ii) No records/evidence of these QI species within the Project site boundary; and (iii) the separation distance of the Project to known/potential QI species populations or suitable habitat (Neither area provided in the sites Conservation Objective are located downstream or in proximity to the Project).
<u>Construction Phase:</u> River Barrow & River Nore SAC: Adverse effects to the conservation objectives of aquatic QI habitats due to direct loss or fragmentation	<u>No likelihood of adverse effects</u> to the following Qualifying Interests: Water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260); Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430); Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (91E0)*; due to: (i) the proposed Ballynalacken Windfarm Project does not overlap the boundary of the SAC, (ii) None of these QI habitats were recorded within the Project site boundary, (iii) the majority (93%) of excavations are associated with the windfarm site. The location of the windfarm across four separate catchments and the separation distance to the boundary of the SAC reduces the magnitude of sedimentation effects to downstream sections of the SAC; (iv) works will be conducted at W3 (90m upstream of SAC), either in the deck of the bridge or by directional drilling under the bridge and watercourse, the absence of instream works, the limited volume of excavations, with excavations removed from the works area as standard practice during road works; and the unlikely scenario of the direction drilling works resulting in sediment run-off or riverbed breach, would involve negligible volumes being released and any increased sedimentation would be localised and of very low magnitude; (v) the works at W2 being fully contained within the footprint of the road and culvert crossing Rathduff_15 stream and upstream distance to the SAC boundary (3.5km); (vi) the negligible volumes of soils excavated at haul route works locations; and (vii) the very infrequent occurrence and negligible volumes of excavations/movement of soils during the operational and decommissioning phases at HR2, HH4, HR5, HR7, HR8, and HR10 with all works (except HR8) within the public road corridor.
<u>Construction Phase:</u> River Barrow & River Nore SAC: Adverse effects to the conservation objectives	<u>No likelihood of adverse effects</u> to the following Qualifying Interests: Water courses of plain to montane levels with Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260); Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430); and Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (91E0)*due to:

of aquatic QI habitats due to degradation.	(i) no known locations of Hydrophilious tall herb fringe communities or Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae), lack of hydrological or other pathways from potential Project impacts to the known locations and the absence of records of these QI habitats within the Project site or at aquatic survey locations (which included a 15km stretch of the River Nore); (ii) Water courses of plain to montane levels is present downstream of the grid connection crossings W2 and W3 within the Nore_130 Waterbody (Ballyragget N77 bridge). This habitat is located more than 2km downstream of these crossings. Given the unlikely risk of sedimentation expected to occur at these crossing points and the short-term nature of the works related to this impact source, no likelihood of degradation is expected to occur.
<u>Construction Phase:</u> River Barrow & River Nore SAC: Adverse effects to the conservation objectives of QI species Freshwater Pearl Mussel and Nore Freshwater Pearl Mussel due to direct loss, disturbance or displacement.	<u>No likelihood of adverse effects </u>to the following Qualifying Interests: Freshwater Pearl Mussel (1029) or Nore Freshwater Pearl Mussel (1990) due to: (i) the proposed Ballynalacken Windfarm Project does not overlap the boundary of the SAC, and (ii) based on field study results - Freshwater Pearl Mussel is not expected to occur directly downstream of the Project or its related works. However, this QI is potentially present within the River Nore which will not undergo any physical loss of habitat as a result of the Project, (iii) there is no suitable habitat within the Project site; the Rathduff_15 is dry part of the year and therefore there is no potential for Freshwater Pearl Mussel to be present in close proximity to the cable crossing works at W2 or W3; (iv) aquatic surveys recorded no evidence of Freshwater Pearl Mussel in the Castlecomer Stream, Dinin River, Cloghnagh, Rathduff_15 or Owveg River; (vii) targeted surveys along the River Nore did not find any live Freshwater Pearl Mussel or suitable habitat along a 15.6km stretch (from upstream of the confluence of the Owveg River to downstream of the confluence of the Dinin River); and (viii) In addition, the targeted surveys along the River Nore found that the habitat condition was a majority of no suitability with High siltation overall with limited filamentous algae due to depths at multiple sample points. The few areas of low/poor suitability offered little in suitable habitat area for Freshwater Pearl Mussel.
<u>Construction Phase:</u> River Barrow & River Nore SAC: Adverse effects to the conservation objectives of QI fisheries species due to direct loss, disturbance or displacement.	<u>Adverse effects are Unlikely</u> to occur to the following Qualifying Interests: Atlantic Salmon (1106), Twaite Shad (1103), Sea Lamprey (1095), Brook Lamprey (1096), River Lamprey (1099), White Clawed Crayfish (1092) due to: (i) due to the location of the Project outside the boundary of the SAC, with no instream works in natural watercourses and therefore no loss, diversion or physical removal of watercourses, that there is no likelihood of direct loss of Atlantic Salmon, Twaite Shad, Sea Lamprey, Brook Lamprey, River Lamprey or White Clayed Crayfish as a result of the development of the Project; (ii) the construction works in close proximity to the source of the Cloghnagh_010 (at W1), and in wet drainage channels D1 to D4, and forestry felling which will take place in the vicinity of W1, D1, D2 and D3 has the potential to affect QI species should they be present. However, such impacts are at worst of brief, Very Low magnitude for these species and Unlikely to occur as these QI species are unlikely to be present in close proximity to construction works areas. Any potential impacts as a result of the construction of the windfarm would be brief/temporary and very short-term. As such, these impacts are assessed as having No adverse effects on the attributes for these species; (iii) Due to the non-perennial nature of the Rathduff_15 stream, these QI species are not expected to be present at the watercourse crossing locations (W2, W3), and even in worst case scenario where there is flow in the watercourse at the time of the construction works and QI species are also present within the Rathduff_15 stream, the works will take place on the pubic road and therefore any disturbance or displacement will be of brief/temporary duration and of Very Low magnitude, and are assessed as having No Impact adverse effects on the attributes for these species; and (iv) No works in close proximity to watercourses is associated with Tinnalintan Substation, or haul route works HR1, HR4 to HR13, and therefore no likelihood of disturbance/displacement effects. HR2 and HR3 will occur close to the Pococke River, however these minor works will take place within the road corridor, are not likely to increase the current levels of traffic, noise and disturbance at these locations.

Construction Phase: River Barrow & River Nore SAC: Adverse effects to the conservation objectives of QI species Otter due to direct loss.	Adverse effects are Unlikely to occur to the following Qualifying Interests: Otter (1355) due to: (i) Although no couching site or holts were identified within 300m of the construction works boundary and Otter was not recorded within the Project construction works areas or within 300m of watercourse/drainage crossing points during Otter transect surveys, mammal surveys or camera trap deployments, Otter do occur in the wider local area and there is potential for Otter to utilise habitats within and adjacent to the Ballynalacken Windfarm Project site. The nearest aquatic habitat with Otter presence was recorded within the Kilcronan stream, 1.6km North from the closest Project element. Spraints were also recorded across (west) the L5840 local road at the northern end of the windfarm site, 201m West and 292m Northwest, respectively, of T12 and therefore the presence of operating plant and machinery, HGVs and other vehicles during the construction phase results in the potential for direct mortality of animals should they be hit by moving traffic. However, due to Otter generally being absent from the windfarm site, with no records at Tinnalintan Substation or along the cable routes, the limited value of terrestrial habitats at the windfarm site and the unsuitability of the habitats at haul route works locations, it is considered that the number of individuals potentially affected will be Very Low magnitude, isolated to a small section of the windfarm site and will have No effect on the conservation objective attribute for Distribution (no significant decline); and (ii) The construction of hardstanding areas (roads, hardstands, compounds) and facilitating works (temporary landcover change at junctions, construction compounds, bat buffer zones) within the construction works area boundary could lead to temporary and permanent loss of suitable habitat ex-situ of the SAC. While most of the locations of landcover change relate to low-suitability improved agricultural grassland and coniferous forestry, there will be some removal of higher value habitats such as riparian habitat at watercourse/drain crossings or adjacent areas of cover in forestry and also as a result of hedgerow removal. These losses mainly relate to the windfarm site, though it is noted that there will be some hedgerow removal associated with the Internal Cable Link. Due to the habitats effected being of low suitability for Otter, the wider area having more suitable habitat that will be undisturbed by the Project and absence of Otter presence within the red line boundary of the Project, it is evaluated that the loss of suitable ex-situ habitat will not adversely affect the conservation objective attribute (Distribution). Due to the location of the Ballynalacken Grid Connection and Haul Route Works along/immediately adjacent to the public road corridor, no direct loss of suitable habitat is expected to occur. When in-combination effects are considered, it is evaluated that there is potential for in-combination effects in the scenario where the other plans and projects take place during the same period as the construction of the Ballynalacken Windfarm Project. However, such impacts are at worst of temporary duration and Low magnitude and not likely to affect the conservation objective attribute for Distribution (no significant decline).
Construction Phase: River Barrow & River Nore SAC: Adverse effects to the conservation objectives of QI species Otter due to degradation.	Adverse effects are Unlikely to occur to the following Qualifying Interests: Otter (1355) due to: (i) Reductions in water quality can affect habitat quality and prey item availability for Otter. Increases in sediment within suitable habitat downstream of the windfarm site could also cause a direct loss of suitable otter couching sites, and of freshwater habitats, which could impact on species distribution. However, Otter hunt a wide variety of prey, and significant reductions in downstream water quality, including sedimentation, are not expected to occur as a result of runoff from the Project construction site as any such run-off is not expected to exceed negligible levels from any of the watercourse crossings and therefore it is evaluated that any effects on prey item species availability are low and unlikely to affect couching sites potentially located within the Kilcronan or Owveg waterbodies. Therefore, secondary effects on local Otter populations are unlikely to occur.
Construction Phase: River Nore SPA: Adverse effects to the special conservation interest Kingfisher due to direct loss (mortality),	Adverse effects are Unlikely to occur to the following Special Conservation Interest species: Kingfisher (A229) due to: (i) the proposed Ballynalacken Windfarm Project does not overlap the boundary of the SPA, and (ii)due to the distance of the turbines and met mast from watercourses (min 50m), the separation distance to suitable Kingfisher habitat (4km), the typical flight heights of Kingfisher (<15m above ground), it is evaluated that collision of Kingfisher with operating turbines is not likely to occur; due to the stationary nature of the met mast, no collision effects are likely; (Iii) furthermore no areas with suitability for Kingfisher nesting or foraging were recorded within the Project site

disturbance or displacement	boundary. The nearest suitable habitat is located along the River Nore within the SPA downstream of the W3 crossing; (iii) No instream works will occur in natural watercourses, the new crossing at W1 in the Cloghnagh stream will use a bottomless culvert as the new crossing structure, while the cabling works at W2 and W3 will cross the Rathduff_15 at the existing culvert and road bridge with no requirement for instream works or changes to the buried structures. Therefore, due to the absence of Kingfisher at the Project site, and due to the absence of suitable habitat, this species is considered not likely to be present in close proximity to works; and (iv) No Kingfisher were recorded during any bird surveys, or during Kingfisher habitat surveys along watercourses connected to the Project site. (v) Surveys of watercourses and of the existing drains potentially affected by Project elements confirm that sub-optimal foraging habitat and no suitable nesting or roosting habitat occurs at, or in proximity to, watercourse or wet drain crossing locations, or within the site boundary of the Project, and therefore disturbance or displacement of Kingfisher is not likely to occur. It is noted that one watercourse crossing (W3 over the Rathduff_15) occurs upstream from the River Nore SPA, with only the lowest sections of this watercourse (immediately upstream of its confluence with the River Nore) providing some low suitability for nesting Kingfisher, due to the fact that this stream is dry for part of the year and the brief/temporary duration of works at/in close proximity to W3, it is considered that disturbance/displacement impacts are unlikely to occur.
<u>Construction Phase:</u> River Nore SPA: Adverse effects to the special conservation interest Kingfisher due degradation via water quality impacts	<u>Adverse effects are Unlikely</u> to occur to the following Special Conservation Interest species: Kingfisher (A229) due to: (i) the separation distance of the works from SPA boundary (generally in excess of 90m from works areas), (ii) the absence of any instream works at W1, W2 and W3, the location of the main works (windfarm site) spread over several sub-catchments with only the cable route and grid connection crossing having upstream connection to the SPA boundary; (iii) the small number of watercourses onsite, the installation of the windfarm site drainage network ahead of works, and the short-term duration (c. 12 months) of the construction phase. (iv) As aquatic species (fish, crayfish) and other prey items can tolerate some reductions in water quality for a short durations, the low Q-values and general riverine health at the watercourses connected to the Ballynalacken Windfarm Project indicate that that these reductions in water quality will not contribute to a significant change in the pre-existing baseline or differ from the receiving environment in a 'Do-Nothing' Scenario for Kingfisher foraging habitat.
<u>Construction Phase:</u> River Nore SPA: Adverse effects to the special conservation interest Kingfisher due degradation via spread of invasive species	<u>Adverse effects are Unlikely</u> to occur to the following Special Conservation Interest species: Kingfisher (A229) due to: (i) No instream works are proposed to occur at W2 and W3 which are the crossings upstream of the Nore SPA. Neither of these crossings will involve instream works. No instream works will be required at W1 on the windfarms site, as a bottomless culvert will be used (ii) no record of invasive species within 50m of the grid connection or internal cable route, (iii) the absence of any suitable nesting habitat within the Rathduff_15 stream.
<u>All Phases</u>: Changes to drainage regimes and water quantities in all downstream Designated Sites	<u>No Likely Impact</u>: Due to the elevated nature of the Ballynalacken Windfarm site, the absence of deep excavations and the characteristics of the underlying bedrock, the very small footprint of the development in the context of the size of the catchments, it is considered that even in the absence of the site drainage network, no changes to the volumes of water runoff reaching downstream Designated Sites will occur.
<u>Operational and Decommissioning Phases</u> Reduction in Water Quality in the River Barrow and River Nore SAC, the River Nore SPA and the River Nore/Abbeyleix Woods pNHA	<u>Imperceptible</u>: Ballynalacken Grid Connection is the closest element of the Project to the SAC, SPA and pNHA on the River Nore, however, once constructed the requirement for disturbance to ground during its operation will be minimal, infrequent and will be carried out at joint bay locations along the road. No works are expected to be required at the bridge crossing at W3 during the operation of the grid connection. In relation to the Ballynalacken Windfarm, groundworks during the Operational Phase or during Decommissioning will be limited to minor upkeep of the site roads, hardstands and drainage system during the operational phase, and the re-opening and subsequent reinstatement of widened junctions and bends, site entrances and concealed areas at wind turbines to facilitate infrequent large component replacements during the operational phase and to facilitate the removal of the turbines during decommissioning,

	and the reinstatement of the turbine foundations/hardstands using soils in the long-term storage berms at each turbine. Due to the brief duration of works, the small extent of groundworks, the very small number of vehicles/machinery present onsite, negligible use of oils, the discrete locations of works spread over several sub-catchments, and the separation distances from the windfarm site (and subsequent dilution factors) to the SAC (closest point 2km), SPA/pNHA (closest point 4km), potential impacts to water quality will be Imperceptible.
All Phases: Reduction in Water Quality in the Inchbeg pNHA, Ardaloo Fen pNHA	Neutral Impact: The Inchbeg pNHA and Ardaloo Fen pNHA are c.18.6km and c.24.8km from the closest turbine works and c.6.6km and c.12.8km downstream of Ballynalacken Grid Connection works at W3. These pNHA sites are designated for wetland habitats, and flora and are of importance to bird species. Due to the separation distance between the Project - by the time water runoff from the Project reaches these Sites, any sediments or contaminants in runoff from the Project will be substantially diluted and will not have any noticeable effect on water quality at these downstream distances. Any haul route works remote from the windfarm site will be infrequent and of minor scale and brief duration. No perceptible impacts are expected to occur to these pNHA sites during the construction, operation or decommissioning of the Ballynalacken Windfarm Project.
Operational Phase Mortality or displacement of birds associated with the River Nore SPA (excluding Kingfisher), Inchbeg pNHA, Ardaloo Fen pNHA and River Nore/ Abbeyleix Woods Complex pNHA	No Likely Impact: Due to low numbers of Peregrine Falcon, Lesser Black-backed Gull and Grey Heron recorded on site, with no Barn Owl recorded during surveys, and the availability of alternative habitats in the surrounding landscape, it is considered that any collision effects will be Negligible and Not Significant, as their activity levels during VP surveys were below minimum levels to trigger Collision Risk Modelling. Due to the distance of other wetland and waterbirds recorded during surveys from the Turbines, and the absence of suitable habitat for Mallard, Coot, Wigeon, Mute Swan, Teal, Pochard, Whooper Swan, Little Grebe, and Moorhen at the windfarm site, it is considered that interaction with turbines is unlikely to occur, and the potential for significant effects via this impact can be excluded. In relation to the Tinnalintan Substation, Met Mast, Telecoms Relay Pole and Control Building, collision risk is considered highly unlikely due to the stationary nature of these facilities and therefore Not Significant.
Construction Phase: Reduction in Water Quality in Dunmore Complex pNHA	Neutral Impact: Dunmore Complex pNHA is on the northern outskirts of Kilkenny City and at a substantial distance downstream of the Ballynalacken Windfarm (19.6km) and furthermore does not overlap the main River Nore channel – no impacts are likely to occur as a result of works at the windfarm/substation/grid connection locations. The closest Project works relate to Haul Route Works HR6 which involves the removal of street furniture at the roundabout. No excavation or storage of soils is planned at this location, any works (for example the replacement of signage) will be very minor in nature and no impact to water quality is expected.

EIAR 13.3.8.2.1	**Habitat Degradation Effects on QI Aquatic Habitats and Aquatic Species**
Sensitive Aspect:	**Designated Sites: River Barrow & River Nore SAC** - QI habitats/plant species: Water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260); Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430); Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (91E0)*; and Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0). QI species: Freshwater Pearl Mussel (1029), Nore Freshwater Pearl Mussel (1990); Atlantic Salmon (1106), Twaite Shad (1103), Sea Lamprey (1095), Brook Lamprey (1096), River Lamprey (1099), White Clawed Crayfish (1092)
Sensitive Aspect:	**Designated Site: River Nore SPA** – SCI species: Kingfisher
Sensitive Aspect:	**Designated Site: River Nore & Abbeyleix Woods Complex pNHA**
Importance:	**Very High** (per Section EIAR 13.3.8.1)
Impact Source(s)	Reduction in water quality from Excavation of soils, groundworks, overburden storage, presence/use of machinery, oils and fuels, concrete pours, directional drilling, forestry felling
Impact Pathway(s)	Surface water runoff, soil, groundwater flow paths
Project Stage	Construction Phase

Overview of Impact (general):

Watercourses are highly sensitive to changes in water quality, containing sensitive aquatic ecological receptors including salmonids, lamprey species and a diverse macroinvertebrate community including Freshwater Pearl Mussell on the River Nore. Reduction in water quality could potentially result from pollutants entering watercourses in water runoff from construction works areas.

The sources of effects to water quality from the Project are: suspended solids (sediment-laden runoff) from excavations and soil movement and storage at the construction works areas; concrete spills or concrete washout waste water; spills or leaks of oils or fuels from site plant, machinery, vehicles or during refuelling; potential drilling fluids during horizontal directional drilling at W3 (if that crossing method is used), and the potential for nutrient runoff from brash in felling areas.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

The sources of water quality degradation mainly relate to the windfarm site where 93% of the excavations will take place, the majority of the concrete will be used, the majority of plant/machinery and vehicles will be present, and all forestry felling will take place. Outside of the windfarm site, the remaining 7% of excavation volumes are spread across the Internal Cable Link, Tinnalintan Substation, Ballynalacken Grid Connection and the Haul Route Works (HR8). No effects from other haul route works due to the very small extent and nature and brief/temporary duration of the works, with works only occurring within the public road corridor.

Though, unlikely to occur, a breach of the watercourse bed during directional drilling works at W3 (crossing option b), would result in the release of a small volume of sediment and drilling fluid, Bentonite, being released. Bentonite is a non-toxic drilling fluid, and no impacts to water quality are expected to occur. Directional drilling will also result in small amounts of sediment being released into groundwater, however any volumes of sediment released would be negligible and localised, and of brief to temporary duration. Habitat fragmentation is possible as a result of the degradation through reductions in areas suitable to host habitats, although this result is unlikely to occur to any significant magnitude or scale given the scope of the potential sources and the duration for such impacts to occur.

The Ballynalacken Windfarm site is proposed for a location upstream of the River Barrow and River Nore SAC, spread over a number of riverbody catchments – and is 2km from the SAC in the Owveg(Nore)_040 catchment, 6.7km from the SAC in the Castlecomer Stream_010 catchment, 4.4km from the SAC in the Cloghnagh_010 catchment. The boundary of the SPA is generally further downstream from the Ballynalacken Windfarm – 4km(Owveg), 22.5km(Cloghnagh), and 16km(Castlecomer Stream) respectively. In relation to Tinnalintan Substation and the Ballynalacken Grid Connection which are located to the southwest of the windfarm, the SAC is c.600m from the Tinnalintan Substation site and c.90m from the Ballynalacken Grid Connection at W3 where it crosses over/drills under an existing bridge on the regional road. The SPA is 90m further downstream than the SAC – i.e. 690m and 180m. The River Nore/Abbeyleix Woods Complex pNHA overlaps the boundary of the SAC, with hydrological connectivity to the Project in the Owveg(Nore)_040 and Nore_120 catchments only.

Aquatic habitats: In relation to degradation of the QI habitats Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-*Batrachion* vegetation; Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels; and Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*), it was evaluated in the AA Report 2025 that the whole Ballynalacken Windfarm Project may cause Low magnitude effects to these Qualifying Interests with a likelihood of <5% (i.e. Unlikely to occur in normal circumstances/likely to occur during worst case scenarios only). The AA Report 2025 also concluded that the magnitude of changes to water quality in downstream waterbodies as a result of the unmitigated Project will not be sufficient to adversely affect the conservation objectives to maintain or restore the QI habitats, due to:

(i) the majority of excavations (93%), and the majority of concrete, presence and use of oil and fuels, and all of the forestry felling are associated with the windfarm site. The location of the windfarm across four separate catchments and the separation distance of the windfarm site to the boundary of the SAC reduces the magnitude (Low) of water quality effects to downstream sections of the SAC;
(ii) although the grid connection along the public road is located close to the SAC boundary (c.90m at W3), the magnitude of effects is evaluated as Very Low to Low, and no adverse impacts are expected to occur to the QI attributes due to the linear and minor nature of these works, which will be carried out within the road corridor, the absence of instream works; the limited volume of excavations and concrete associated with the watercourse crossing works, with excavations removed from the works area as standard practice during road works, and concrete limited to the trench in the public road; and any sediment released during works over the W3 bridge, or during direction drilling works under the bridge W3, would result in negligible volumes being released and any increased sedimentation would be localised and of very low magnitude; and due to the non-toxic nature of the Bentonite which will be used as the drilling fluid during directional drilling works;
(iii) the linear nature and location of the Internal Cable Link route, the absence of instream works and the separation between works at the existing culvert crossing of the upper reaches of the Rathduff_15 stream and the SAC boundary (3.5km);
(iv) the negligible volumes of soils excavated, and machinery present, at Tinnalintan Substation;
(v) the negligible volumes of soils excavated, and machinery present, at haul route works locations;
(vi) the negligible volumes of excavations/movement of soils and operation of machinery during the operational and decommissioning phases;
(vii) the adaptability of the QI habitats to periodic increases in sediment in the water as part of normal cyclical changes (e.g. during flooding and periods of wet weather).

Overall, the combined Ballynalacken Windfarm Project is not likely to adversely affect the conservation objectives for the QI habitats of the River Barrow and River Nore SAC, and it is also considered that the magnitude of impacts to the habitats associated with the River Nore & Abbeyleix Woods Complex pNHA will also be of Low magnitude (worst case scenario), and mitigation measures are not required to avoid adverse effects. However, the mitigation measures which are proposed below to avoid adverse effects to QI aquatic species will also minimise any effects of the development on aquatic habitats.

Aquatic Species: Additional sediment presents the largest risk to downstream water quality, and magnitude ratings are assigned under the precautionary principal to address any potential of significant effect occurring, given the sensitivity and conservation status of these species under the habitat's directive.

When the sensitivity of Freshwater Pearl Mussel to sedimentation is taken into consideration, it is evaluated that the magnitude of impacts could be potentially Medium to High in a worst-case scenario. However, it should be noted that **no live Freshwater Pearl Mussel were recorded** on any of the watercourses surveyed as part of the Freshwater Pearl Mussel surveys (Appendix 13.7), and therefore these impacts are Unlikely to occur.

While Atlantic Salmon and Brown Trout were recorded at seven and ten sites downstream of the Project respectively, the watercourses in direct contact or in close proximity to the Ballynalacken Windfarm Project are not considered to be of high ecological value to salmonids. In relation to Lamprey species, *Lampetra sp*. ammocoetes were recorded from five sites during surveys, and it is considered that habitat suitability was poor across the survey sites. Twaite Shad was not recorded at any sample point during the aquatic surveys. White-clawed Crayfish was not recorded during aquatic ecological surveys, though the Dinin River and Owveg did yield positive crayfish eDNA results. Magnitude of impacts to Atlantic salmon, Brown Trout, Lamprey species, Twaite Shad and White-clayed crayfish are assessed as Medium.

Water beetle is likely sensitive to this impact since its presence contributes Q-Values of watercourses. Lower quality would equate to a Medium magnitude but only a slight significance due to it not being list as protected species.

The new culverts at D1 and W1 on the Cloghnagh and the extended culvert at D2 upstream of the Ballymartin_15 could potentially affect the passage of European eel, Lamprey species or Atlantic salmon, although the numbers of salmon/eel likely to utilise the upper reaches of the Cloghnagh or Ballymartin_15 are expected to be very low.

The crossing at D4 is upstream of the section of the Kilcronan stream that was identified to only have local importance (lower value). This confluence is 690m downstream of the D4 location. Further downstream of the confluence is a section of the stream that was identified to be of Local importance (High value) based on the presence of Otter couching site and spraint containing crayfish remains, eel and trout and its close proximity to the River Barrow and Nore SAC.

The crossing at W2 involves the installation of the Internal Cable Link in the public road over an existing culvert on the upper reaches of the Rathduff_15 stream, while the grid connection cabling will be installed either over the existing road bridge (option a – in the deck of the bridge), or under the bridge (option b- directional drilling), further down the Rathduff_15.. While the magnitude and likelihood of effects is reduced due to the absence of instream works, there are likely to be low levels of sediment released to surface waters during unmitigated works at W2 and W3 for either crossing method, particularly during wet weather periods. In addition, there are underground interactions to consider with the drilling option. Directional drilling is an accepted method for watercourse crossings as it requires no instream works. Bentonite, which is non-toxic, will be used as the drilling fluid. It is expected that there will be some localised turbidity effects in the groundwater during works, but these effects will be brief-temporary in duration, with the completion of the drilling, and the installation of the ducting into the borehole. Although unlikely, should a riverbed breach occur during the directional drilling, this would result in drilling lubricant and sediment to be released onto the bed of the watercourse, and potentially washed downstream into the River Nore, however any volumes of sediment or non-toxic Bentonite would be negligible.

Overall, the magnitude of impact to aquatic species is potentially High for Freshwater pearl mussel due to its sensitivity to this type of impact, Medium for white-clayed crayfish, Medium for Atlantic salmon, Brown trout, Lamprey species, Twaite Shad, and European eel, and mitigation measures will be required to avoid and minimise adverse effects to aquatic species of Designated Sites.

Impact Magnitude	Low to Medium *(aquatic habitats and species in Designated Sites*)	**Impact Significance: *(pre-mitigation)***	**Not Significant** *(habitats)* **Potentially Significant** *(species)* due to presence and sensitivity of SCI species downstream.

Mitigation and Monitoring Measures which will be implemented are presented along with a brief description of their effectiveness in avoiding, reducing or otherwise ameliorating the potential Significant impact

**See Chapter 19: Mitigation & Monitoring Arrangements for full wording of mitigation measure*

Design	Avoidance of on-site sensitive hydrology features by constraints mapping (i.e. buffer zones)
Design	Avoidance of areas of peat
Design	No temporary storage of overburden in the Owveg_Nore_040 Catchment
Design	Construction and installation of the site drainage network
Design	Implementation of the Surface Water Management Plan

Design	At D1, the existing wet drainage channel will be permanently diverted for a short distance so that it is at least 25m away from the turbine foundation, an interceptor drain will be constructed between the works area and the diverted section of the watercourse.
SM02*	Pre-construction confirmatory surface water quality monitoring and recording.
SM11	The construction Method Statements to be developed by the construction contractors will take full account of the EMP including the mitigation and monitoring measures and will be reviewed by the Environmental Manger prior to the commencement of construction works.
SM12	All construction works will be monitored for compliance with the Environmental Management Plan by the project Environmental Management Team which will include an Environmental Clerk of Works, the Project Ecologist and specialists such as a hydrologist, who are independent of the site contractors. The Environmental Management Team will report to the owner's Project Manager.
SM14	A suitably qualified engineer will supervise all windfarm site excavations and construction works.
SM15*	Regular inspection of the windfarm drainage network by the Contractor and Project Hydrologist.
SM16*	Regular surface water quality monitoring and recording during the Construction Phase in accordance with the Surface Water Management Plan
SM20	The Project Ecologist will liaise with the Contractors on a weekly basis regarding the upcoming schedule of works and will advise the Contractors of any particular ecological protection requirements at specific locations on site.
MM01	The boundaries of the Construction Works Area will be fenced to prevent the encroachment of construction phase personnel, machinery or materials beyond this boundary. In agricultural lands, livestock proof fencing will be used, with landowner access maintained through the provision of gates along the boundary fences.
MM02	Construction traffic, personnel and materials will be restricted to within the Construction Works Area Boundary fence. Machinery will be kept on the windfarm site roads and hardstanding areas, and, aside from advancing excavations, will avoid moving onto areas not delineated on the site drawings
MM03	Land reinstatement will not be carried out during very wet weather or when the soil is waterlogged. If any compaction has occurred along the construction works area, these areas will be ploughed with a sub-soiler to loosen the subsoil layer
MM05	During windfarm construction works, excavations will be backfilled as soon as is possible.
MM06*	Removal of excavated materials to designated berms more than 50m from watercourses or wet drainage features. Implementation of silt control measures and maintenance of vegetative buffers.
MM07*	Storage berms will be graded, sod to be retained and placed on berms and berms re-seeded, measures incorporated to prevent dust and soil erosion.
MM08	Along the cable route on the public road, there will be no storage of overburden and all excavations from road trenches will be removed to licensed waste facilities in accordance with the Waste Management Plan. The excavated material will be covered during transportation to prevent spillages and reduce dust.
MM09	All excavations which are unsuitable for use as construction/reinstatement material which arise within the catchment of the Owenbeg River (T9, T10, T11 and T12 and associated Windfarm Site Roads) will not be stored within the catchment, instead these arisings will be transported to the temporary deposition area at Borrow Pit No.2 and at Turbine T7 (both located outside of the Owenbeg River catchment). In addition, a Siltbuster or other suitable treatment train will be used to remove fine silt particles from site runoff in this catchment. The Siltbuster will be set up at works locations and used during groundworks and earthmoving activities.
MM10	At the windfarm site, at works locations within 50m of watercourses or existing drainage features there will be additional mitigation measures deployed including double silt fencing prior to the commencement of the works, temporary drain blocking in existing drains, placement of silt trapping arrangements along preferential surface water flowpaths and, where necessary, the use of matting to prevent ground erosion and rutting. Works will not take place within this zone during prolonged heavy or exceptional rainfall events.
MM11	Weather forecasts will be consulted in advance of works. If there is heavy prolonged rainfall or if an exceptional rainfall event occurs, then construction works will cease until peak flows have subsided.

MM12*	Site roads and hardstanding areas have a permanent surface water drainage network, the borrow pits will have a temporary surface water drainage network in place during works. The site drainage network will include check dam, settlement ponds and buffered outfall weirs.
MM13*	Site roads and hardstanding areas will be capped with clean high-grade bedrock, such as limestone
MM14*	At the windfarm site, there will be no direct discharge into any watercourses or drains or onto adjacent habitat. All pumped water from excavations will be treated prior to discharge.
MM15	Along the cable routes, where dewatering of trenches or excavations is required, there will be no direct discharge of treated water into any watercourse or drain. Rather, all pumped water will be discharged via a silt bag.
MM17	New culverts which will be installed at watercourses or wet drainage channels will be bottomless or clear spanning.
MM18*	In-stream works will not be undertaken without isolation of flow within the watercourse. The water will be isolated from the works by over pumping, flume (pipe) or channel diversion methods.
MM19*	At wet drainage channels, instream works will be followed by site-specific reinstatement measures to ensure the restoration of flow character and morphology within the affected reach.
MM20	Only precast concrete culverts will be used for new watercourse crossing structures on the windfarm site. Only precast concrete chambers will be used at Joint Bay locations.
SM18	The plant and machinery will be regularly inspected for leaks and maintained in good working order for the duration of the works.
SM19	Fuel, oil and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage.
MM21*	Concrete control procedures will be implemented including no batching; ready mixed concrete will be used for all foundations; work scheduled for dry days; experienced operators; run-off will be settled out and no concrete truck washing on-site.
MM22*	Fuel/oil control procedures will be implemented including control of on-site refuelling of plant and machinery; provision of spill kits. trained operatives, use of double-skinned mobile bowsers. Emergency Response Plan in place.
MM23	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse or wet drainage channel or local spring/well.
MM24*	All fuels or oils, will be stored in designated, bunded, locked storage areas and fitted with a storm drainage system and an appropriate oil interceptor. Emergency Response Plan in place.
MM25	Overnight parking of plant and machinery will only be permitted at locations which are greater than 50m from watercourse/drainage features and at an existing hard-core surface. Drip trays and fuel traps will be used under and around parked plant and machinery to contain any leaks.
MM26	All associated tree felling will be undertaken using good working practices as outlined by the Forest Service in their ‘Forestry Harvesting and Environment Guidelines’ (2000) and the ‘Forestry and Water Quality Guidelines ‘(2000). Measures will include the protection of the riparian zones, installation of buffered drainage outfalls, installation of drains and silt traps as soon as possible once felling has been completed, and a regime of continued monitoring of silt traps and drainage outfalls will be implemented. All excess felled brash will be removed off site to avoid release and runoff of phosphorous into sensitive watercourses.
MM27	In-stream works in wet drainage channels (D1, D2) will only be undertaken during the IFI specified period (July, August and September) and will be carried out in accordance with the *Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters* (IFI, 2016).
MM28	Works at W2 and W3 will take place when the Rathduff_15 is in its dry state and the works at W2 or W3 will be planned for periods of dry weather.
MM71	The horizontal directional drilling works at W3 will be carried out when the Rathduff_15 is in its dry state, to ensure that the works are carried out under a dry stream bed. The drilling works will be carried out by an experienced Drilling Contractor and supervised and managed by a competent and experienced Mud Engineer who understands the technicalities and challenges of drilling works. The Mud Engineer will advise the Construction Manager on the selection of competent drillers for the HDD works; monitor the watercourse bed during drilling works, and will supervise the drilling works including the drilling pressures and the implementation of any

	contingency measures. From a surface water quality protection perspective, the area around the launch/reception pit, bentonite batching, pumping and recycling plant will be bunded using appropriate terram geotextile and/or sandbags in order to contain any spillages. Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area. Spills of drilling fluid will be cleaned up immediately and stored in an adequately sized watertight skip before being taken off-site to a suitably licensed waste facility. In the event of a break-out occurring, the Environmental Emergency Response Procedure for Frac-Out will be implemented which includes the following contingency measures; • In the event of break-out occurring in the stream bed, the rig will immediately shut off the pumps and the drilling assembly will be pulled off to reduce annular pressures; • In the event of break-out on the road an excavator will be available to dig a pit to contain fluid with vacuum trucks/pumps available to transfer drill fluid from the containment point back to the recycling point; and in either scenario, drilling fluid additives designed to plug the formation will be introduced to the circulation system and let set. Environmental Emergency Response Procedures are included in the Ballynalacken Windfarm Project Environmental Management Plan.

<u>Effectiveness of Mitigation</u>:

The above measures are proven and effective best practice measures which will avoid and minimise the risk of sediment or contaminant release by:

- reducing the potential for sediment/contaminant release (limestone capping, weather related restrictions, management of overburden, no temporary storage of overburden in Owveg catchment, concrete controls, refuelling controls, containment bunds, use of shuttering at foundations, design of culverts, removal of brash),
- capturing and treating any sediment/fuel spills that are released (silt fencing, Siltbuster, drainage system, wheel washes),
- thereby breaking the pathway between the potential sources and the receptor.

Furthermore, the ongoing monitoring of water quality in downstream watercourses and the inspection of drainage systems and of the construction works by an Environmental Manager (with 'stop works' authority) will ensure that any decreases in water quality are identified and rectified at an early stage. as a result, would likely be short-term, temporary and reversible in nature.

The directional drill related measures are accepted best practice to prevent and manage any breach to a riverbed during direction drilling works. Given the timing of the works will be at a period when this stream is dry, these measures are unlikely to be needed but will be sufficient to mitigate any potential breach or contamination event. As such, given these measures being part of an emergency response event, any significant effect related to directional drilling works will be negligible to neutral in nature.

Following the implementation of mitigation measures, minimal sediment or contaminants will enter downslope watercourses, habitats will be maintained through restoration and the construction and design of new culverts will ensure free passage of fish and aquatic species. Therefore, any potential negative impacts on downstream waterbodies, aquatic habitats or species will be Negligible.

Residual Impact Significance *(post-mitigation)*:	**Neutral - Not significant**

EIAR 13.3.8.2.2	**Spread of aquatic & riparian invasive species**
Sensitive Aspect:	**Designated Sites: River Barrow & River Nore SAC** - QI habitats/plant species: Water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260); Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430); Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (91E0)*; and Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0). QI species: Freshwater Pearl Mussel (1029), Nore Freshwater Pearl Mussel (1990); Atlantic Salmon (1106), Twaite Shad (1103), Sea Lamprey (1095), Brook Lamprey (1096), River Lamprey (1099), White Clawed Crayfish (1092)
Sensitive Aspect:	**Designated Site: River Nore SPA** – SCI species: Kingfisher
Sensitive Aspect:	**Designated Site: River Nore & Abbeyleix Woods Complex pNHA**
Importance:	**International (SAC, SPA), National (pNHA)** (per Section EIAR 13.3.8.1)
Impact Source(s)	Construction activities including vegetation removal and groundworks and other construction activities, import of materials/movement of machinery onto the project site
Impact Pathway(s)	Movement of soils and surface water containing invasive species
Project Stage	All phases – construction, operation, decommissioning

Overview of Impact (general):

Invasive aquatic species include non-native invasive species such as fish and mobile invertebrate fauna (such as Asian clam, Signal crayfish, or non-native shrimp species).

Invasive riparian species include non-native, terrestrial invasive species such as Japanese knotweed or Himalayan balsam and invasive riparian vegetation such as Water Fern or waterweeds.

Aquatic and riparian invasive species have the potential for significant ecosystem disturbance, disrupting the predator/prey balance or causing habitat disruption within aquatic systems. The spread of invasive species is not restricted in extent to the footprint of construction/instream works but can be transported both upstream (mobile species and 3rd party transport) and downstream (hydrological transport) within a watercourse, potentially extending throughout the catchment. Fragmentation is also possible as a result of invasive species impacts through encroachment of habitat locations and reduction in area suitable to host habitats.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Surveys of habitats at the Project site and during aquatic surveys outside of the Project site, recorded one infestation of an invasive plant species – an infestation of Cherry Laurel was recorded in forestry at the windfarm site. Outside of the windfarm site, both Cherry Laurel and Japanese Knotweed has been recorded on the National Biodiversity Database in the S47 10km square.

The main construction works at the windfarm, cable routes and Tinnalintan substation are located within the S47 10km square, with works along the Ballynalacken Grid Connection in close proximity to the boundary of the SAC. Due to the presence of Cherry Laurel on the windfarm site (1 location) with Cherry Laurel, in addition to NBDC records of Japanese Knotweed being recorded in the surrounding wider area, the importation of materials and movement of machinery/vehicles onto the construction sites, with importation of hedging materials to the windfarm site and to the Tinnalintan Substation site, and movement of machinery, vehicles and works occurring in close proximity to 1 watercourse (W1) and 4 wet drainage channels at the windfarm site, 1 watercourse along the Internal Cable Link (W2) and along the Ballynalacken Grid Connection (W3), that there is a risk, albeit unlikely to occur, that the existing Cherry Laurel infestation could spread or that invasive species could inadvertently be brought onto the construction works areas in loads/on machinery or vehicles and then spread, to the SAC, SPA and pNHA via connected watercourses.

Although the presence of vehicles on the windfarm during the Operational Phase and during Decommissioning Works will be negligible, and groundworks/movement of soils will be at discrete locations at the windfarm site and remote at haul route works locations, with no requirement for instream works, the risk of movement/introduction of invasive species cannot be excluded.

<table>
<tr><td colspan="4">Without mitigation in place, albeit unlikely to occur - given the general absence of invasive species onsite, but taking into account the risk of introduction of invasive species with site vehicles/machinery entering the project site, and the potential for effects both upstream and downstream in a catchment, the magnitude of unmitigated impacts could potentially be Low to High magnitude in the downstream Designated Sites, and has potential to adversely affect the conservation objectives of the above listed QI habitats and species of the River Barrow and River Nore SAC. It is also considered that the habitats of the pNHA could be adversely affected (Low-Medium magnitude). Therefore, mitigation measures will be required to avoid and prevent the spread of invasive species.

In relation to the River Nore SPA, the construction of the Internal Cable Link and Ballynalacken Grid Connection are relevant, as these elements cross the Rathduff_15 stream at W2 and W3, with works c.180m from the boundary of the SPA. However, neither of these crossings will involve instream works. Given the absence of invasive species along the Internal Cable Link or Ballynalacken Grid Connection, the absence of any suitable nesting habitat within the Rathduff_15, and low value of foraging habitat, it is considered that the spread of invasive species unlikely to adversely affect the conservation objectives of the SPA. However, it is noted, that the mitigation measures which are proposed for the protection of aquatic species and habitats of the SAC/pNHA will also mitigate the risk of invasive species spread into the SPA.</td></tr>
<tr><td>Impact Magnitude</td><td>Medium – High</td><td>Impact Significance: (pre-mitigation)</td><td>Slight to Potentially Significant</td></tr>
<tr><td colspan="4">Mitigation and Monitoring Measures which will be implemented are presented along with a brief description of their effectiveness in avoiding, reducing or otherwise ameliorating the potential Significant impact.</td></tr>
<tr><td>SM03</td><td colspan="3">No invasive species, other than Cherry Laurel, were recorded within the Construction Works Area Boundary during pre-planning surveys, however pre-construction surveys of the Construction Works Areas plus 7m will be carried out in order to determine if any new infestations have been established in the interim period. These pre-construction confirmatory surveys for invasive species will be carried out by the Project Ecologist to accurately determine the extent of new invasive species infestations. Mapping, showing the most up to date distribution and extent of each infestation, will be distributed to the Environmental Clerk of Works and to the Project Engineer.</td></tr>
<tr><td>SM20</td><td colspan="3">The Project Ecologist will liaise with the Contractors on a weekly basis regarding the upcoming schedule of works and will advise the Contractors of any particular ecological protection requirements at specific locations on site.</td></tr>
<tr><td>SM21</td><td colspan="3">No invasive species, other than Cherry Laurel, were recorded within the Construction Works Area Boundary during pre-planning surveys, however should a new infestation of invasive species be established in the interim period, any excavation works in close proximity (7m) to the new infestation location will be carried out under the direct supervision of an ecologist with prior experience of this type of work.</td></tr>
<tr><td>SM22</td><td colspan="3">Visual inspections will be carried out by the Contractor on all machinery and equipment (particularly for machinery and equipment which has come into contact with water or soils) for evidence of attached plant or animal material, or adherent mud or debris. Any attached or adherent material will be removed before entering or leaving the site, securely stored away from traffic for removal to the waste storage area in the temporary construction compound at the Ballynalacken site.</td></tr>
<tr><td>MM02</td><td colspan="3">Construction traffic, personnel and materials will be restricted to within the Construction Works Area Boundary fence. Machinery will be kept on the windfarm site roads and hardstanding areas, and, aside from advancing excavations, will avoid moving onto areas not delineated on the site drawings</td></tr>
<tr><td>MM29</td><td colspan="3">The infestation of Cherry Laurel will be removed prior to the commencement of construction works. Any plant material and stems and roots treated with herbicide and any remains disposed of via biohazard best practice with regards to managing invasive plant species in accordance with Maguire et al. (2008).</td></tr>
<tr><td>MM30</td><td colspan="3">No Japanese Knotweed was recorded within the Construction Works Area Boundary during pre-planning surveys, however, should a new infestation of Japanese knotweed within 7m of works, then the infestation will be covered with high density polyethylene grass carpet terram prior to any works commencing at the location. The covering of any</td></tr>
</table>

	new infestations will only be carried out under the direct supervision of an ecologist with prior experience of this type of work, and the works within 7m of the infestation will also be under the direct supervision of an ecologist with prior experience of invasive species.
OMM06	Prior to works along cable routes or public road works for turbine component transportation, the works locations will be surveyed for invasive plant species. Should a new infestation be identified, then the works within 7m of the infestation will also be under the direct supervision of an ecologist with prior experience of invasive species.
DMM02	Before any reopening/re-widening of site entrances, haul route works locations or turbine hardstands to accommodate the removal of large turbine components, the works locations will be surveyed for invasive plant species infestations and should any be present within 7m of the works, then the works within 7m of the infestation will be under the direct supervision of an ecologist with prior experience of invasive species.

Effectiveness of Mitigation:

The above measures are proven and effective best practice measures which will prevent the risk of spreading invasive species by:

- Identifying any new infestations which may have established in the interim,
- Management and supervision of works in close proximity to any new infestations by experienced ecologist.

Following the implementation of mitigation measures, the spread of invasive species is not likely to occur.

Residual Impact Significance *(post-mitigation)*:	**No Impact**

EIAR 13.3.8.2.3	**Disturbance or displacement Effects**
Sensitive Aspect:	**Designated Sites: River Barrow & River Nore SAC** - QI species: Otter (1355)
Sensitivity:	**Very High** (per Section EIAR 13.3.4.1)
Impact Source(s)	Noise and visual intrusion, movement of machinery, groundworks, vegetation clearance
Impact Pathway(s)	Air and visibility, physical contact
Project Stage	All Phases – construction, operation, decommissioning

Overview of Impact (general): Otters are rated as a very high sensitivity receptor and do not tolerate disturbance at or near holts (breeding dens) that are in active use (breeding may occur at any time of the year, but most likely during the Summer/early Autumn period). When Otters are not breeding, records suggest that Otters are less sensitive to human disturbance (Chanin, 2013). Disturbance to Otters can occur via noise and visual intrusion associated with Construction Phase activities.

Whilst Otter may occasionally traverse bogs or upland areas, it generally confines its movements close to waterways, lakes or wetlands (NRA, 2006b).

It is also noted that watercourses are present which form part of or are hydrologically connected to Natura 2000 sites (SAC's) which include Otter as a Qualifying Interest.

Examination of the Impact of the Proposed Ballynalacken Windfarm Project:

Otters do not tolerate disturbance at or near holts (breeding dens) that are in active use (breeding may occur at any time of the year, but most likely during the Summer/early Autumn period). When Otters are not breeding, records suggest that Otters are less sensitive to human disturbance (Chanin, 2013).

No couching sites or holts were recorded within 300m of the windfarm construction works area boundary, however, evidence of Otter was recorded within 300 of the windfarm site (spraints), and, it is therefore considered that a Low number of Otter could be disturbed / displaced by the construction works, the use of plant/machinery, movement of vehicles, noise and the presence of personnel, which has potential to result in a temporary **Low to Medium magnitude loss of terrestrial habitat through avoidance (displacement) within the windfarm site** should a holt become present within 300m of the construction works prior to project commencement. Due to any displacement being limited to the temporary construction works and brief instances of operational maintenance works and strictly ex-situ of the SAC, with the wider environment surrounding the project site being of higher suitability for Otter, it is evaluated that the conservation objective attribute (distribution, extent of terrestrial habitat and couching and holt sites) will not be adversely affected.

Construction works away from the windfarm site will take place in agricultural lands or along/adjacent to public roads and will not result in significant disturbance or displacement. The works related to the W3 crossing (i.e. trenching in deck with parapet wall works or directional drilling under the bridge and watercourse) will take place within 300m of the River Nore. However, it is evaluated that these works will not increase disturbance factors to Otter as the works will be brief (c.1-2 weeks), reversible in nature with completion of the works, all works will be isolated within the footprint of the existing road and will not increase the baseline noise sources significantly and neither crossing method will involve instream works. In addition, no holts or couching sites were recorded along the Rathduff_15 stream and no evidence of Otter was recorded during surveys. Therefore, it is considered that the grid connection works are **unlikely** to disturb or displace Otter.

During the operational phase, noise from the wind turbines are **unlikely** to displace Otter. The presence of works and personnel during the operational and decommissionings phases will mainly take place at the turbines and at substations, and therefore away from watercourses and wet drainage channels and any disturbance or displacement will be brief and unlikely to affect conservation objectives for this QI species. There is potential for the new fences erected around the footprint of the windfarm to result in operational phase disturbance or fragmentation of Otter, however the use of bottomless culverts will reduce the magnitude of effects, and it is evaluated that operational ex-situ displacement impact would be permanent but of Low magnitude due to the wider environment remaining unaffected for Otters to commute between watercourses and the areas affected being entirely ex-situ of the SAC site. As such, these impacts will not adversely affect the attribute (**Distribution**).

Overall, it is considered that the Project is unlikely to adversely affect the a**ttributes relating to Distribution and Extent of Terrestrial habitats** ex-situ of the SAC site.

However, mitigation measures will be implemented to minimise the significance of the unlikely negligible effect to No effect.			
Impact Magnitude	Low – Medium (construction phase) Low – operational phase	**Significance:** ***(pre-mitigation)***	Negligible - Slight

Mitigation and Monitoring Measures: Even though Significant impacts are not predicted; the following mitigation and monitoring measures will be implemented as best practice environmental management.

Design	Otter friendly/mammal gates will be installed along points of fencing once any invasive works related to construction phase are complete to facilitate Otter commuting between the watercourses and drains within the receiving environment during the operational phase of the project.
MM34	Road traffic speed limits of 30km/hr along the local roads L5840 and L5845 at the windfarm site and along the L58442 in Tinnalintan and of 15km/hr along on-site roads throughout project site during the construction and decommissioning phases. Should an Otter fatality occur, then the Project Ecologist will identify appropriate additional measures which will be implemented in areas that show to be high activity road crossing points for Otter.
SM04	No Otter holts were recorded within the Construction Works Area Boundary or within 150m upstream or downstream of watercourse crossing locations during pre-planning surveys, however pre-construction surveys will be carried out in order to determine if any new holts have been established in the interim period. These pre-construction confirmatory surveys for Otter holts and activity (particularly holts at which breeding females or cubs are present) will be carried out 150m upstream and downstream of watercourse crossing locations.
MM32	No Otter holts were recorded within 150m upstream or downstream of watercourse crossing locations during pre-planning surveys, however should a new holt be identified in the interim period during pre-construction surveys (*see SM04*), then all construction works within 150m of the active otter holt, will be carried out during daylight hours and outside of 2 hours after sunrise or before sunset during summer/outside of 1 hours after sunrise or before sunset during winter. If an active holt (particularly holts at which breeding females or cubs are present) is located within 150 meters of the watercourse crossing points, no works will be undertaken while cubs are present in the holt and NPWS will be notified immediately. Except under license, no wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding otter Holts, and light work, such as digging by hand or scrub clearance will not take place within 15m of such holts. The prohibited working area associated with otter holts will, where appropriate, be fenced with temporary fencing prior to any invasive works and declared as 'out of bounds'. Appropriate awareness of the purpose of the enclosure will be conveyed through toolbox talks with site personnel and sufficient signage will be placed on each exclusion fence. All contractors or operators on site will be made fully aware of the procedures pertaining to each affected holt and subject to audits and non-conformance records in the event of non-compliance, to be included in reports submitted to Local Authorities and relevant Statutory Consultees.

<u>Effectiveness of Mitigation</u>:

The control of construction traffic speeds provide a precautionary measure to reduce the likelihood of impact on Otter and other mammals crossing these road paths to Negligible. As such, with these mitigation measures this impact source is unlikely to occur.

Pre-construction surveys will verify any changes to the baseline presence of Otter prior to work taking place to ensure any increased likelihood of disturbance will be identified prior to works occurring, with the appropriate buffer distances implemented in line with NRA guidance and consultation with NPWS. These measures are sufficient to alleviate any likelihood of disturbance causing a greater than not significant effect as a result of the proposed Ballynalacken Windfarm Project.

The mammal gates are an accepted measure to remove any obstruction to wildlife commuting through a development where fencing is required for security, safety or environmental mitigation measures. This will remove any effect related to disturbance/displacement from project fencing erected around the works boundary area for the operational phase and make any effects arising from the construction phase temporary/short-term in duration and negligible/not significant in nature.

Residual Impact Significance *(post-mitigation)*:	**Neutral (Mortality) –** **Not Significant *(disturbance)***

EIAR 13.3.8.3 Cumulative Impact on Designated Sites with Other Projects

EIAR 13.3.8.3.1 Introduction to the Cumulative Evaluation for Aquatic Habitats & Species

The Ballynalacken Windfarm Project (*whose effects range from Neutral to Potentially Significant, as per Section EIAR 13.3.7.2*) is examined hereunder for potential to have cumulative effects on Designated Sites with other existing and permitted projects, and projects advanced in the planning system. These projects are referred to as 'Other Projects' herein.

A Cumulative Study Area is set out below and Other Projects located within this Study Area are identified and examined for in-combination effects with the Ballynalacken Windfarm Project. The potential for off-site and secondary consequential development is also considered.

EIAR 13.3.8.3.2 Scoping of the Cumulative Study Areas

Firstly, a hydrological cumulative impact assessment is carried out on a regional catchment scale for other large projects such as other wind farm developments and large-scale infrastructure developments located inside the River Nore catchment. Other smaller developments have been excluded at this regional scale as cumulative effects are likely to be Neutral at this (regional) scale. This is described below.

<u>Regional Cumulative Study Area</u>: This area comprises all sub-catchments of the River Nore as far as south of Kilkenny City (Nore SC_100) The large up-stream catchment of the River Nore at Kilkenny City (1,745km^2) and high flows (50%ile – 19m^3/sec) means potential cumulative effects downstream of the Nore SC_100 will not be perceptible.

The Regional Cumulative Study Area comprises the following sub-catchments:

- Nore_SC_010
- Nore_SC_020
- Nore_SC_030
- Nore_SC_040
- Nore_SC_050
- Nore_SC_060
- Nore_SC_070
- Nore_SC_080
- Nore_SC_090
- Nore_SC_100
- Dinin[North]_SC_010
- Dinin[South]_SC_010
- Erkina_SC_010
- Goul_SC_010

<u>Local Cumulative Study Area:</u> A hydrological cumulative impact assessment is then undertaken on a more local scale using WFD sub-catchments (in which the Ballynalacken Windfarm Project is located) as the Cumulative Study Area. Other smaller private and commercial developments are considered at this more sub-catchment scale. The sub-catchments occupied by the project site include the Nore_SC_060, Dinin(North)_SC_010, Nore_SC_080 and Nore_SC_100. The Nore_SC_070 is also included in the Local Cumulative Study Area due the close downstream proximity to the Ballynalacken Grid Connection and Tinnalintan Substation.

EIAR 13.3.8.3.3 Evaluation of Cumulative Impacts

The Other Projects which occur within the Cumulative Study Area are identified in the table below and in Figure 13.12: Other Projects within the Aquatics Habitats and Designated Sites Cumulative Study Areas *(included at end of this chapter).*

The Ballynalacken Windfarm Project is examined below for cumulative effects with each of the Other Projects within the Cumulative Study Area. An evaluation of the collective cumulative impact of the Ballynalacken Windfarm Project in-combination with all the Other Projects then follows. The evaluation takes into account any existing sources of pollution or damage identified in Section EIAR 13.3.7.1.6.

Table 13-31: Evaluation of Ballynalacken Windfarm Project cumulatively with Other Projects

Other Project	Status	Evaluation of Cumulative Impact
Laois-Kilkenny Grid Reinforcement Project including recently consented extension to Ballyragget compound – parts located in: Nore_120 and Owveg (Nore)_040	Under Construction	Scoped Out: The Laois-Kilkenny Grid Reinforcement Project OHL passes through the Nore_120 and Owveg(Nore)_040, however due to the OHL nature of the project, with works spread across a large distance, and the fact that the Laois-Kilkenny Grid Reinforcement Project is currently under construction and groundworks within the Study Area will likely be completed by the time the Ballynalacken Project commences construction, and considering that any areas of exposed soil (source of sediment runoff) will have revegetated before Ballynalacken commences constructed, it is evaluated that there is no potential for cumulative impacts. Due to the small footprint of works and separation distance from watercourses, effects to designated sites due to the extension of the Ballyragget Substation compound will be negligible. Any operational activities will have negligible impacts on water quality in downstream waterbodies, and the potential for significant cumulative impacts can be excluded.
Moatpark - Loan 38kV overhead line Telecom Masts, Ballyouskill	Existing	Scoped Out: The overhead line and the telecom masts are already constructed and the lands around the polesets and the masts have revegetated. Therefore, as sources are absent, there is no potential for cumulative construction related impacts. Any operational activities will have negligible impacts on water quality in downstream waterbodies, and the potential for significant cumulative impacts can be excluded.
Pinewood Wind Farm – parts located in: Owveg (Nore)_040	Consented	See Section EIAR 13.3.7.3.4
Monaincha Wind Farm –located in: Nore_SC_010	Existing	See Section EIAR 13.3.7.3.4
Cullenagh Wind Farm – Parts located in Nore_SC_040 and Nore_SC_060	Consented	See Section EIAR 13.3.7.3.4
Lisheen (III) Wind Farm – Parts located in Erkina_SC_010	Existing	See Section EIAR 13.3.7.3.4
Bruckana Wind Farm – Parts located in Erkina_SC_010	Existing	See Section EIAR 13.3.7.3.4

Other Project	Status	Evaluation of Cumulative Impact
Lisdowney Wind Farm –located in Nore_SC_070	Existing	See Section EIAR 13.3.7.3.4
Gortahile Windfarm – Located in Dinin[South]_SC_010	Existing	See Section EIAR 13.3.7.3.4
Bilboa Wind Farm – Located in Dinin[South]_SC_010	Consented	See Section EIAR 13.3.7.3.4
White Hills Wind Farm – Located in Dinin[South]_SC_010	Consented	See Section EIAR 13.3.7.3.4
Farranrory Wind Farm Grid Connection - parts located in: Nore_120	Consented	See Section EIAR 13.3.7.3.4
Parksgrove & Ballyragget Solar Farms Grid Connection - parts located in: Nore_120	Consented	See Section EIAR 13.3.7.3.4
Battery Energy Storage Developments, Moatpark	Consented	See Section EIAR 13.3.7.3.4
Mixed Use Development, Castlecomer - entirely located in: Castlecomer Stream_010	Consented	<u>Scoped Out</u>: Development works will take place adjacent to the Castlecomer Stream. Nearest Ballynalacken project works (haul route works HR10) will involve small scale and very shallow excavation of soils at HR10, which will have negligible effects on the river waterbody. Potential for significant cumulative impacts with the main Ballynalacken construction works at the windfarm site can be excluded due to separation distances and dilution factors.
Hebron House Development, Kilkenny	Consented	*Scoped in for cumulative assessment with Haul Route Works only. See Section EIAR 13.3.7.3.4* <u>Scoped out for cumulative impacts with the windfarm</u>: Due to the small size and scale of this project and the distance from the wind farm site, cumulative impacts with the Ballynalacken Windfarm Project at local scale will not be perceptible. *Due to the size and scale of this project, cumulative impacts at regional scale will not be perceptible.*
Tirlán Milk Processing Plant, Water Treatment Plant, Solar Farm, Anaerobic Digestor	Existing Consented	See Section EIAR 13.3.7.3.4
Wastewater Treatment Plants (including upgrade works*)	Existing	<u>Scoped Out</u>: Existing WWTPs are considered to form part of the baseline environment – i.e. they are already included in water quality measurements which contribute to WFD status and risk assessments. In any case, when the separation distances (dilution factor) between the subject development and the

Other Project	Status	Evaluation of Cumulative Impact
Tirlán – Ballyconra* Sion Road Purcellsinch Castlecomer Deerpark		WWTPs and the water quality protection which would form part of their discharge licenses, are taken into account, it is considered that the potential for measurable cumulative impacts with the Ballynalacken Windfarm Project can be excluded.
Existing Quarries Quarry at Ironmills-or-Kilrush in *Owveg* (Nore)*_040* Murphys Quarry-Firoda in Castlecomer Stream_010 McKeons & Kilkenny Block in Nore_160	Existing	Scoped Out: This activity is considered to form part of the baseline environment. Also, if quarries are discharging to local watercourses, they will do so under a discharge license, and therefore significant impacts from quarries to downstream waterbodies is unlikely to occur. Limited pressure on water quality with one quarry in a sub-basin also associated with windfarm works, and while there are two quarries in the Nore_160 the subject development works in this sub-basin relate to haul route works on roundabouts along the national public road network. When considered with the separation distances (dilution factors) between the subject development and these quarries, the potential for measurable cumulative impacts with the Ballynalacken Windfarm Project can be excluded.
Agriculture	Ongoing	Scoped Out: This activity is considered to form part of the baseline environment and is contributing to the current WFD status of the local waterbodies at the windfarm and grid connection sites, no material change in landuse practices is expected within the construction period of the subject development.
Forestry	Ongoing	Scoped Out: This activity is considered to form part of the baseline environment and is contributing to the Moderate WFD status of the local waterbodies at the windfarm and grid connection sites, no material change in landuse practices is expected within the construction period of the subject development.
Offsite Project – Forestry Replant Lands (outside of cumulative geographical boundary)	Future activity	Scoped Out: The afforestation of 19.9ha of lands will only be carried out on licenced lands, which were subject to an afforestation license application. The application would have examined the potential for significant impacts to aquatic habitats and species within Designated Sites, appropriate mitigation measures and constraints would have been proposed and the license would only have issued where there would be no likely significant impacts on the environment, including on the water environment, as a result of the afforestation. Therefore, it can be assumed that the afforestation of the Replant Lands will not cause significant impacts to Designated Sites on its own. In relation to cumulative impacts, The Promoter of Ballynalacken Windfarm Project is committed to replanting 19.9ha of forestry on lands outside of the River Nore and River Barrow catchments, therefore there is no potential cumulative impact to Designated Sites within the study area.
Secondary Projects / Consequential Developments – Other Energy Projects connecting to Tinnalintan Substation (potential future works located in the Nore_120)	Future project, unknown	Scoped Out: Future connections of other energy projects, which may arise due to the existence of the Tinnalintan Substation (if built), are currently not known and in any case are likely to be constructed after the Tinnalintan Substation exists – i.e. during the operational phase of the Ballynalacken Windfarm Project, therefore it is considered that there will be no overlap of construction periods, and the potential for cumulative construction phase effects can be excluded.

EIAR 13.3.8.3.4 Designated Sites - Cumulative Evaluation

Firstly, as per Chapter 8 Water, in terms of cumulative hydrological effects arising only from elements of the proposed project (wind farm site infrastructure, grid connection, haul route works and substation), no *likely* significant effects are expected due to the construction methodologies, construction programme and the transient nature of the works across several sub-basins, significant surface water quality effects are not anticipated as a result of the construction methodologies to be implemented, the surface water control measures to be put in place and the general adherence to the 50m hydrological buffer.

Watercourses are highly sensitive to changes in water quality, containing sensitive aquatic ecological receptors including salmonids, lamprey species and a diverse macroinvertebrate community including Freshwater Pearl Mussel on the River Nore. Reduction in water quality could potentially result from pollutants entering watercourses in water runoff from construction works areas. These pollutants include suspended solids (sediment) from excavation and movement of soils, hydrocarbons from fuel/oil spills or leaks, cementitious materials from concrete pours, and phosphorus from forestry felling.

Reductions in water quality can result in the reduction or loss of aquatic habitats, and in a reduction or loss of feeding, resting or breeding habitat for aquatic species. Furthermore, reductions in water quality can lead to reductions in population distribution or structure of important aquatic species and could result in a downgrading of the Q-status of a waterbody under the Water Framework Directive.

Due to the separation distance of the other projects to the works in wet drainage channels associated with Ballynalacken Windfarm Project, (i.e. Cloghnagh), no cumulative hydro-morphological impacts will occur.

In relation to cumulative invasive species risk, given the separation distances between construction works areas and likely haulage routes for the other projects, with no instream works for the other projects in any of the watercourses/wet drainage channels associated with the Ballynalacken Windfarm Project, and the nature of the deliveries for the Ballynalacken Windfarm Project in the Rathduff_15 catchment (concrete, asphalt, substation materials, cabling materials), it is evaluated that although the spread of invasive species into downstream waterbodies is unlikely to occur. However, the risk is increased when other projects are taken into consideration, and should it occur, this impact pathway has the potential to cause High magnitude in-combination effects.

It is considered that the potential for cumulative impacts relates to cumulative reductions in water quality as a result of sediment or contaminant laden runoff from multiple projects as a result of excavations, earthworks and overburden storage, instream works, use of concrete, oils and fuels, and forestry felling.

As evaluated in Section 13.3.7.3.4, none of the other large projects considered for in-combination effects to the wider receiving subcatchment environment are in close proximity to aquatic receptor effects sources related to the proposed Ballynalacken Windfarm Project. As such, these projects cumulative effects on the water quality and aquatic habitats or species are unlikely to occur due to the absence of in-combination interactions present between their respective impact sources and the proposed Ballynalacken Windfarm Project sources.

Therefore, when the effects of the Ballynalacken Windfarm Project, are considered collectively with all of the Other Projects and existing sources of impacts within the Cumulative Study Area, it is evaluated that although there is potential for low magnitude combined effects, the magnitude of changes to water quality in downstream waterbodies as a result of the unmitigated Project in combination with other plans and projects would not be sufficient to affect the conservation objectives related to the listed QI/SCI receptors attributes or targets for the River Barrow and River Nore SAC or for River Nore SPA, and that significant adverse effects are not likely to the River Nore & Abbeyleix Woods Complex pNHA.

EIAR 13.4 Summary Conclusion

TERRESTRIAL HABITATS:

No habitats of county importance or higher are present within the construction or operational/decommissioning phase working boundary for the proposed Ballynalacken Windfarm Project. (EIAR 13.3.1.1).

Areas of Local (High Value) Importance are within the footprint of the project and include Wet Grassland and a small area of Wet Heath. The Wet Heath area (5.5Ha) has been set aside, adjacent to the construction works boundary of the windfarm site to be used as a biodiversity protection area.

The majority of the receiving environment is dominated by low value Conifer Plantation and Improved Agricultural Grassland habitat which makes up over 80% of the estimated habitat loss.

A number of linear habitats of high local value are present within the baseline receiving environment. 17.2km of hedgerow is located within 50m of the project - only 1.5km will be removed as part of the construction works. 5.8km of Treeline is located within 50m of the project - only 12 no. trees will be removed as part of the construction works.

Based on the limited extent of high value habitat permanently effected, the nature of the duly considered impacts magnitude, unlikelihood for adverse effects and proposed mitigation measures (EIAR 13.3.1.2) **the proposed Ballynalacken Windfarm Project will result in Neutral (invasive species) or Slight positive (habitat enhancement and protection) effects on terrestrial habitat receptors.**

INVERTEBRATES:

No invertebrate species of conversation concern were recorded within the construction works boundary of the proposed Ballynalacken Windfarm Project (EIAR 13.3.2.1).

One Annex II invertebrate species was recorded within the wider receiving environment - where Marsh Fritillary Butterfly is utilising habitat east of the proposed site boundary. This location has no overlap with the footprint of the windfarm or grid connection route with no host plant recorded within the construction or operational site boundary. As such, this species is unlikely to be affected by the proposed Ballynalacken Windfarm Project.

Based on the limited presence of these species within the receiving environment of the proposed construction works boundary, the nature of the duly considered impacts magnitude and unlikelihood for adverse effects (EIAR 13.3.2.2) **the proposed Ballynalacken Windfarm Project will result in Neutral/No Likely Impact on terrestrial invertebrate receptors.**

AMPHIBIANS & REPTILES:

Field Surveys yielded no sightings of Amphibian or Reptile receptors. Desk study data indicates Common Frog, Smooth Newt and Common Lizard being present within the wider receiving environment of the proposed construction works boundary (EIAR 13.3.3.1)

No impacts were identified to pose greater than neutral effects on these receptors.

Based on the limited presence of these species within the receiving environment of the proposed construction works boundary, the nature of the duly considered impacts magnitude and unlikelihood for adverse effects (EIAR 13.3.3.2) **the proposed Ballynalacken Windfarm Project will result in Neutral or Imperceptible positive effects on amphibian or Reptile receptors.**

TERRESTRIAL MAMMALS:

Five mammals species were recorded within the receiving environment. Pine Marten, Stoat, Red Squirrel, Otter and Badger. Only Badger and Pine Marten were recorded from Camera Trap surveys. All other records were via secondary evidence of these species (EIAR 13.3.4.1). Only two species were identified to have potential to experience significant effects as a result of the Ballynalacken Windfarm Project (Otter and Badger).

Otter was not sighted on site but secondary evidence of Otter is present outside the red line boundary of the proposed Ballynalacken Windfarm Project and downstream of the Kilcronan stream within the River Barrow and Nore SAC. This species is likely to commute through the area of the windfarm site between watercourses. Mitigation measures are proposed to facilitate Otter commuting unhindered through the windfarm site during the operational phase of the project. **The residual impact to Otter is predicted to be Slight (loss/degradation of suitable terrestrial habitat), Neutral/Not Significant (reduction in suitable aquatic habitat quality and availability of prey-item species), and Slight (mortality) to Not Significant (disturbance or displacement).**

Badger was recorded utilising the forestry and surrounding habitat for foraging. No sett was recorded within the baseline of the Ballynalacken Windfarm Project. Any extent of disturbance to badger will be temporary, related to the construction phase and unlikely to cause disturbance of greater than, negligible magnitude badger during the operational/decommissioning phase. Pre-construction measures will be implemented to confirm no active sett is within 50m of construction works prior to any works commencing on site. **The residual impact (mortality, disturbance or displacement at Setts) to Badger is predicted to be Neutral/Not Significant.**

Overall, based on the limited presence of Terrestrial Mammals within the receiving environment of the proposed construction works boundary, the nature of the duly considered impacts magnitude, unlikelihood for adverse effects and proposed mitigation measures (EIAR 13.3.4.2) **the proposed Ballynalacken Windfarm Project will result in Neutral to Slight adverse impacts on Mammal receptors.**

BATS:

Six bat species were recorded on during field surveys (Leisler's Bat, Common Pipistrelle, Soprano Pipistrelle, Nathusius' Pipistrelle, Brown Long-eared Bat, Natterer's Bat and Daubenton's Bat).

Two roosts were identified (BL2 and TR1). BL2 (derelict building) observed Common Pipistrelle, Soprano Pipistrelle and Natterers Bat entering and emerging from this roost. BL2 is evaluated as being of Local (High Value) Importance but will remain unaffected by the proposed development due to it being more than 300m from the nearest disturbance source. TR1 (mature ash tree) is located within 150m of Turbine 10, and was evaluated as having High suitability. This is a small roost which only had Common Pipistrelle emerging. As such, the mitigation measures including bat buffers, planting of new hedgerow, and the biodiversity protection area located immediately south of the roost provides habitat to encourage commuting and foraging away from the proposed T10 location.

Three species were identified as high risk to mortality/disturbance impacts (Leisler's Bat, Common Pipistrelle, Soprano Pipistrelle) with all three having high activity records during the summer period. The remaining species are considered low risk to this impact. As such, mitigation measures to implement a bat buffer zone around the turbines and to control the timing of forestry felling are proposed, along with operational monitoring to identify at-risk times/conditions in order to deploy smart curtailment/feathering of turbines. Fatality monitoring (including Carcass retention trials, carcass searches [with trained detection dogs where available]* and efficiency trials) will be deployed to monitor the success and efficacy of the smart curtailment methods implemented. **The residual impact (mortality) to Bats is predicted to be Imperceptible-Slight adverse significance.**

The proposed Ballynalacken Windfarm Project will involve the removal of a 19.9Ha of conifer plantation. Replanting of 1500m of hedgerow include 43 no. trees will be implemented on site. As such, the impact of the project will have a **slight net positive impact** on bat foraging habitat within the receiving environment.

Overall, based on the presence of these species within the receiving environment of the proposed construction works boundary and operational impact sources, the nature of the duly considered impacts magnitude, likelihood for adverse effects and proposed mitigation measures (EIAR 13.3.5.2) the **proposed Ballynalacken Windfarm Project will result in Neutral or Slight positive effects on Bat receptors foraging and roost habitat and an imperceptible mortality effect on low risk bat species (Nathusius' Pipistrelle, Brown Long-eared Bat and Myotis Species) and Slight effect on High risk bat species (Leisler's Bat, Common Pipistrelle, Soprano Pipistrelle).**

BIRDS:

Bird receptors within the ecological baseline comprise four main groups.

Birds of Prey: Four species were recorded utilising the receiving environment of the windfarm site (Buzzard, Kestrel, Peregrine, Sparrowhawk). Buzzard, Kestrel and Sparrowhawk were all assessed for collision risk based on the extent flights recorded. Only Kestrel was determined to be at risk for significant effect from mortality. Measures to reduce the suitability of hunting ground within the bat buffer zones for turbines will be implemented to reduce the risk of Kestrel hunting in proximity to operational turbines. **The residual impact (mortality/collision risk) to is predicted to be Not Significant (Kestrel) to Neutral (other Birds of Prey).**

Fatality monitoring (including Carcass retention trials, carcass searches [with trained detection dogs where available] and efficiency trials) will be deployed to monitor the real-time impact on Kestrel to ensure that the projected mortality magnitude is consistent with the operational real-life mortality magnitude.

Based on the extent of presence of these species within the receiving environment of the proposed construction works boundary and operational impact sources, the nature of the duly considered impacts magnitude, likelihood for adverse effects and proposed mitigation measures (EIAR 13.3.6.2) the proposed **Ballynalacken Windfarm Project will result in Neutral to Not Significant effects on Bird of Prey Species receptors.**

Waders: Only one Annex I wader species was recorded during surveys and is also a red-list BoCCI species (Golden Plover). Four other red-list species were also recorded during surveys (Curlew, Lapwing, Snipe and woodcock). Curlew was recorded only once incidentally flying over the site.

Golden Plover and Snipe were the only wader species observed flying through the potential Collision risk zone of the project (500m from the nearest turbine). Neither species were considered to at risk for significant effects. With the monitoring measures deployed for Kestrel applied for Golden Plover as well, the residual impact to Golden Plover will be **Not Significant**.

Lapwing was not observed utilising or flying through the windfarm site. The entirety of the Lapwing sightings were limited to the I-WeBS surveys across the wider receiving environment within the larger river waterbodies (Nore, Owveg Rivers).

Woodcock and Snipe were both recorded during the targeted breeding surveys and are considered to be breeding within the wider receiving environment of the proposed Ballynalacken Windfarm Project but not within the footprint of the proposed construction or operational works boundary.

These species were identified to be at risk to Not Significant effects as result of the construction works removing vegetation and felling the conifer forestry during nesting periods. As such, accepted measures including timing of hedgerow removal and being timed outside the breeding season and where works are to be conducted during the breeding season, confirmatory surveys are to be conducted to identify any active Curlew, Snipe, Lapwing or Woodcock nests prior to works commencing. With the implementation of these mitigation measures, the **residual impact (physical injury/destruction of nests or chicks) to is predicted to be Neutral.**

No other Wader species were identified as key receptors within the receiving environment.

Based on the presence of these species within the receiving environment of the proposed construction works boundary and operational impact sources, the nature of the duly considered impacts magnitude, likelihood for adverse effects and proposed mitigation measures (EIAR 13.3.6.2) **the proposed Ballynalacken Windfarm Project will result in Neutral or Not Significant effects on Wader Species receptors.**

Kingfisher:

Kingfisher is the sole SCI of the River Nore SPA which the only SPA within 20km of the proposed Ballynalacken Windfarm Project. Although suitable habitat is present within the River Nore. No sightings were recorded as part of the baseline surveys. No riverine habitat within the 50m baseline of the proposed construction works area boundary of the Project was deemed suitable for Kingfisher nesting nor for foraging along streams within the footprint of the Ballynalacken Windfarm Project site.

Potential effects to Kingfisher are therefore restricted to impacts via invasive species and degradation of suitable habitat downstream of works, and with the implementation of water quality and invasive species mitigation measures, the **residual impact (reduction in downstream foraging/nesting resource) to is predicted to be Not Significant.**

Passerines:

One red list species (Meadow Pipit) and eight amber list species (Skylark, Spotted Flycatcher, Willow Warbler, Starling, Linnet, House Sparrow, Swallow and Goldcrest) were recorded during field surveys. These species were identified to be at risk to only slight/not significant effects as result of the construction works removing vegetation and felling the conifer forestry during nesting periods. As such, accepted measures including timing of hedgerow removal and being timed outside the breeding season and where works are to be conducted during the breeding season, confirmatory surveys are to be conducted to identify any active Meadow Pipit nests prior to works commencing. With the implementation of these mitigation measures, the **residual impact (physical injury/destruction of nests or chicks) to is predicted to be Neutral.**

Overall, based on the presence of birds species within the receiving environment of the proposed construction works boundary and operational impact sources, the nature of the duly considered impacts magnitude, likelihood for adverse effects and proposed mitigation measures (EIAR 13.3.6.2) the proposed Ballynalacken Windfarm Project will result in Neutral/Not Significant effects on Bird Species receptors.

AQUATIC HABITATS & SPECIES:

Three Aquatic invertebrates of conservation concern were recorded during targeted aquatic surveys. The IUCN near-threatened water beetle was recorded within the Castlecomer stream. DNA yielded positive results for White-clawed Crayfish within the Dinin and Owveg River. However, no live individuals were recorded. Freshwater Pearl Mussel was only recorded within the River Nore. Only four individuals were recorded, all four were of dead specimens. No live individuals were recorded.

A number of salmonid and other fish receptors were also recorded across the aquatic electro-fishing locations (Atlantic salmon, Brown trout, Lamprey species, and European eel). With the exception of European eel, all these species are Annex II species listed as QIs for the River Barrow and Nore SAC. Twaite Shad was the only aquatic QI species not recorded but is considered a receptor for impacts based on its conservation status within the SAC downstream of the proposed Ballynalacken Windfarm Project.

A number of watercourses have hydrological connectivity to the Proposed Ballynalacken Windfarm Project via:

- Drainage ditch works pathways (Cloghnagh and Kilcronan Streams),
- Stream crossings via existing infrastructure (culverts, bridges) (Cloghnagh and Rathduff_15); or
- Surface run-off pathways (Castlecomer Stream, Cloghnagh, Kilcronan, and Rathduff_15)

These water courses were all assessed to be of Local (Low Value) importance within their upper reaches that are the closest to the project impact sources. However further downstream, with the exception of the Rathduff_15 stream, these watercourses were assessed as Local (High Value) Importance.

All these streams flow into larger watercourses of international importance. The Owveg (via the Kilcronan Stream), Dinin (via the Castemcomer Stream and Cloghnagh Stream) and Nore (via the Rathduff_15) Rivers. All three of which are within the boundary of River Barrow and Nore SAC.

Only one Annex I habitat was recorded during aquatic surveys. Water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) was recorded present underneath the N77 bridge at Ballyragget Town, over 2km downstream of the works at W3 crossing the Rathduff_15 Stream.

Due the projects upstream relationship to a designated site and the presence of Annex I habitats and Annex II species, a suite of Measures will be implemented to mitigate potential adverse effects, although these effects unlikely to occur (i.e. in a worse-case scenario) (EIAR 13.3.7.2).

Despite on the presence of species and habitats of significance downstream of the proposed construction works boundary, the nature of the duly considered impacts magnitude, unlikelihood for adverse effects and proposed mitigation measures (EIAR 13.3.7.2) **the proposed Ballynalacken Windfarm Project will result in Neutral/Not Significant effects on aquatic Species or habitat receptors.**

DESIGNATED SITES:

No designated site overlaps with or is directly connected to works related to the proposed Ballynalacken Windfarm Project.

Two Natura 2000 sites are downstream of one or more elements of the proposed Ballynalacken Windfarm Project (River Barrow and Nore SAC, River Nore SPA). Four proposed Natural Heritage Area sites are also present downstream of the same project elements (River Nore/Abbeyleix Woods Complex pNHA, Inchbeg pNHA, Ardaloo Fen pNHA, Dunmore Complex pNHA). All four pNHA sites overlap partially with sections of the River Barrow and Nore SAC.

As presented in Section 13.3.8.2, only three sites were identified to have potential for significant adverse effects. The River Barrow and Nore SAC, River Nore SPA and the River Nore/Abbeyleix Woods Complex pNHA were identified for impacts related to Habitat Degradation Effects on QI Aquatic Species, Spread of aquatic & riparian invasive species for all three sites and Disturbance or displacement Effects on Otter for the River Barrow and Nore SAC only. As such, although based on worst-case scenarios of unlikely events, mitigation measures are provided to prevent or reduce the risk for sediment or contaminant/nutrient-laden run-off effecting aquatic habitats resulting in changes to water quality, and to prevent and reduce the risk of the spread of invasive species. Measures to mitigate mortality, disturbance or displacement of Otter as a result of the proposed Ballynalacken Windfarm Project are also provided, and the residual impact will be Neutral – Not Significant.

Cumulative effects were considered unlikely and of negligible magnitude as a result of in-combination sources with the Pinewood Windfarm which has some connectivity to the Owveg river. No other projects were identified to be at risk for in-combination interactions resulting in cumulative effects to the River Barrow and River Nore SAC, River Nore SPA or the River Nore/Abbeyleix Woods Complex pNHA based on the minimal nature of potential sources from the project and separation distance or absence of any reasonable proximity from the proposed Ballynalacken Windfarm Project impact sources, scoped receptors and the other projects considered.

Based on the downstream location of The River Barrow and River Nore SAC, River Nore SPA and River Nore/Abbeyleix Woods Complex pNHA from the proposed construction works boundary and distance from operational works, the nature of the duly considered impacts magnitudes, unlikelihood for adverse effects and proposed mitigation measures (EIAR 13.3.8.2), **the proposed Ballynalacken Windfarm Project has only Neutral effects on the integrity of these designated sites and their QI/SCI receptors.**

Conclusion

Overall, it is evaluated that the residual impact on the Environmental Factor, Biodiversity, will be Neutral. This is based on receptors being unlikely to experience direct impacts above negligible magnitude and indirect impacts unlikely to result in adverse effects due to the extent of potential impact sources being short-term or temporary in nature and the mitigation measures proposed addressing worst-case scenario prevention and response measures.

Therefore, based on ecological receptors identified, their conservation status and sensitivity to impacts, informed by the best-evidence and scientific knowledge at the time of writing, the nature of the duly considered impacts magnitude, the unlikelihood for adverse effects and the proposed mitigation measures it is evaluated that the proposed Ballynalacken Windfarm Project will not result in any adverse effects on ecological receptors within the receiving environment as a result of its Construction, Operational or Decommissioning phase works or in-combination with other projects.

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EIAR 13.6 List of Figures for Biodiversity

FIGURES (overleaf)

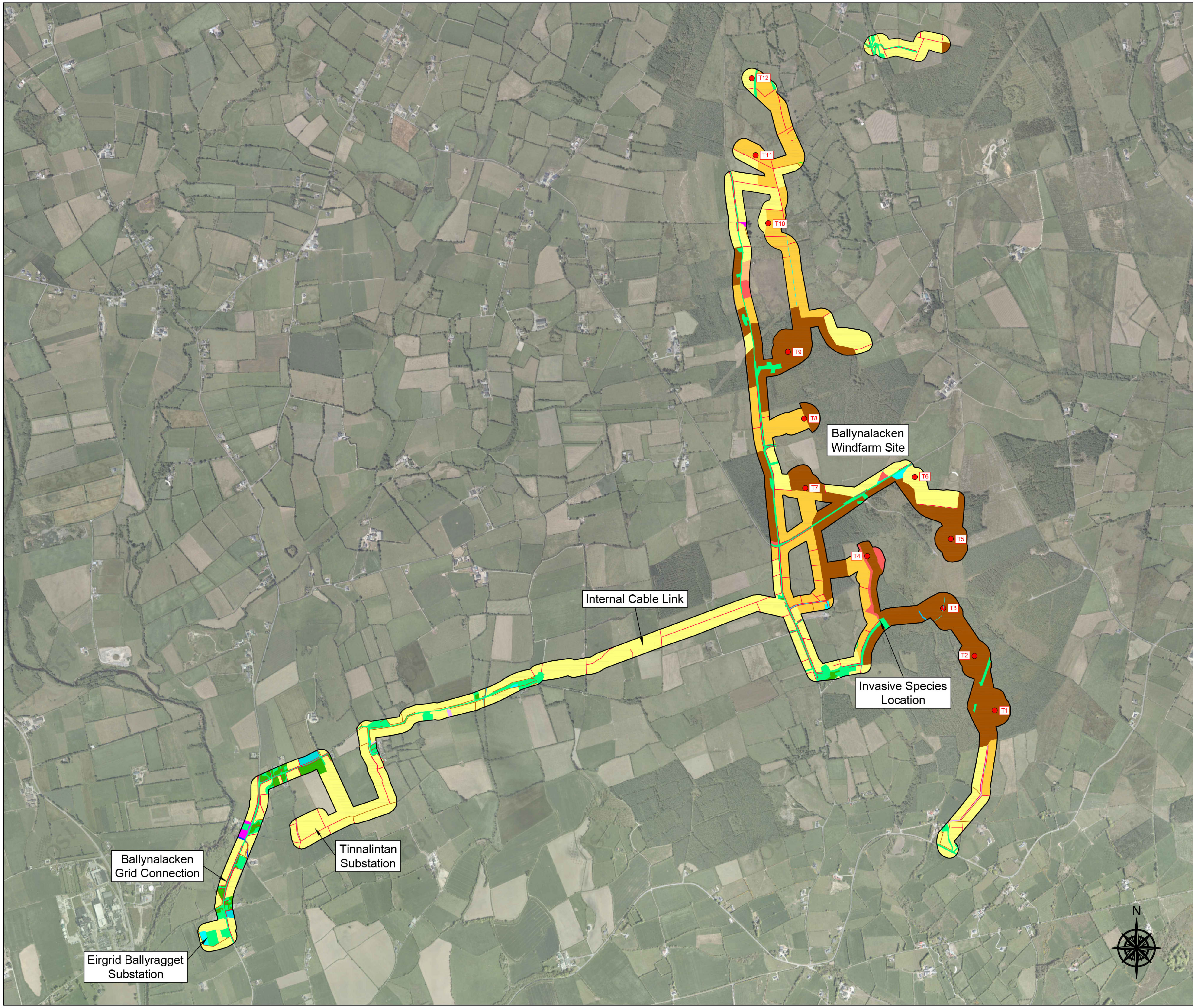
EIAR 13.7 List of Appendices for Biodiversity

APPENDICES (overleaf)

Figures for Biodiversity

EIAR Chapter 13: Biodiversity

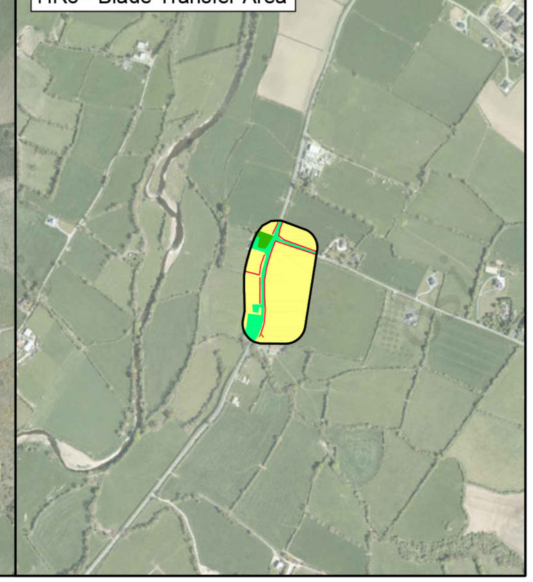
Figure 13.1 - Terrestrial Habitats



Legend:

- Ballynalacken Turbine
- 50m Study Area
- BC1 - Arable crops
- BL1 - Stone walls and other stonework
- BL3 - Buildings and artificial surfaces
- ED3 - Recolonising bare ground
- FW1 - Eroding - upland rivers
- FW2 - Depositing - lowland rivers
- FW4 - Drainage ditches
- GA1 - Improved agricultural grassland
- GA2 - Amenity grassland
- GS2 - Dry meadows and grassy verges
- GS4 - Wet grassland
- HH3 - Wet heath
- WD4 - Conifer plantation
- WD5 - Scattered trees and parkland
- WL1 - Hedgerows
- WL2 - Treelines
- WS1 - Scrub
- Invasive Species - Cherry Laurel

HR8 - Blade Transfer Area



EIAR Chapter 13: Biodiversity

Figure 13.2 - Invertebrates

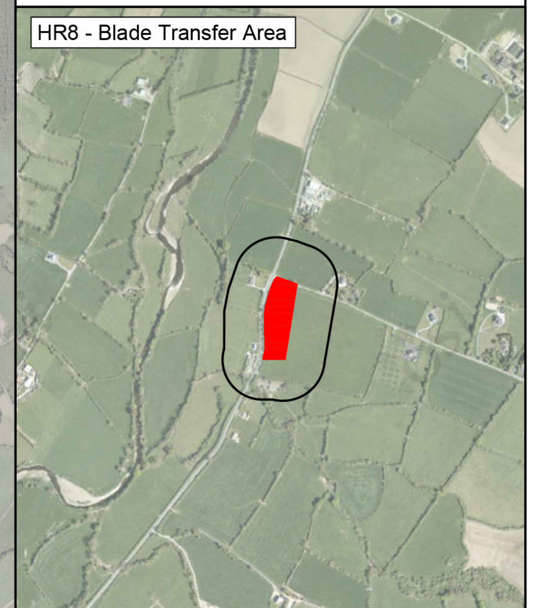
Legend:

Ballynalacken Windfarm Construction Works Area

100m Study Area

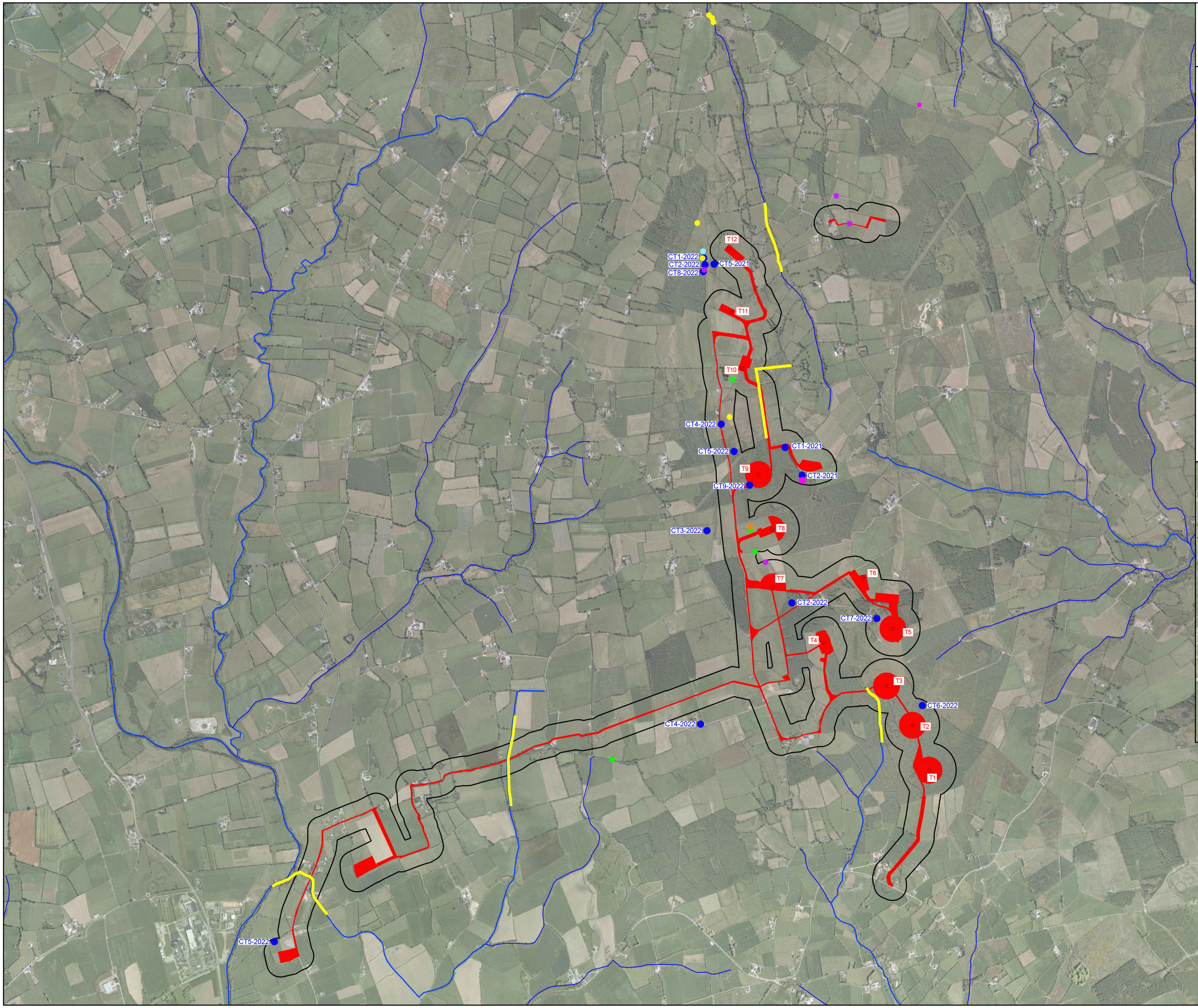
Location of Marsh Fritillary Larvel Web

Note: There is no Marsh Fritillary recorded within the study areas



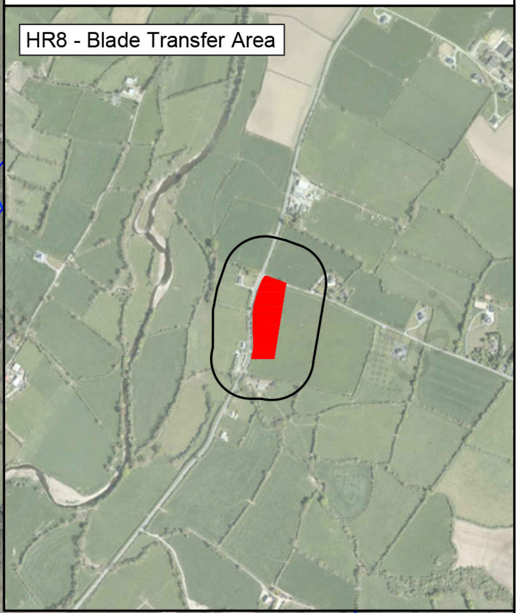
EIAR Chapter 13: Biodiversity

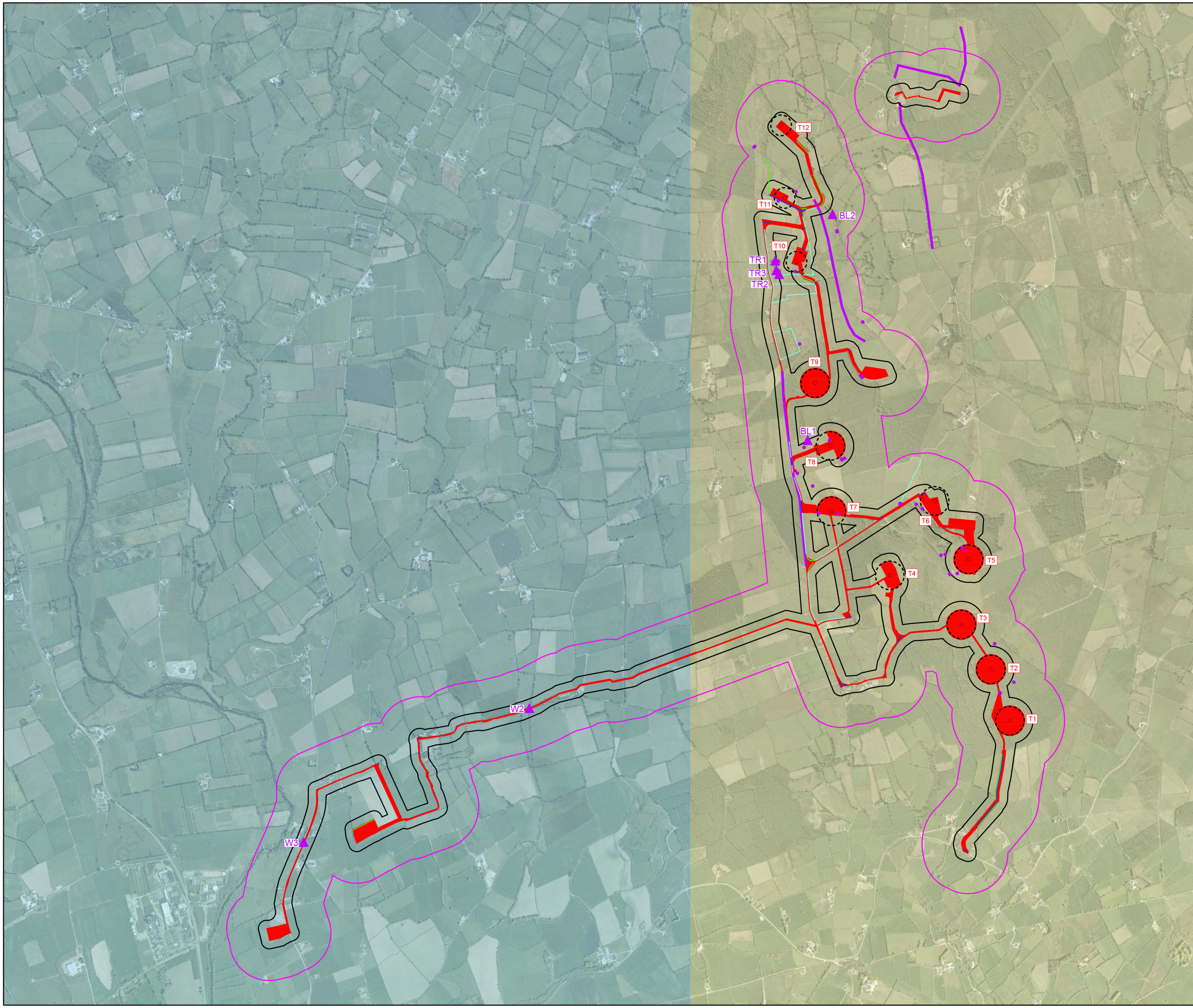
Figure 13.3 - Terrestrial Mammals



Legend:

- Ballynalacken Windfarm Construction Works Area
- 100m Study Area
- Otter Spraints
- Otter Survey Locations
- Badger
- Irish Stoat
- Red Squirrel
- Hedgehog
- Fox
- Camera Trap Locations
- EPA Waterbodies





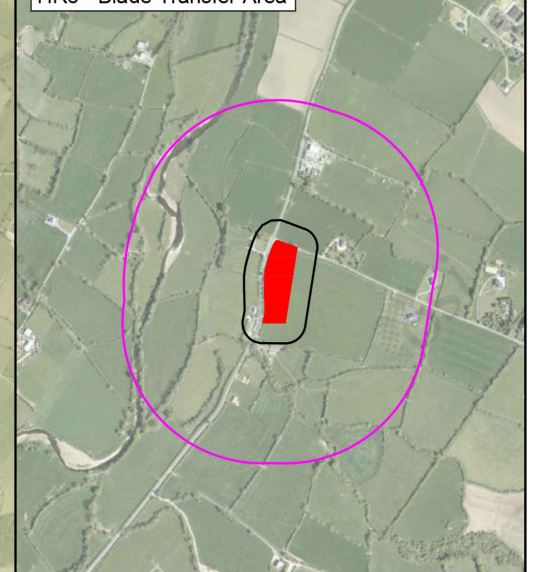
EIAR Chapter 13: Biodiversity

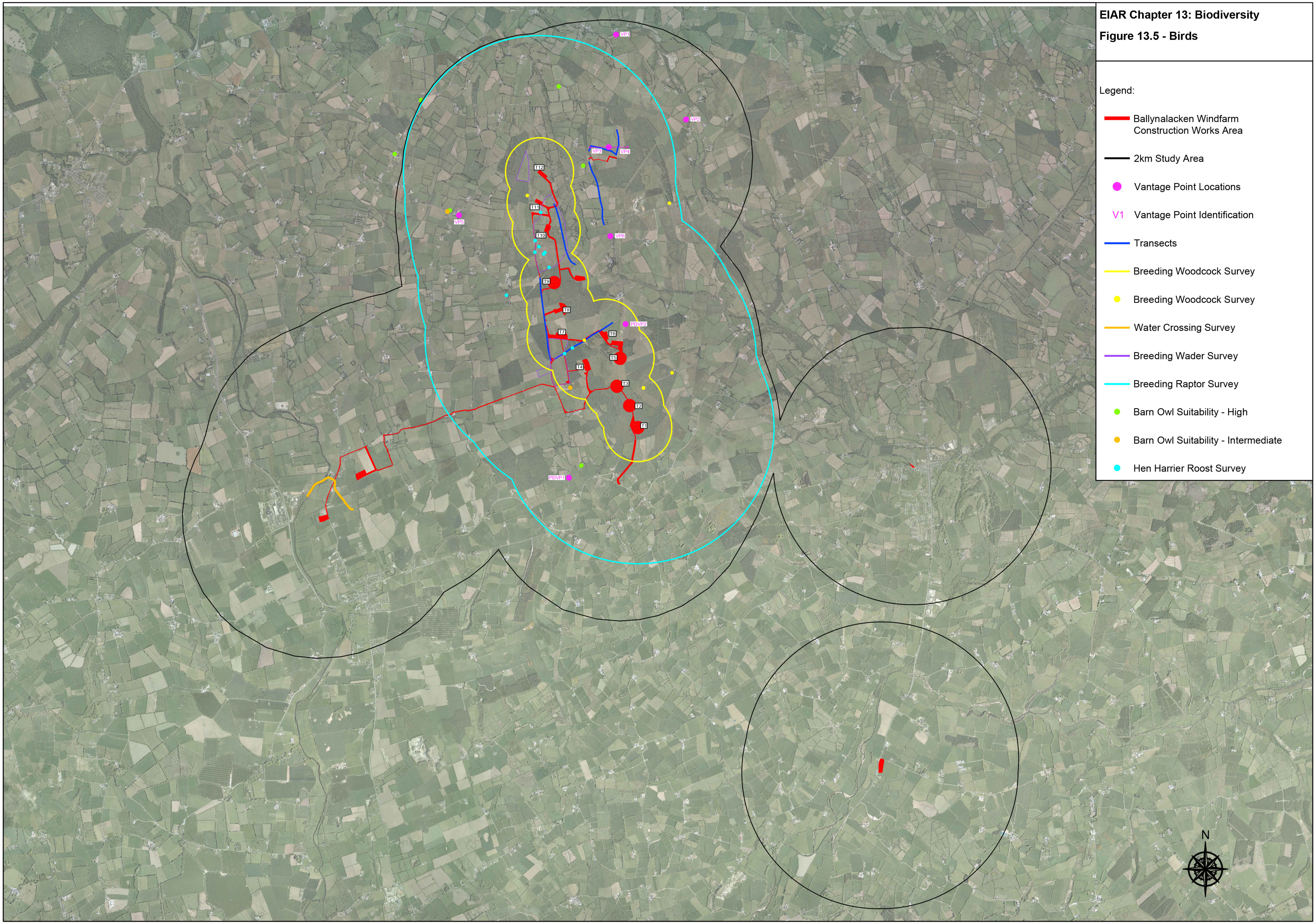
Figure 13.4 - Bats

Legend:

- Ballynalacken Windfarm Construction Works Area
- 50m Study Area
- 250m Study Area
- Preliminary Roost Assessment Locations
- BL1 Preliminary Roost Assessment Identification
- Static Detector Locations
- Bat Transect
- Bat Buffer Zone
- Hedgerow Removal
- Hedgerow Replant
- Hedgerow Improvement
- Habitat Suitability (21.3 - 28.1)
- Habitat Suitability (28.1 - 36.4)

HR8 - Blade Transfer Area



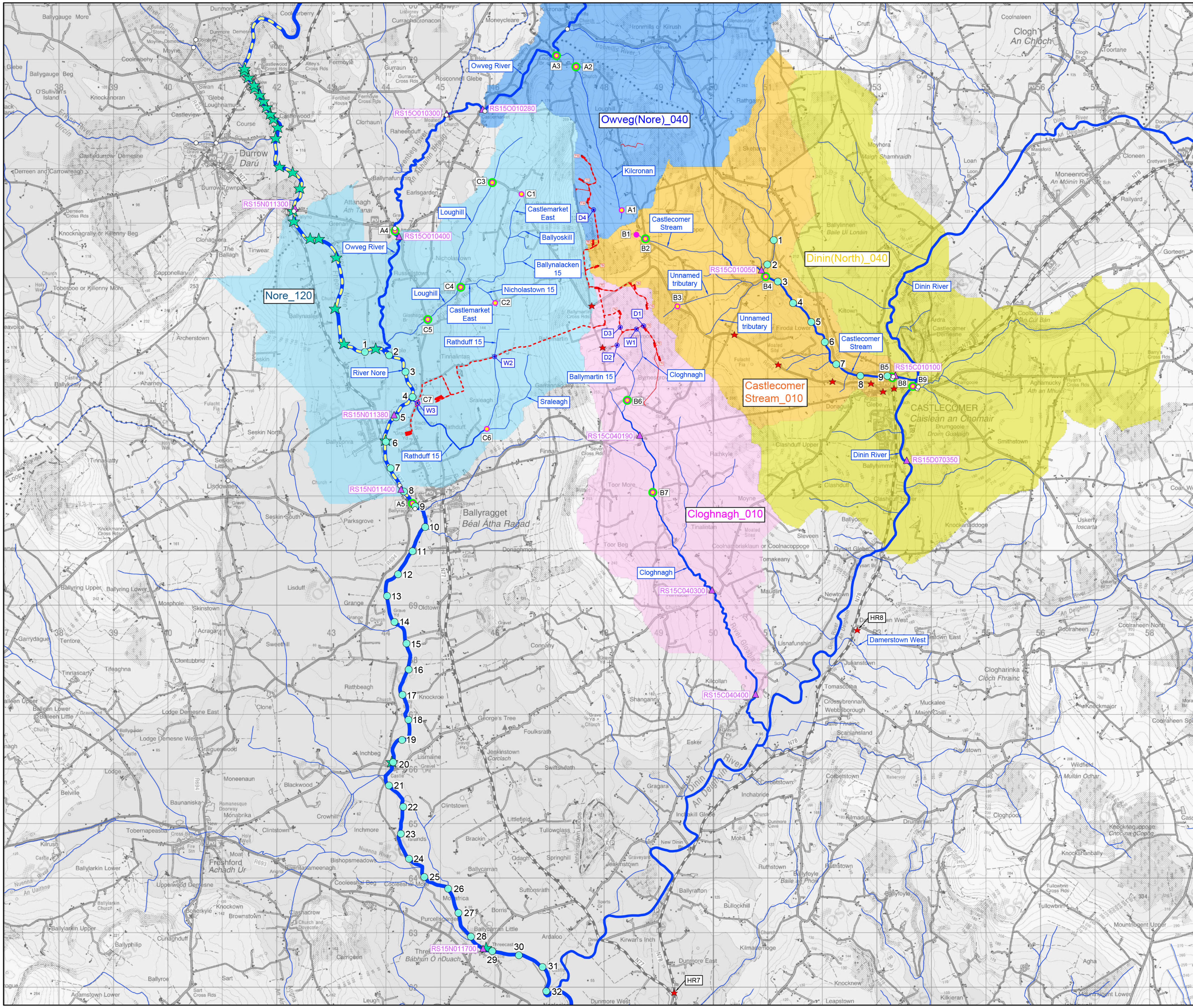


EIAR Chapter 13: Biodiversity

Figure 13.5 - Birds

Legend:

- Ballynalacken Windfarm Construction Works Area
- 2km Study Area
- Vantage Point Locations
- V1 Vantage Point Identification
- Transects
- Breeding Woodcock Survey
- Breeding Woodcock Survey
- Water Crossing Survey
- Breeding Wader Survey
- Breeding Raptor Survey
- Barn Owl Suitability - High
- Barn Owl Suitability - Intermediate
- Hen Harrier Roost Survey



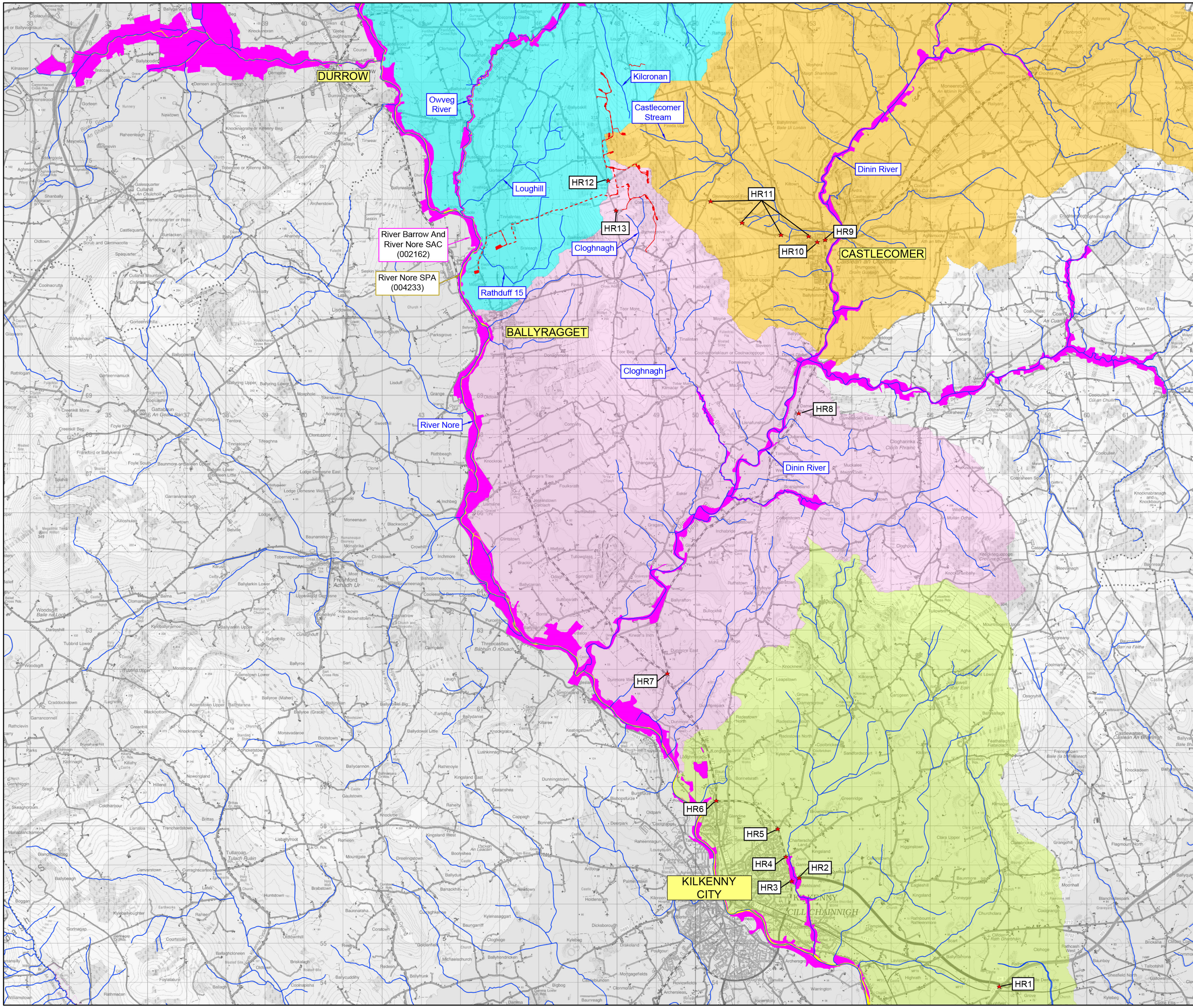
EIAR Chapter 13: Biodiversity

Figure 13.6 - Aquatic Habitats

Legend:

- Ballynalacken Windfarm Project
- Ballynalacken Windfarm Project (Haul Route Works)
- Watercourse Crossing
- Wet Drainage Channel Crossing
- EPA Waterbodies
- EPA Water Monitoring Station
- Aquatic Survey Sites
- Water Quality Sampling Locations
- Electro-Fishing Sites
- eDNA Sampling Locations
- Freshwater Pearl Mussel Records
- White-clawyed Crayfish Records
- Nore Pearl Mussel Distrubution *(DEHLG 2010)*
- Castlecomer Stream_010
- Cloghnagh_010
- Dinin(North)_040
- Nore_120
- Owveg(Nore)_040

Source:
-Environmental Protection Agency
-National Parks & Wildlife Service



EIAR Chapter 13: Biodiversity

Figure 13.7 - Designated Sites - (SPA and SAC)

Legend:

- Ballynalacken Windfarm Project
- Ballynalacken Windfarm Project (Haul Route Works)
- Special Area of Conservation (SAC)
- Special Protection Areas (SPA)
- EPA Waterbodies

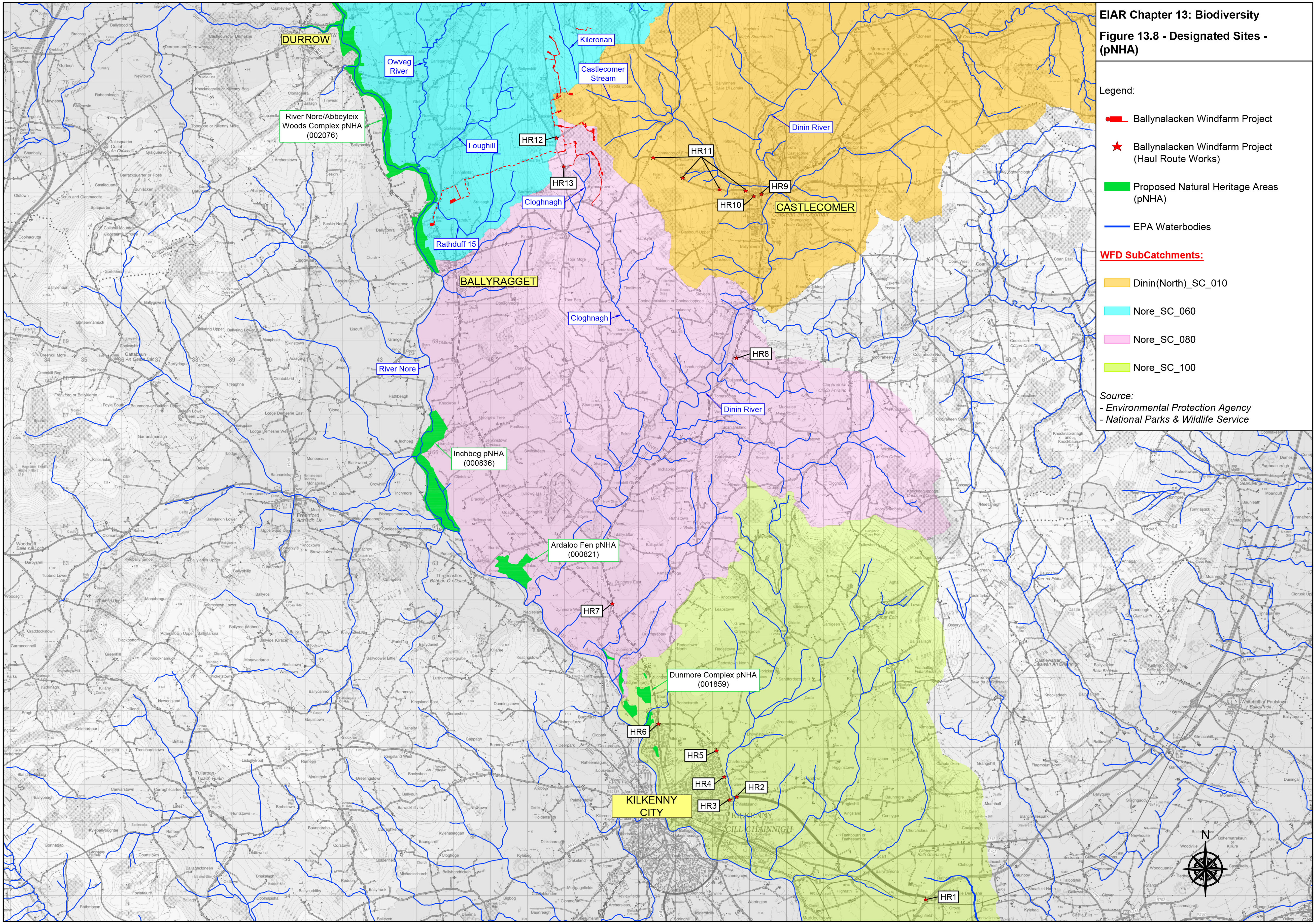
WFD SubCatchments:

- Dinin(North)_SC_010
- Nore_SC_060
- Nore_SC_080
- Nore_SC_100

Source:
- Environmental Protection Agency
- National Parks & Wildlife Service

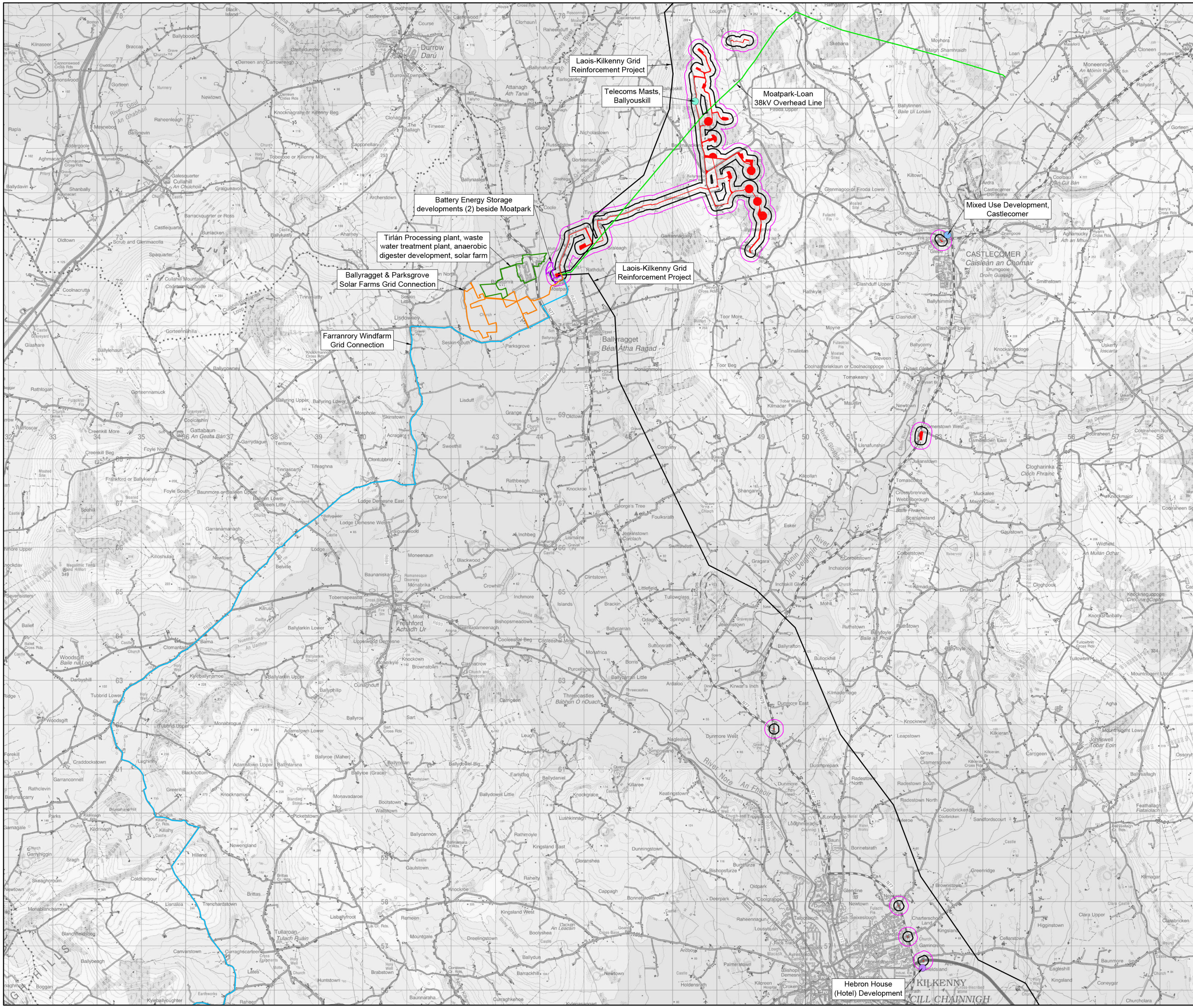
EIAR Chapter 13: Biodiversity

Figure 13.8 - Designated Sites - (pNHA)



EIAR Chapter 13: Biodiversity

Figure 13.9 - Other Projects within the Cumulative Study Areas



Legend:

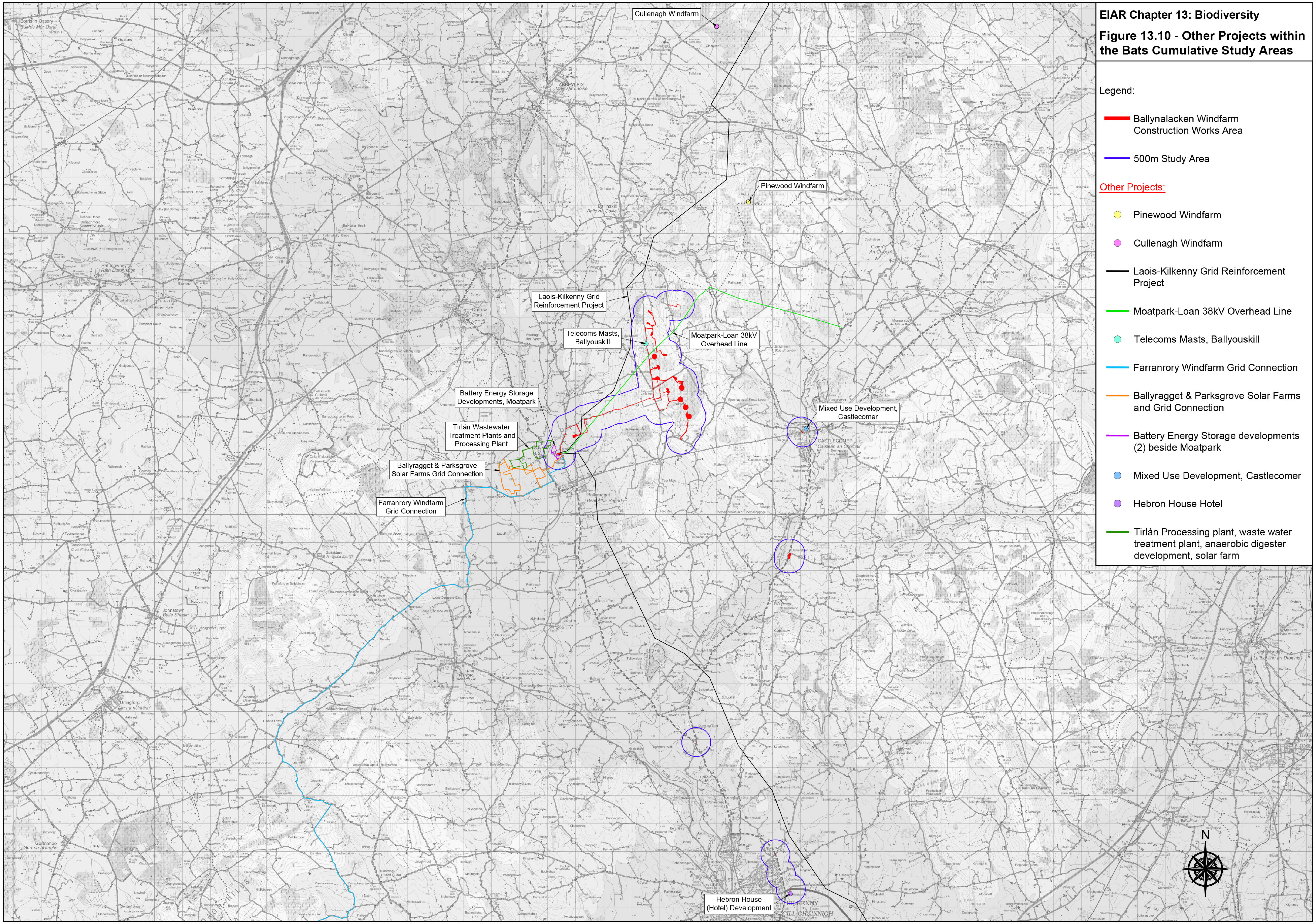
- Ballynalacken Windfarm Construction Works Area
- 100m Study Area
- 200m Study Area

Other Projects:

- Laois-Kilkenny Grid Reinforcement Project
- Moatpark-Loan 38kV Overhead Line
- Telecoms Masts, Ballyouskill
- Farranrory Windfarm Grid Connection
- Ballyragget & Parksgrove Solar Farms and Grid Connection
- Battery Energy Storage developments (2) beside Moatpark
- Mixed Use Development, Castlecomer
- Hebron House Hotel
- Tirlán Processing plant, waste water treatment plant, anaerobic digester development, solar farm

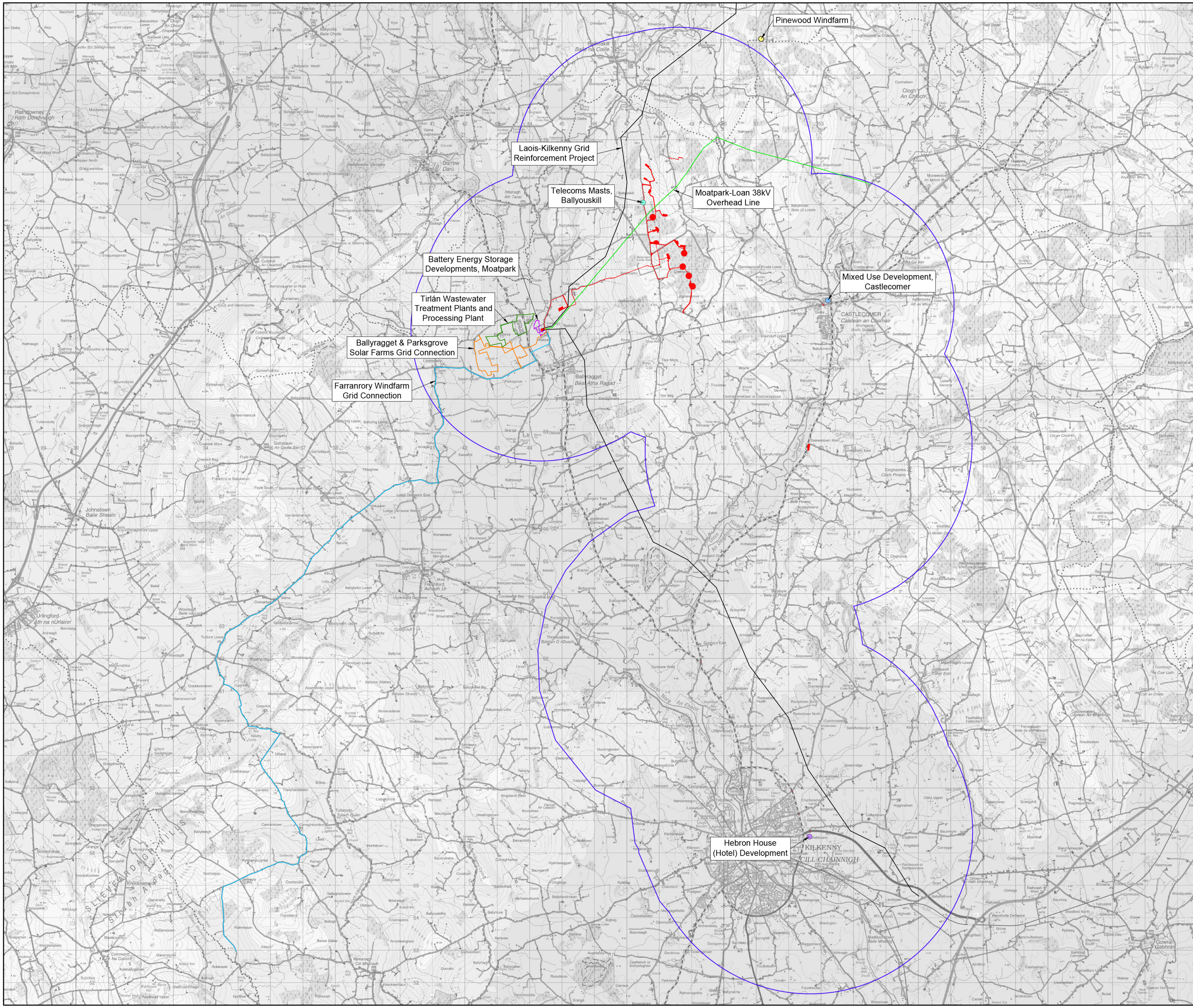
EIAR Chapter 13: Biodiversity

Figure 13.10 - Other Projects within the Bats Cumulative Study Areas



EIAR Chapter 13: Biodiversity

Figure 13.11 - Other Projects within the Birds Cumulative Study Areas



Legend:

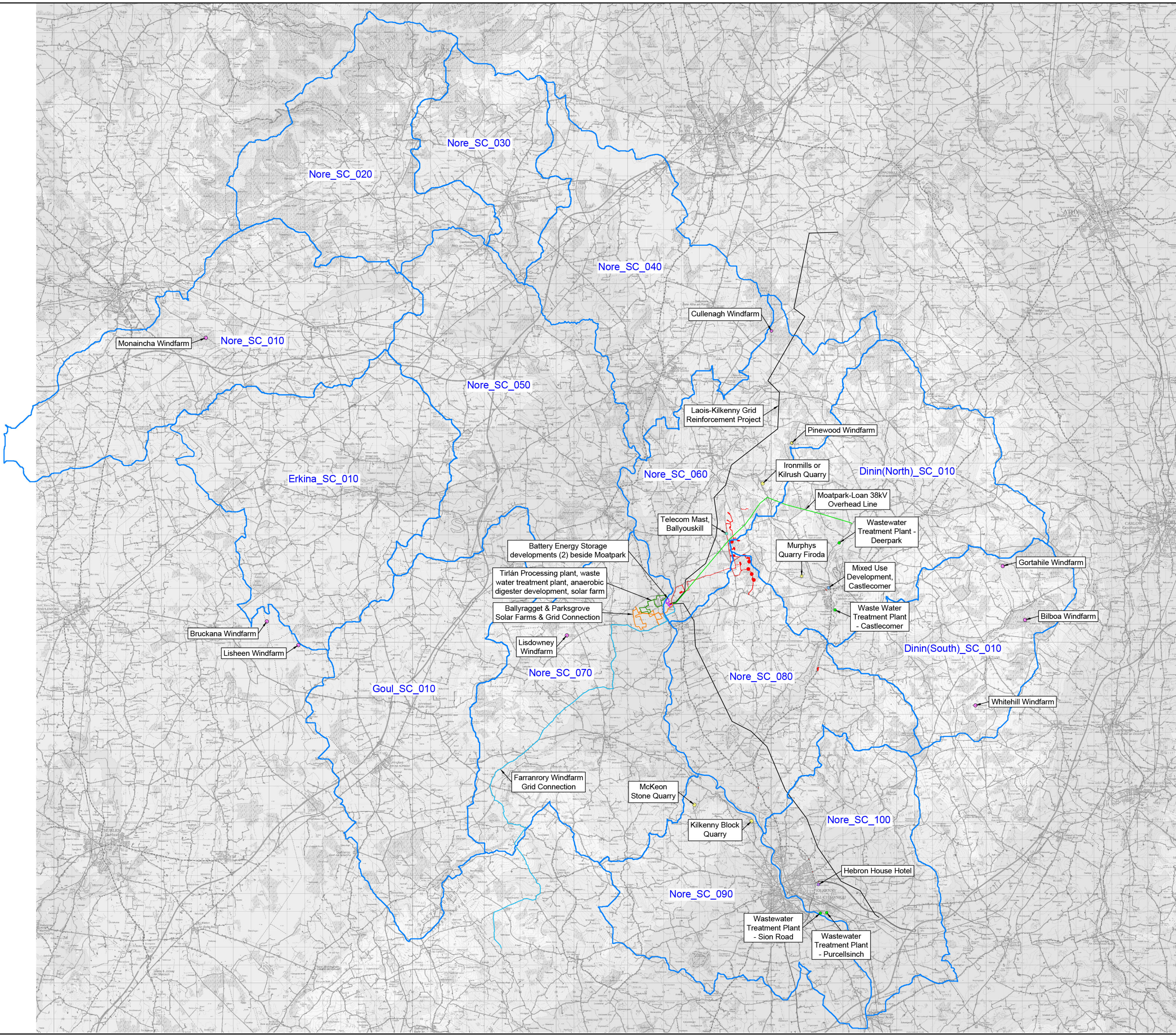
- Ballynalacken Windfarm Construction Works Area
- 4km Study Area

Other Projects:

- Pinewood Windfarm
- Laois-Kilkenny Grid Reinforcement Project
- Moatpark-Loan 38kV Overhead Line
- Telecoms Masts, Ballyouskill
- Farranrory Windfarm Grid Connection
- Ballyragget & Parksgrove Solar Farms and Grid Connection
- Battery Energy Storage developments (2) beside Moatpark
- Mixed Use Development, Castlecomer
- Hebron House Hotel
- Tirlán Processing plant, waste water treatment plant, anaerobic digester development, solar farm

EIAR Chapter 13: Biodiversity

Figure 13.12 - Other Projects within the Aquatic Habitats and Designated Sites Cumulative Study Areas



Legend:

- Ballynalacken Windfarm Construction Works Area
- Regional Cumulative Study Area - Subcatchments

Other Projects:

- Laois-Kilkenny Grid Reinforcement Project
- Moatpark -Loan 38kV Overhead Line
- Telecoms Masts, Ballyouskill
- Farranrory Windfarm Grid Connection
- Ballyragget & Parksgrove Solar Farm and Grid Connection
- Battery Energy Storage developments (2) beside Moatpark
- Mixed Use Development, Castlecomer
- Hebron House Hotel
- Other Windfarms
- Tirlán Processing plant, waste water treatment plant, anaerobic digester development, solar farm
- Quarries
- Wastewater Treatment Plants

Appendix 13.1: Species Records held by NBDC

Appendix to Chapter 13: Biodiversity

Appendix 13.1: Species Records held by NBDC

A13.1. National Biodiversity Data Centre Grid Squares

Provided below are the Data tables for the species recorded within the grid squares that overlap with the proposed Ballynalacken Windfarm Project (S46, S47, S55, S56 & S57).

- S47 – Ballynalacken Windfarm, Ballynalacken Grid Connection, Tinnalintan Substation & Internal Cable Link;
- S46, S55, S56 & S57 – Haul Route.

Records older than 50 years were omitted as this historical data is not likely to reflect the current receiving environment. This Data was accessed on 19th August 2024.

A13.1.1. S46

Species name	Record count	Date of last record	Designation
Amphibians			
Common Frog (*Rana temporaria*)	1	19/04/2014	Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Smooth Newt (*Lissotriton vulgaris*)	1	19/04/2014	Protected Species: Wildlife Acts
Birds			
Corn Crake (*Crex crex*)	1	31/07/1972 (record older than 50 years)	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Dunlin (*Calidris alpina*)	1	05/12/2022	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Golden Plover (*Pluvialis apricaria*)	5	25/01/2023	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Kingfisher (*Alcedo atthis*)	17	23/04/2021	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Little Egret (*Egretta garzetta*)	15	23/12/2022	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species

Whooper Swan (*Cygnus cygnus*)	8	25/01/2023	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Barn Owl (*Tyto alba*)	10	07/01/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Curlew (*Numenius arquata*)	15	23/12/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Kestrel (*Falco tinnunculus*)	15	31/05/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Lapwing (*Vanellus vanellus*)	19	25/01/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Meadow Pipit (*Anthus pratensis*)	9	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Shoveler (*Anas clypeata*)	1	09/02/2004	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Snipe (*Gallinago gallinago*)	5	15/04/2010	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Redshank (*Tringa totanus*)	2	05/12/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Redwing (*Turdus iliacus*)	7	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Woodcock (*Scolopax rusticola*)	1	31/07/1972 (record older than 50 years)	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Yellowhammer (*Emberiza citrinella*)	15	10/04/2019	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Barn Swallow (*Hirundo rustica*)	20	03/08/2018	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Black-headed Gull (*Larus ridibundus*)	7	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern – Amber List
Goldcrest (*Regulus regulus*)	21	18/03/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber list
Coot (*Fulica atra*)	7	25/01/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Cormorant (*Phalacrocorax carbo*)	3	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

House Martin (*Delichon urbicum*)	9	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Sparrow (*Passer domesticus*)	17	10/10/2012	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Lesser Black-backed Gull (*Larus fuscus*)	2	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Linnet (*Carduelis cannabina*)	7	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Mallard (*Anas platyrhynchos*)	20	25/01/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Mute Swan (*Cygnus olor*)	25	25/01/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Sand Martin (*Riparia riparia*)	46	23/04/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Sky Lark (*Alauda arvensis*)	7	31/07/1991	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Spotted Flycatcher (*Muscicapa striata*)	4	31/07/1991	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Starling (*Sturnus vulgaris*)	21	19/05/2013	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Stock Dove (*Columba oenas*)	6	20/03/2018	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Swift (*Apus apus*)	9	01/07/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Teal (*Anas crecca*)	5	25/01/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Tree Sparrow (*Passer montanus*)	2	09/06/2013	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Wigeon (*Anas penelope*)	4	25/01/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Willow Warbler (*Phylloscopus trochilus*)	15	23/04/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Buzzard (*Buteo buteo*)	18	02/05/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Green List
Sparrowhawk (*Accipiter nisus*)	7	10/04/2018	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Green List
Invertebrates			

Freshwater Pearl Mussel (*Margaritifera (Margaritifera) margaritifera*)	3	05/09/2007	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Freshwater White-clawed Crayfish (*Austropotamobius pallipes*)	6	31/12/2020	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Terrestrial Mammals			
Otter (*Lutra lutra*)	4	16/04/2013	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Pine Marten (*Martes martes*)	8	23/08/2021	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Badger (*Meles meles*)	132	31/12/2016	Protected Species: Wildlife Acts
Hedgehog (*Erinaceus europaeus*)	17	01/08/2022	Protected Species: Wildlife Acts
Irish Hare (*Lepus timidus subsp. hibernicus*)	2	22/11/2015	Protected Species: Wildlife Acts
Pygmy Shrew (*Sorex minutus*)	1	02/08/2012	Protected Species: Wildlife Acts
Red Squirrel (*Sciurus vulgaris*)	4	18/01/2023	Protected Species: Wildlife Acts
Red Fox (*Vulpes vulpes*)	4	12/06/2018	
Wood Mouse (*Apodemus sylvaticus*)	1	07/11/2010	
Bats			
Common Pipistrelle (*Pipistrellus pipistrellus sensu stricto*)	3	11/08/2018	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Brown Long-eared Bat (*Plecotus auritus*)	2	11/09/2018	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Daubenton's Bat (*Myotis daubentonii*)	230	18/08/2021	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Leisler’s Bat (*Nyctalus leisleri*)	2	10/08/2018	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Natterer's Bat (*Myotis nattereri*)	2	11/09/2018	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts

Soprano Pipistrelle (*Pipistrellus pygmaeus*)	4	10/08/2018	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Invasive Mammals			
American Mink (*Mustela vison*)	2	10/10/2012	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Brown Rat (*Rattus norvegicus*)	3	13/10/2013	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Grey Squirrel (*Sciurus carolinensis*)	11	01/08/2017	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> EU Regulation No. 1143/2014 || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Sika Deer (*Cervus nippon*)	1	15/10/2014	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland) || Protected Species: Wildlife Acts
Bank Vole (*Myodes glareolus*)	1	07/11/2010	Invasive Species: Invasive Species >> Medium Impact Invasive Species
European Rabbit (*Oryctolagus cuniculus*)	3	19/05/2013	Invasive Species: Invasive Species >> Medium Impact Invasive Species
Invasive Plants			
Canadian Waterweed (*Elodea canadensis*)	4	31/12/1999	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Giant Hogweed (*Heracleum mantegazzianum*)	1	01/06/2021	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Indian Balsam (*Impatiens glandulifera*)	3	23/05/2023	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Japanese Knotweed (*Fallopia japonica*)	2	26/06/2015	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Cherry Laurel (*Prunus laurocerasus*)	3	02/08/2012	Invasive Species: Invasive Species >> High Impact Invasive Species
Invasive Fungi			
Aphanomyces astaci (Crayfish Plague)	2	31/12/2020	Invasive Species: Invasive Species >> High Impact Invasive Species

A13.1.2. S47

Species name	Record count	Date of last record	Designation
Amphibians			
Common Frog	13	15/03/2011	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Smooth Newt	1	30/04/1972 (record older than 50 years)	Protected Species: Wildlife Acts
Birds			
Bar-tailed Godwit (*Limosa lapponica*)	1	31/12/2001	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Corn Crake	1	31/07/1972 (record older than 50 years)	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Golden Plover	6	19/12/2022	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Hen Harrier (*Circus cyaneus*)	1	31/07/1972 (record older than 50 years)	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Whooper Swan	1	31/12/2001	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Kingfisher	23	12/06/2022	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Peregrine Falcon (*Falco peregrinus*)	1	03/03/2022	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern – Green List
Little Egret	10	22/03/2023	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern – Green List

Grey Partridge (*Perdix perdix*)	1	31/07/1972 (record older than 50 years)	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Curlew	8	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
White-tailed Eagle (*Haliaeetus albicilla*)	1	31/12/1937	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Lapwing	11	19/12/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Kestrel	13	16/09/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Barn Owl	2	11/08/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Quail (*Coturnix coturnix*)	1	31/07/1991	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Yellowhammer	22	11/12/2019	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Meadow Pipit	28	29/03/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Redwing	12	04/03/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Black-headed Gull	9	13/11/2014	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Barn Swallow	44	12/10/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Sandpiper (*Actitis hypoleucos*)	2	14/04/2010	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

Coot	3	31/12/2001	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Goldcrest	32	04/03/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Grasshopper Warbler (*Locustella naevia*)	1	31/07/1972 (record older than 50 years)	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Herring Gull (*Larus argentatus*)	2	12/06/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Martin	24	15/06/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Sparrow	32	12/06/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Lesser Black-backed Gull	3	15/06/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Linnet	22	29/03/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Mallard	35	29/03/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Mute Swan	15	19/12/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Sand Martin	65	22/03/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
SkyLark	21	08/06/2015	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Snipe	17	29/03/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Spotted Flycatcher	19	15/06/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Starling	31	15/06/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

Swift	12	01/08/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Teal	4	04/05/2010	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Tree Sparrow	3	27/11/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Wigeon	1	31/12/2001	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Willow Warbler	28	08/05/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Woodcock	3	13/03/2018	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Buzzard	17	15/06/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Green List
Long-eared Owl (*Asio otus*)	5	14/06/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Green List
Raven (*Corvus corax*)	14	12/06/2022	Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Green List
Sparrowhawk	9	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Green List
Invertebrates			
Freshwater White-clawed Crayfish	10	31/12/2020	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Freshwater Pearl Mussel	1	04/09/2007	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts

Desmoulin's Whorl Snail (*Vertigo (Vertigo) moulinsiana*)	6	03/09/1998	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: Wildlife Acts || Threatened Species: Endangered
Marsh Fritillary (*Euphydryas aurinia*)	16	27/05/2023	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Threatened Species: Vulnerable
Terrestrial Mammals			
European Otter	6	09/10/2015	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Pine Marten	7	15/04/2021	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Eurasian Badger	86	17/06/2018	Protected Species: Wildlife Acts
Eurasian Pygmy Shrew	2	03/08/2012	Protected Species: Wildlife Acts
Eurasian Red Squirrel	7	05/12/2017	Protected Species: Wildlife Acts
West European Hedgehog	12	03/04/2023	Protected Species: Wildlife Acts
Irish Hare	4	21/04/2021	Protected Species: Wildlife Acts
Red Fox	5	31/05/2017	
Wood Mouse	1	03/08/2012	
Bats			

Brown Long-eared Bat	1	05/09/2018	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Daubenton's Bat	110	14/06/2022	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Leisler's Bat	7	05/09/2018	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Natterer's Bat	1	02/08/2007	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Pipistrelle (*Pipistrellus pipistrellus sensu lato*)	1	08/11/2021	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Soprano Pipistrelle	8	05/09/2018	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Common Pipistrelle	8	05/09/2018	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Invasive Mammals			
American Mink	1	06/05/1991	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Bank Vole	2	05/01/2018	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species

European Rabbit	5	01/04/2016	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species
Greater White-toothed Shrew (*Crocidura russula*)	1	03/08/2012	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species
Invasive Plants			
Japanese Knotweed	1	13/07/2015	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Cherry Laurel	8	01/08/2023	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species
Invasive Fungi			
Aphanomyces astaci (Crayfish Plague)	1	31/12/2020	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species

A13.1.3. S55

Species name	Record count	Date of last record	Designation
Amphibians			
Common Frog	11	22/03/2023	Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Birds			
Corn Crake	1	31/07/1972 (record older than 50 years)	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Golden Plover	2	09/11/2020	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Kingfisher	22	28/03/2023	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Whooper Swan	1	29/02/1984	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Little Egret	4	01/01/2017	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species
Peregrine Falcon	2	07/09/2017	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species
Barn Owl	16	17/03/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Kestrel	20	03/04/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Lapwing	3	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Meadow Pipit	9	21/09/2013	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Snipe	5	25/01/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Twite (*Carduelis flavirostris*)	2	31/07/1991	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Woodcock	4	06/12/2013	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List

Yellowhammer	25	25/06/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Barn Swallow	57	20/04/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Black-headed Gull	7	15/12/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Coot	10	27/01/2016	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Cormorant	7	10/12/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Goldcrest	25	11/01/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Great Black-backed Gull (*Larus marinus*)	1	12/12/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Herring Gull	1	29/02/1984	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Martin	16	28/06/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Sparrow	35	14/07/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Lesser Black-backed Gull	2	12/12/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Linnet	17	25/01/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Mallard	48	31/03/2020	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Mute Swan	20	15/02/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Northern Wheateater (*Oenanthe oenanthe*)	3	31/07/1991	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Pochard (*Aythya ferina*)	2	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Teal	3	07/01/2013	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Tree Sparrow	1	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

Tufted Duck (*Aythya fuligula*)	2	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Sand Martin	22	13/05/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Sky Lark	7	02/06/2013	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Spotted Flycatcher	5	05/07/2012	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Starling	36	28/03/2018	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Stock Dove	8	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Swift	43	04/06/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Willow Warbler	29	28/04/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Buzzard	30	04/04/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Green List
Sparrowhawk	8	25/03/2020	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Green List
Invertebrates			
Freshwater White-clawed Crayfish	4	31/12/2020	Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Terrestrial Mammals			
Otter	20	12/05/2018	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Pine Marten	4	05/11/2020	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Badger	175	27/03/2023	Protected Species: Wildlife Acts
Pygmy Shrew	5	23/12/2017	Protected Species: Wildlife Acts
Red Squirrel	4	07/01/2023	Protected Species: Wildlife Acts
Hedgehog	87	20/09/2023	Protected Species: Wildlife Acts

Irish Hare	12	06/11/2020	
Red Fox	18	28/08/2018	
Wood Mouse	4	05/08/2017	
Bats			
Brown Long-eared Bat	5	11/09/2007	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Common Pipistrelle	14	03/09/2016	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Daubenton's Bat	187	26/08/2021	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Leisler's Bat	11	26/03/2022	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Pipistrelle	3	03/09/2016	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Soprano Pipistrelle	15	10/09/2016	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Invasive Mammals			
Grey Squirrel	35	18/08/2018	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> EU Regulation No. 1143/2014 || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
American Mink	2	31/01/1992	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Brown Rat	23	31/08/2017	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Feral Ferret (*Mustela furo*)	1	31/03/2007	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species
Bank Vole	4	18/08/2012	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species
European Rabbit	27	31/05/2018	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species
Greater White-toothed Shrew	6	07/04/2020	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species

Invasive Plants			
Canadian Waterweed	5	06/09/2007	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Giant Hogweed	13	22/05/2023	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Giant-rhubarb	2	09/08/2017	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Indian Balsam	26	27/06/2023	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Japanese Knotweed	4	13/06/2020	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Nuttall's Waterweed (*Elodea nuttallii*)	1	14/07/2012	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
American Skunk-cabbage (*Lysichiton americanus*)	3	31/07/2022	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species || Invasive Species: Invasive Species >> EU Regulation No. 1143/2014 || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Three-cornered Garlic (*Allium triquetrum*)	2	18/04/2023	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Cherry Laurel	3	31/07/2022	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species

A13.1.4. S56

Species name	Record count	Date of last record	Designation
Amphibians			
Common Frog	7	07/03/2023	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Smooth Newt	3	15/07/2012	Protected Species: Wildlife Acts
Birds			
Barn Owl	2	05/02/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Curlew	5	31/07/1991	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Kestrel	11	13/07/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Lapwing	3	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Meadow Pipit	23	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Redwing	14	16/02/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Snipe	10	11/04/2015	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Swift	3	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Yellowhammer	14	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List

Little Egret	1	02/09/2016	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species
Barn Swallow	32	28/08/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Black-headed Gull	2	31/07/1991	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Grasshopper Warbler	4	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Greenfinch (*Carduelis chloris*)	27	23/05/2015	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Goldcrest	29	16/02/2014	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Martin	23	11/04/2016	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Sparrow	30	23/05/2015	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Linnet	20	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Mallard	3	31/12/2011	Protected Species: Wildlife Acts || Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Mute Swan	3	30/04/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Sand Martin	10	28/08/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Sky Lark	18	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Spotted Flycatcher	8	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Starling	29	16/02/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

Stock Dove	3	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Willow Warbler	33	30/04/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Buzzard	8	22/04/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Green List
Eurasian Sparrowhawk	3	01/07/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Green List
Invertebrates			
Marsh Fritillary	1	31/12/2010	Protected Species: EU Habitats Directive >> Annex II || Threatened Species: Vulnerable
Terrestrial Mammals			
Otter	10	09/10/2015	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Pine Marten	7	26/04/2023	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Badger	102	06/05/2018	Protected Species: Wildlife Acts
Pygmy Shrew	1	03/08/2012	Protected Species: Wildlife Acts
Red Squirrel	8	18/09/2018	Protected Species: Wildlife Acts
Hedgehog	6	20/08/2023	Protected Species: Wildlife Acts
Irish Hare	2	03/09/2014	Protected Species: Wildlife Acts
Irish Stoat (*Mustela erminea subsp. hibernica*)	2	28/01/2014	Protected Species: Wildlife Acts
Red Fox	4	16/08/2017	
Bats			
Brown Long-eared Bat	1	24/08/2003	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Common Pipistrelle	9	04/08/2019	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Daubenton's Bat	44	04/08/2019	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts

Leisler's Bat	5	04/08/2019	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Natterer's Bat	2	02/07/2008	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Soprano Pipistrelle	9	04/08/2019	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Invasive Mammals			
American Mink	3	15/08/2015	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Brown Rat	1	24/04/2023	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Grey Squirrel	3	31/12/2012	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> EU Regulation No. 1143/2014 || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Rabbit	3	31/12/2007	Invasive Species: Invasive Species >> Medium Impact Invasive Species
Invasive Invertebrates			
Harlequin Ladybird (*Harmonia axyridis*)	1	13/06/2022	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Invasive Plants			
Himalayan Knotweed (*Persicaria wallichii*)	1	16/06/2015	Invasive Species: Invasive Species >> Medium Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Indian Balsam	12	22/09/2023	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)

A13.1.5. S57

Species name	Record count	Date of last record	Designation
Amphibians			
Common Frog	29	25/03/2023	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Smooth Newt	8	02/04/2023	Protected Species: Wildlife Acts
Reptile			
Common Lizard (*Zootoca vivipara*)	1	19/06/2011	Protected Species: Wildlife Acts
Birds			
Corn Crake	1	31/07/1972 (record older than 50 years)	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Golden Plover	1	29/02/1984	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Kingfisher	7	04/05/2020	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Merlin (*Falco columbarius*)	1	31/12/2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Little Egret	8	02/11/2017	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species
Peregrine Falcon	2	20/07/2021	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species
Greylag Goose (*Anser anser*)	4	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List || Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland) ||
Barn Owl	6	22/08/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Curlew	5	31/07/1991	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Kestrel	10	13/04/2020	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List

Lapwing	6	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Meadow Pipit	8	15/03/2016	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Redwing	11	16/02/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Snipe	12	05/05/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Swift	24	04/06/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Woodcock	16	27/04/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Yellowhammer	10	20/07/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Barn Swallow	26	27/04/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Black-headed Gull	4	31/07/1991	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Coot	2	29/02/1984	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Cormorant	3	01/04/2015	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Grasshopper Warbler	4	17/05/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Greenfinch	15	29/04/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Martin	26	30/04/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Sparrow	16	08/01/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Linnet	10	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Mallard	17	07/03/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Mute Swan	6	27/06/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

Sand Martin	7	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Starling	22	06/06/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Sky Lark	9	08/04/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Spotted Flycatcher	14	20/07/2022	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Stock Dove	8	31/07/1991	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Teal	4	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Whinchat (*Saxicola rubetra*)	1	31/07/1991	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Willow Warbler	33	05/05/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Buzzard	49	05/05/2023	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Green List
Sparrowhawk	13	26/02/2021	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Green List
Invertebrates			
Freshwater White-clawed Crayfish	6	13/09/2010	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Marsh Fritillary	12	16/03/2020	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Threatened Species: Vulnerable
Terrestrial Mammals			
Otter	13	11/01/2023	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Pine Marten	15	23/03/2023	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Badger	86	31/12/2015	Protected Species: Wildlife Acts
Pygmy Shrew	6	25/01/2017	Protected Species: Wildlife Acts
Red Squirrel	18	04/10/2018	Protected Species: Wildlife Acts
Irish Hare	13	11/06/2022	Protected Species: Wildlife Acts
Irish Stoat	1	03/04/2013	Protected Species: Wildlife Acts
Hedgehog	30	14/12/2023	Protected Species: Wildlife Acts

Red Fox	6	01/04/2023	
Wood Mouse	4	26/10/2016	
Bats			
Brown Long-eared Bat	2	06/07/2009	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Common Pipistrelle	6	29/08/2019	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Daubenton's Bat	6	17/05/2022	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Leisler’s Bat	5	29/08/2019	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Soprano Pipistrelle	8	29/08/2019	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Invasive Mammals			
Grey Squirrel	2	31/12/2012	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> EU Regulation No. 1143/2014 || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
American Mink	2	31/03/2015	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Brown Rat	6	03/04/2023	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Fallow Deer (*Dama dama*)	1	27/05/2018	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland) || Protected Species: Wildlife Acts
House Mouse (*Mus musculus*)	2	11/05/2018	Invasive Species: Invasive Species >> High Impact Invasive Species
European Rabbit	4	07/12/2013	Invasive Species: Invasive Species >> Medium Impact Invasive Species
Bank Vole	2	04/08/2012	Invasive Species: Invasive Species >> Medium Impact Invasive Species
Greater White-toothed Shrew	3	17/01/2023	Invasive Species: Invasive Species >> Medium Impact Invasive Species
Invasive Plants			
Canadian Waterweed	3	07/07/2015	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Giant-rhubarb	1	21/08/2021	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Indian Balsam	1	23/06/2022	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)

Japanese Knotweed	4	17/07/2023	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Rhododendron ponticum	4	25/03/2023	Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Salmonberry (*Rubus spectabilis*)	1	19/08/2022	Invasive Species: Invasive Species >> Medium Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Cherry Laurel	6	19/08/2022	Invasive Species: Invasive Species >> High Impact Invasive Species

Appendix 13.2: Mammal Survey Results

Appendix to Chapter 13: Biodiversity

Appendix 13.2: Mammal Survey Results

A13.2. Mammal Survey Results

Provided below is the Data table for the species recorded by Mammal surveys at the proposed Ballynalacken Windfarm Project in 2021, 2022 and 2023. This data is addressed in Section EIAR 13.3.4 of Chapter 13.

For camera deployment dates, survey methodology, see Appendix 13.8 to the Biodiversity Chapter. Locations of species are provided in Figure 13.3.

A13.2.1. Camera Trap Results

Survey	Surveyor	Date Deployed	Trap No.	Camera Coordinates (ITM)	Species	No. of individuals
Mammal Camera Trap	MD	17/06/2021	1	647929 675853	Fox	1
Mammal Camera Trap	MD	17/06/2021	2	648052 675653	Pine Marten	1
Mammal Camera Trap	MD	17/06/2021	5	647418 677173	Jay	1
Mammal Camera Trap	ML	11/01/2022	Camera 1	647343 677218	Blackbird	1
Mammal Camera Trap		11/01/2022	Camera 2	647352 677168	Nil Sightings	
Mammal Camera Trap		11/01/2022	Camera 3	647366 675253	Nil Sightings	
Mammal Camera Trap		13/01/2022	Camera 4	647469 676020	Fox	1
Mammal Camera Trap		13/01/2022	Camera 5	647561 675824	Nil Sightings	
Mammal Camera Trap	EM	16/11/2022	CT2	647978 674733	Nil Sightings	
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Field mouse	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Field mouse	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Field mouse	1
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Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1
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Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1
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Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1
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Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1

Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Field mouse	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Field mouse	1
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Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Field mouse	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1
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Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1
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Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Fox	1

Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Field mouse	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Field mouse	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Field mouse	1
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Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1
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Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Field mouse	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Field mouse	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Field mouse	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1
Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1

Mammal Camera Trap	EM	16/11/2022	CT4	647320 673860	Brown rat	1
Mammal Camera Trap	EM	16/11/2022	CT5	644249 672293	Dog	1
Mammal Camera Trap	EM	16/11/2022	CT5	644249 672293	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT5	644249 672293	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT6	648918 673994	Nil Sightings	
Mammal Camera Trap	EM	16/11/2022	CT7	648590 674621	Nil Sightings	
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1
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Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1

Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1
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Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1

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Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1

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Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1
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Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1

Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Fox	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1
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Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Pine Martin	1
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Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Badger	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Badger	1
Mammal Camera Trap	EM	16/11/2022	CT8	647340 677120	Badger	1
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Mammal Camera Trap	EM	16/11/2022	CT9	647673 675581	Field mouse	1
Mammal Camera Trap	EM	16/11/2022	CT9	647673 675581	Pine Martin	1
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Mammal Camera Trap	EM	16/11/2022	CT9	647673 675581	Fox	1

A13.2.2. Mammal Walkover Results

Date	Field Sign	Species	ITM	Notes
17/06/2021	Hair and track	Badger	648897, 678320	Badger hair on barbed wire. Slight track leading into forestry.
17/06/2021	Scat	Badger	648054, 675616	Badger scat in conifer forest
17/06/2021	Carcass	Fox	648298, 677665	Fox carcass
17/06/2021	Scat	Fox	648393, 677465	Fox scat
17/06/2021	Scat	Fox	647788, 675026	Fox scat
17/06/2021	Scat	Fox	647354, 677005	Fox scat on roadside near conifer forest
17/06/2021	Burrow/Den	Fox/Rabbit	647770, 675886	potential Fox/Rabbit den or burrow at base of tree in conifer forest
14/12/2021	Burrow/Food signs	Mice/Squirrel	647681.98, 675270.886	
14/12/2021	Spraint	Otter	647529.342, 676072.444	
14/12/2021	Burrow	Rabbit	648259, 678332	Rabbit burrow. No sign of recent use by Rabbit. Rat droppings at and inside entrance.
14/12/2021	Droppings	Rat	648259, 678332	Rabbit burrow. No sign of recent use by Rabbit. Rat droppings at and inside entrance.
14/12/2021	Track	Small Mammal	648559, 678907	Tracks into Gorse stand
14/12/2021	Scat	Stoat	647713.36, 675102.518	
14/12/2021	Scat	Stoat	647682.082, 675260.438	
14/12/2021	Scat	Stoat	647553.654, 676342.416	
10/01/2022	Scat	Hedgehog	647338, 677266	
10/01/2022	Spraint	Otter	647334.596, 677216.423	
10/01/2022	Spraint	Otter	647296.886, 677469.742	
10/01/2022	Scat	Hedgehog	647338, 677266	
15/11/2022	Hole	Stoat	646684, 673606	Possible Stoat den, or rat
15/11/2022	Mammal Run	Fox	644304, 672313	probably fox, seen on CT5 (Photo ID 11190016)
16/11/2022	Mammal Run		648629, 674458	possible fox/badger
16/11/2022	Mammal Run		647928, 675125	possible fox/badger
24/11/2022		Nil Sightings		
24/08/2023		Nil Sightings		

A13.2.3. Otter Watercourse Survey Results

Date	Survey	Surveyor	Species	Field Sign	ITM	Notes
22/04/2022	Otter	CK	Nil Sightings	Nil Sightings	647679 674522	Drain under road. No evidence of otter activity
22/04/2022	Otter	CK	Nil Sightings	Nil Sightings	647179 675244	Roadside drain by gate. No evidence
22/04/2022	Otter	CK	Nil Sightings	Nil Sightings	646664 674938	Roadside drain by gate. No evidence
22/04/2022	Otter	CK	Nil Sightings	Nil Sightings	646271 674693	Roadside drain by gate. Stream crosses underneath road. No evidence.
22/04/2022	Otter	CK	Nil Sightings	Nil Sightings	645797 674568	Mapped grid connection crossing point. Stream crossing road. No evidence.
22/04/2022	Otter	CK	Nil Sightings	Nil Sightings	644531 672795	Lower map crossing. No evidence.
29/06/2023	Otter	KME	Nil Sightings	Nil Sightings	N/A	W1
24/08/2023	Otter	KME	Nil Sightings	Nil Sightings	N/A	W2
24/08/2023	Otter	KME	Nil Sightings	Nil Sightings	N/A	W3
11/03/2025	Otter	CM	Nil Sightings	Nil Sightings	N/A	D1 and Kilcronan stream

Appendix 13.3: Bat Survey Results

Appendix to Chapter 13: Biodiversity

Appendix 13.3: Bat Survey Results

A13.3. Bat Survey Results

Provided below are the data tables for the surveys conducted to provide the Bat baseline for the Ballynalacken Windfarm Project addressed in Section EIAR 13.3.5 of Chapter 13: Biodiversity.

Surveys conducted included:

- Bat Dusk Transects in 2021;
- Static Detectors in 2021 and 2022;
- Roost Surveys were conducted in 2021.

A13.3.1. Bat Roost Results

TR1 Roost Survey Results

TR1			
Dusk			
Date	**Species**	**Behaviour**	**Occurrence (no. of flight passes)**
23rd Aug 2021	Common Pipistrelle	Commuting	0
		Foraging	20
		Emerging	1
	Soprano Pipistrelle	Commuting	0
		Foraging	26
		Emerging	2
	Leisler's Bat	Commuting	0
		Foraging	6
		Emerging	0
	Myotis Sp.	Commuting	0
		Foraging	3
		Emerging	0
6th Sep 2021	Common Pipistrelle	Commuting	1
		Foraging	0
		Emerging	0
	Soprano Pipistrelle	Commuting	1
		Foraging	21
		Emerging	0
	Natterers' Bat	Commuting	0
		Foraging	21
		Emerging	0
9th Sep 2021	Common Pipistrelle	Commuting	0
		Foraging	22
		Emerging	0
	Soprano Pipistrelle	Commuting	0
		Foraging	54
		Emerging	0
20th Sep 2021	Common Pipistrelle	Commuting	0
		Foraging	16
		Emerging	0
	Soprano Pipistrelle	Commuting	0
		Foraging	15
		Emerging	0

TR1			
Dawn			
Date	**Species**	**Behaviour**	**Occurrence (no. of flight passes)**
14th Sep 2021	Common Pipistrelle	Commuting	0
		Foraging	31
		Emerging	0
	Soprano Pipistrelle	Commuting	0
		Foraging	36
		Emerging	0

TR2 Roost Survey Results

TR2			
Dusk			
Date	**Species**	**Behaviour**	**Occurrence (no. of flight passes)**
6th Sep 2021	Common Pipistrelle	Commuting	0
		Foraging	141
		Emerging	0
28th Sep 2021	Common Pipistrelle	Commuting	1
		Foraging	3
		Emerging	0
	Soprano Pipistrelle	Commuting	1
		Foraging	0
		Emerging	0

BL1 Roost Survey Result

BL1			
Dusk			
Date	**Species**	**Behaviour**	**Occurrence (no. of flight passes)**
15th Sep 2021	Soprano Pipistrelle	Commuting	11
		Foraging	100
		Emerging	0
23rd Sep 2021	Common Pipistrelle	Commuting	2
		Foraging	4
		Unknown	2
		Emerging	0

BL2 Roost Results

BL2			
Dusk			
Date	**Species**	**Behaviour**	**Occurrence (no. of flight passes)**
25th Aug 2021	Common Pipistrelle	Commuting	3
		Foraging	8
		Emerging	4
		Unknown	1
	Soprano Pipistrelle	Commuting	0
		Foraging	0
		Unknown	1
		Emerging	0
	Natterers' Bat	Commuting	0
		Foraging	0
		Unknown	1
		Emerging	0
	Pipistrelle sp.	Commuting	0
		Foraging	0
		Unknown	1
		Emerging	0
	Leisler's	Commuting	0
		Foraging	0
		Unknown	1
		Emerging	0
2nd Sep 2021	Common Pipistrelle	Commuting	3
		Foraging	3
		Emerging	5
		Unknown	0
	Soprano Pipistrelle	Commuting	0
		Foraging	0
		Unknown	0
		Emerging	1
	Natterers' Bat	Commuting	0
		Foraging	0
		Unknown	1
		Emerging	0
20th Sep 2021	Common Pipistrelle	Commuting	4
		Foraging	4
		Emerging	0
		Unknown	5
	Soprano Pipistrelle	Commuting	5
		Foraging	5
		Unknown	7
		Emerging	0
	Natterers' Bat	Commuting	0
		Foraging	2

30th Sep 2021		Unknown	4
	Common Pipistrelle	Emerging	0
		Commuting	0
		Foraging	7
	Soprano Pipistrelle	Emerging	9
		Unknown	0
		Commuting	0
		Foraging	1
	Natterers' Bat	Unknown	0
		Emerging	0
		Commuting	0
		Foraging	0
	Leisler's	Unknown	0
		Emerging	17
		Commuting	0
		Foraging	9
		Unknown	0
		Emerging	0

A13.3.2. Bat Transect Results

Transect Species Activity Results

Date	Transect	Species	Behaviour	Occurrence (no. of flight passes)
Spring Efforts				
13th May 2021	1	Soprano Pipistrelle	Commuting	1
			Foraging	0
		Leisler's Bat	Commuting	3
			Foraging	5
	3	Soprano Pipistrelle	Commuting	2
			Foraging	0
		Common Pipistrelle	Commuting	0
			Foraging	6
		Leisler's Bat	Commuting	0
			Foraging	3
	4	Common Pipistrelle	Commuting	0
			Foraging	12
Summer Efforts				
14th June 2021	3	Common Pipistrelle	Commuting	1
			Unknown	0
			Foraging	8
		Leisler's Bat	Commuting	1
			Unknown	0
			Foraging	0
	4	Common Pipistrelle	Commuting	0
			Unknown	19
			Foraging	0
		Soprano Pipistrelle	Commuting	0
			Unknown	2
			Foraging	0
		Leisler's Bat	Commuting	0
			Unknown	3
			Foraging	0
Autumn Efforts				
13th May 2021	1	Common Pipistrelle	Commuting	1
			Foraging	0
	2	Common Pipistrelle	Commuting	1
			Foraging	0
	4	Common Pipistrelle	Commuting	1
			Foraging	13

A13.3.3. Bat Static Detector Raw Data 2021

Spring															
May															
Date	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**Total**
Turbine 12																
LB	6	12	9	0	0	0	1	0	58	5	0	5	-	-	-	**96**
CP	4	6	134	0	0	1	0	0	8	134	41	125	-	-	-	**453**
SP	0	0	28	0	0	0	0	0	12	27	0	3	-	-	-	**70**
NP	0	0	0	0	0	0	0	0	0	0	0	6	-	-	-	**6**
NB	0	0	1	0	0	0	0	0	0	0	0	0	-	-	-	**1**
DB	0	0	1	0	0	0	0	0	0	0	0	0	-	-	-	**1**
BLE	0	0	1	0	0	0	0	0	0	3	0	0	-	-	-	**4**
Turbine 10																
LB	8	0	0	0	0	3	0	-	0	3	-	-	63	3	3	**83**
CP	0	2	4	0	0	0	0	-	0	6	-	-	34	46	200	**292**
SP	0	1	1	0	0	0	0	-	0	0	-	-	8	16	215	**241**
NP	0	0	0	0	0	0	0	-	0	0	-	-	0	1	0	**1**
NB	0	0	0	0	0	0	0	-	0	0	-	-	0	0	64	**64**
DB	0	0	1	0	0	0	0	-	0	0	-	-	0	0	9	**10**
BLE	0	0	0	0	0	0	0	-	0	0	-	-	0	0	0	**0**
Turbine 11																
LB	20	14	4	0	26	46	22	5	13	20	0	-	-	-	-	**170**
CP	348	229	168	2	307	778	39	299	395	780	0	-	-	-	-	**3345**
SP	2	0	1	0	0	11	0	1	26	22	18	-	-	-	-	**81**
MS	0	0	0	0	0	0	0	0	9	2	0	-	-	-	-	**11**
NP	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	**0**
NB	0	1	1	0	0	0	0	0	0	0	0	-	-	-	-	**2**
DB	0	1	1	0	0	0	0	0	0	0	0	-	-	-	-	**2**
BLE	1	0	0	0	0	0	0	0	0	0	0	-	-	-	-	**1**
Turbine 8																
LB	34	5	0	0	0	0	0	3	77	1	0	13	-	-	-	**133**

CP	19	7	25	0	0	0	13	0	17	1	0	1	-	-	-	**83**
SP	2	0	0	0	0	0	0	0	2	0	0	0	-	-	-	**4**
Turbine 9																
LB	12	8	10	NA	0	4	1	1	101	6	0	-	-	-	-	**143**
CP	2	1	21	NA	0	2	1	1	2	7	0	-	-	-	-	**37**
SP	0	1	0	NA	0	0	2	0	0	3	0	-	-	-	-	**6**
NB	1	5	7	NA	0	5	1	0	0	2	1	-	-	-	-	**22**
BLE	0	0	0	NA	0	0	0	0	0	1	0	-	-	-	-	**1**
Turbine 7																
LB	66	14	15	0	7	4	0	1	42	3	2	-	-	-	-	**154**
CP	1	0	1	0	1	0	0	0	7	0	1	-	-	-	-	**11**
SP	0	0	0	0	0	0	0	0	3	0	0	-	-	-	-	**3**
NB	1	4	1	0	0	2	1	1	1	1	0	-	-	-	-	**12**
Turbine 6																
LB	3	1	7	0	2	1	0	0	10	4	NA	-	-	-	-	**28**
CP	1	7	16	0	0	2	0	4	6	11	NA	-	-	-	-	**47**
SP	1	2	1	0	0	1	0	0	1	2	NA	-	-	-	-	**8**
MS	0	0	0	0	0	0	0	0	0	0	NA	-	-	-	-	**0**
NP	0	0	0	0	0	0	0	0	0	0	NA	-	-	-	-	**0**
NB	0	0	1	0	0	0	0	0	1	0	NA	-	-	-	-	**2**
DB	0	0	0	0	0	0	0	0	0	0	NA	-	-	-	-	**0**
BLE	0	0	0	0	0	0	0	0	0	0	NA	-	-	-	-	**0**

Summer											
June											
Date	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**Total**
Turbine 12											
CP	71	205	69	127	N/A	53	7	45	29	42	**648**
SP	3	78	29	40	N/A	18	2	8	8	12	**198**
LB	42	53	48	12	N/A	7	1	2	19	31	**215**
MS	1	1	0	5	N/A	2	2	7	2	0	**20**
BLE	0	0	0	1	N/A	0	0	0	0	0	**1**
Turbine 11											
CP	0	3	1	1	N/A	0	0	0	11	2	**18**
SP	0	2	0	0	N/A	0	1	0	1	0	**4**
LB	7	5	6	1	N/A	2	1	2	4	37	**65**
MS	0	0	0	0	N/A	0	0	0	0	0	**0**
Turbine 8											
CP	2	129	25	132	N/A	7	2	7	15	2	**321**
SP	0	6	0	0	N/A	0	1	0	3	1	**11**
LB	14	99	69	6	N/A	2	1	1	2	4	**198**
MS	1	3	1	0	N/A	21	3	1	2	1	**33**
BLE	0	0	0	1	N/A	0	0	0	0	1	**2**
NP	0	0	0	0	N/A	0	0	1	0	0	**1**
Turbine 10											
CP	N/A						0			N/A	**0**
SP	N/A						0			N/A	**0**
LB	N/A						0			N/A	**0**
MS	N/A						0			N/A	**0**
BLE	N/A						0			N/A	**0**
NP	N/A						0			N/A	**0**
Turbine 7											
CP	4	106	22	5	0	2	1	2	10	1	**153**
SP	0	21	3	0	0	0	0	0	1	0	**25**
LB	3	64	26	3	1	2	0	0	1	90	**190**

MS	0	1	0	0	0	0	0	0	0	0	**1**
BLE	0	0	0	0	0	0	0	0	0	0	**0**
NP	0	0	0	0	0	0	0	0	0	0	**0**
Turbine 9											
CP	51	80	136	93	19	94	7	33	8	14	**535**
SP	4	4	6	7	2	3	5	4	0	0	**35**
LB	3	12	14	6	1	60	0	1	4	11	**112**
MS	2	2	1	3	0	0	0	0	0	0	**8**
BLE	0	0	0	0	0	1	0	0	1	0	**2**
NP	0	0	0	0	0	0	0	0	0	0	**0**
Turbine 9/10											
CP	6	134	54	6	4	5	0	5	38	4	**256**
SP	0	2	1	0	0	0	0	0	2	0	**5**
LB	0	9	2	1	0	0	1	0	10	5	**28**
MS	1	2	1	5	1	2	3	0	1	0	**16**

Autumn														
October														
Species	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**Total**
Turbine 2														
CP	201	4	1	1	3	13	0	3	N/A	129	14	7	N/A	**376**
SP	2	4	4	7	7	4	2	11	N/A	4	2	0	N/A	**47**
LB	1	0	0	0	0	0	1	0	N/A	0	1	0	N/A	**3**
MS	0	0	0	0	0	0	0	0	N/A	0	0	0	N/A	**0**
BLE	0	0	0	0	0	0	0	0	N/A	0	0	0	N/A	**0**
Turbine 2														
Nil	0	0	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Turbine 10														
CP	3	N/A	N/A	28	62	16	15	61	N/A	20	14	2	4	**225**
SP	0	N/A	N/A	18	6	0	7	0	N/A	0	0	2	4	**37**
LB	0	N/A	N/A	0	0	0	0	0	N/A	0	0	0	0	**0**
MS	0	N/A	N/A	0	0	0	0	0	N/A	0	0	0	0	**0**
BLE	0	N/A	N/A	0	0	0	0	2	N/A	1	0	0	0	**3**
Turbine 10														
CP	N/A	5	1	4	5	0	21	0	N/A	0	0	0	N/A	**36**
SP	N/A	0	0	0	0	0	1	0	N/A	0	0	0	N/A	**1**
LB	N/A	0	0	0	0	1	0	0	N/A	0	0	0	N/A	**1**
Turbine 7														
CP	0	0	0	N/A	1	N/A	N/A	0	0	N/A	0	0	N/A	**1**

November															
Dates	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**Total**
Turbine 5															
CP	N/A	0	0	0	0	1	0	0	N/A	0	0	0	0	N/A	**1**
LB	N/A	1	0	0	0	0	0	0	N/A	0	0	1	0	N/A	**2**
MS	N/A	0	0	0	2	1	1	1	N/A	0	0	0	0	N/A	**5**
Turbine 6															
SP	0	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	**1**
MS	0	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	**1**

Turbine 9															
SP	N/A	0	1	N/A	N/A	0	0	N/A	N/A	N/A	N/A	N/A	0	N/A	**1**
LB	N/A	0	1	N/A	N/A	0	0	N/A	N/A	N/A	N/A	N/A	0	N/A	**1**
MS	N/A	0	1	N/A	N/A	2	4	N/A	N/A	N/A	N/A	N/A	5	N/A	**12**
Turbine 8															
CP	29	0	0	39	0	0	0	0	18	0	0	0	0	0	**86**
SP	502	13	147	389	18	88	40	1	116	14	23	175	33	0	**1559**
LB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
BLE	49	0	10	85	10	20	15	0	141	1	16	108	21	0	**476**

A13.3.4. Bat Static Detector Raw Data 2022

Spring													
July													
Turbine 5													
Dates	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**Total**	
LB	0	2	2	0	0	1	0	1	4	0	0	**10**	
SP	3	8	3	0	0	2	3	2	22	5	0	**48**	
CP	2	9	8	0	0	0	3	1	11	5	0	**39**	
BLE	0	4	6	0	0	0	1	9	1	1	0	**22**	
NP	0	0	0	0	0	0	0	1	1	0	0	**2**	
MS	0	0	0	0	0	0	1	0	1	0	0	**2**	
June/July													
Turbine1/2													
Dates	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**1**	**2**	**3**	**4**	**Total**
LB	1	0	0	0	0	0	0	0	0	0			**1**
Turbine 5													
SP	0	0	0	0	0	0	1	0	0	0			**1**
CP	0	0	0	0	0	0	0	0	0	0			**0**
LB	3	0	0	0	1	0	6	0	1	0			**11**
MS	0	0	0	0	0	0	1	0	1	0			**2**
Turbine 6													
LB	2	109	0	1	5	3	25	44	100	10	92	50	**441**
SP	16	96	0	33	82	42	71	71	16	51	32	24	**534**
CP	10	25	0	29	20	9	186	14	9	2	1	2	**307**
NP	0	0	0	0	0	2	2	2	1	1	7	11	**26**
MS	0	0	0	1	4	34	50	8	0	0	0	0	**97**
Turbine 8													
LB	1	0	0	0	0	3	6	4	0	8	1	-	**23**
SP	1	0	0	0	0	1	2	1	0	5	1	-	**11**
CP	4	0	0	0	0	7	15	4	0	5	3	-	**38**
BLE	0	0	0	0	0	0		0	0	0		-	**0**

NP	0	0	0	0	0	1	0	0	0	1	1	-	**3**
MS	0	0	0	0	0	1	3	1	0	3	2	-	**10**

Summer																
August																
Turbine 1/2																
Dates	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**Total**
LB	8	19	18	0	4	72	0	0	9	4	0	N/A	12	10	14	**170**
CP	215	218	284	326	397	211	0	5	160	75	5	N/A	55	67	56	**2074**
SP	351	362	489	599	552	325	0	11	71	47	3	N/A	24	9	14	**2857**
NP	3	0	0	0	0	0	0	0	0	0	0	N/A	0	0	5	**8**
BLE	1	12	8	2	1	4	0	0	0	1	0	N/A	0	1	0	**30**
Turbine 5																
LB	3	4	2	0	1	0	0	0	0	0	0	3	2	0	1	**16**
CP	224	459	493	290	279	1126	0	2	287	105	1	174	143	103	10	**3696**
SP	30	198	11	17	76	6	0	2	5	2	0	0	3	2	3	**355**
MS	0	5	0	1	1	0	0	0	0	0	0	0	0	0	0	**7**
NP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	**2**
BLE	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	**3**
Turbine 5																
LB	2	3	9	5	2	2	0	3	3	2	0	4	3	4	6	**48**
CP	123	495	555	543	450	193	0	0	88	48	1	25	64	87	57	**2729**
SP	28	214	77	135	119	42	0	0	89	81	0	3	5	3	1	**797**
MS	0	4	1	0	2		0	0	1	0	0	1	1	0	1	**11**
NP	0	0	0	0	0		0	0	0	0	0	0	0	0	2	**2**
BLE	1	1	3	1	1	1	0	0	1	0	0	0	0	0	0	**9**
Turbine 6																
LB	5	5	7	5	1	3	0	0	5	6	0	2	7	3	5	**54**
CP	25	45	33	35	27	32	0	0	42	5	0	5	9	0	7	**265**
SP	21	12	16	24	11	8	0	0	1	3	1	1	2	1	2	**103**
NP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	**5**
BLE	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	**4**
Turbine 8																
No data recorded																

Autumn																			
September																			
Dates	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**Total**
Turbine 2																			
LB	0	0	3	0	20	42	0	2	7	4	38	119	342	61	197	0	0	0	**835**
CP	0	0	0	0	203	136	0	100	62	306	27	26	27	167	27	0	0	0	**1081**
SP	0	0	0	0	19	51	0	18	9	20	5	15	15	59	6	0	0	0	**217**
MS	0	0	0	0	0	1	0	0	0	0	1	0	1	0	1	0	0	0	**4**
NP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	**4**
BLE	0	0	0	0	1	1	0	0	1	1	0	1	2	0	1	0	0	0	**8**
Turbine 3/4/5																			
LB	-	-	1	0	1	1	0	2	0	4	2	3	0	4	3	2	0	0	**23**
CP	-	-	334	7	107	2	1	7	132	2	3	6	159	64	2	0	0	0	**826**
SP	-	-	0	0	7	16	1	3	2	2	0	2	103	10	4	0	0	0	**150**
MS	-	-	0	0	2	2	0	1	0	2	1	0	2	8	1	0	0	0	**19**
NP	-	-	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	**4**
BLE	-	-	0	0	0	0	0	0	1	0	1	0	1	0	1	1	0	0	**5**
Turbine 5																			
LB	-	-	2	1	7	7	0	2	4	3	3	8	1	18	9	2	1	0	**68**
CP	-	-	2	1	11	3	2	3	2	3	1	2	7	95	5	0	0	0	**137**
SP	-	-	0	3	0	7	1	4	3	3	0	0	3	21	2	0	0	0	**47**
MS	-	-	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
NP	-	-	0	0	0	0	0	0	0	0	0	0	0	0	5	1	0	0	**6**
BLE	-	-	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**
Turbine 6																			
LB	-	0	0	0	2	13	12	13	7	2	4	7	1	13	6	3	0	0	**83**
CP	-	0	3	0	94	16	60	147	50	7	35	0	30	57	29	23	0	0	**551**
SP	-	0	0	0	34	9	14	50	75	16	17	4	14	46	53	19	0	0	**351**
MS	-	0	0	0	0	8	3	3	0	2	2	3	0	2	0	0	1	0	**24**
NP	-	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	7	1	**12**
BLE	-	0	0	0	0	4	2	1	1	3	2	0	1	1	1	3	0	0	**19**
Turbine 8																			

LB	-	-	31	1	5	0	0	0	15	1	-	-	-	-	-	-	-	-	**53**
CP	-	-	44	24	35	18	20	42	30	33	-	-	-	-	-	-	-	-	**246**
SP	-	-	30	3	9	6	19	15	10	26	-	-	-	-	-	-	-	-	**118**
MS	-	-	0	0	1	3	3	4	5	2	-	-	-	-	-	-	-	-	**18**
BLE	-	-	0	0	0	1	0	1	2	2	-	-	-	-	-	-	-	-	**6**

Appendix 13.4: General Bird Fieldwork & Survey Results

Appendix to Chapter 13: Biodiversity

Appendix 13.4: General Bird Fieldwork & Survey Results

A13.4 General Bird Fieldwork & Survey Results

A13.4.1 Countryside Bird Survey Data Results

Provided below are the Data tables for the species recorded along the Countryside Bird survey transects conducted in winter 2021/22, 2022/23 and in breeding season 2021, 2022.

For locations, see Figure 13.5.

A13.4.1.1 Winter 2021/2022

Species	Jan Transect				Jan Total	Feb Transect				Feb Total	Mar Transect		Mar Total	Dec Transect				Dec Total	Grand Total
	1	2	3	4		1	2	3	4		1	2		1	2	3	4		
Blackbird	11			5	16	3	5	6	6	20	1	1	2	5			11	16	**54**
Blue Tit				1	1	4			1	5					1		1	2	**8**
Bullfinch								1	2	3									**3**
Buzzard						1	2			3						1		1	**4**
Chaffinch						4	3		5	12					3		3	6	**18**
Coal Tit						2				2									**2**
Dunnock						1			2	3									**3**
Fieldfare						6	15			21									**21**
Goldfinch							12		13	25									**25**
Great Tit	2			2	4				1	1				2	1		1	4	**9**
Hooded Crow		4	3		7	4	5	3	4	16	1	1	2	1		3		4	**29**
House Sparrow											1		1						**1**
Jackdaw						4	4		3	11									**11**
Kestrel		1			1		1			1									**2**
Long-tailed Tit									5	5									**5**
Magpie						1	3	2	2	8	1	1	2	2				2	**12**
Meadow Pipit						2	3	5		10									**10**

Pheasant							1			1									**1**
Pied Wagtail							1	1	2	4				4				4	**8**
Raven	4	1		1	6									1	2			3	**9**
Redpoll (Lesser)						12				12									**12**
Redwing							20	130	35	185									**185**
Robin	3		3	1	7	3	2	4	3	12		1	1	2		1	4	7	**27**
Rook	7	2	11		20	4	5			9	5	1	6		3	11	6	20	**55**
Snipe							3			3									**3**
Song Thrush						4	2	2	3	11									**11**
Starling		5		11	16	20	20	20		60									**76**
Stonechat		2			2														**2**
Woodpigeon						5	7	1	4	17									**17**
Wren			4		4	3		2		5		1	1			2	1	3	**13**
Grand Total	27	15	21	21	84	83	114	177	91	465	9	6	15	17	10	18	27	72	**636**

A13.4.1.2 Winter 2023/2024

Species	Nov Transect			Nov Total	Dec Transect			Dec Total	Jan Transect		Jan Total	Feb Transect			Feb Total	Grand Total
	1	2	3		1	2	3		1	2		1	2	3		
Blackbird			2	2	4	1		5	4		4	11		6	17	28
Blue Tit				0			5	5	3		3	4			4	12
Bullfinch				0				0			0	1			1	1
Buzzard				0				0			0			2	2	2
Chaffinch			4	4	2			2	6		6	7		3	10	22
Coal Tit				0				0	4		4	1		2	3	7
Crossbill				0	2		3	5	9		9				0	14
Dunnock				0	1			1	2		2	3		2	5	8
Fieldfare				0			2	2	3		3	41			41	46
Goldcrest	2		3	5	3			3			0	2		2	4	12
Golden Plover		12		12				0			0				0	12
Goldfinch				0				0			0				0	0
Great Tit	1			1	1		2	3	8		8	7		2	9	21
Hooded Crow				0		1	10	11			0	1		1	2	13
House Sparrow				0				0			0				0	0
Jackdaw				0			1	1			0				0	1
Kestrel				0				0			0				0	0
Long-tailed Tit				0				0	2		2				0	2
Magpie				0				0			0	3			3	3
Meadow Pipit		2	1	3	1		1	2			0	6		15	21	26
Mitsle Thrush				0				0	1		1				0	1
Pheasant				0				0			0				0	0
Pied Wagtail				0				0			0			1	1	1
Raven				0	2			2	1		1			2	2	5
Redpoll (Lesser)				0				0			0	2			2	2
Redwing				0				0	3		3	54			54	57

Reed Bunting			2	2				0	2		2	1		16	17	**21**
Robin		2	2	4	6	3	1	10	11		11	11		5	16	**41**
Rook	2			2			1	1			0	8			8	**11**
Siskin				0	1			1			0				0	**1**
Skylark				0				0			0			2	2	**2**
Snipe		1		1				0			0	3			3	**4**
Song Thrush				0	3			3	3		3	3		1	4	**10**
Starling				0				0			0	61			61	**61**
Stonechat				0				0			0				0	**0**
Treecreeper				0			1	1	1		1				0	**2**
Woodpigeon				0				0	2		2	11		11	22	**24**
Wren	1		4	5	2	2	1	5	5		5	17		14	31	**46**
Grand Total	6	17	18	41	26	7	28	61	70	0	70	258	0	87	345	520

A13.4.1.3 Breeding 2021

Species	April				Total	May				Total	Grand Total
	Transect					Transect					
	1	2	3	4		1	2	3	4		
Blackbird	7	5	5	5	22	7	3	5	4	19	41
Blackcap				1	1	1		1	1	3	4
Blue Tit		1	1	3	5		1	1	2	4	9
Buzzard					0		1			1	1
Chaffinch	12	3	6	7	28	11	3	6	5	25	53
Chiffchaff				2	2		1	1	2	4	6
Coal Tit	7				7	1				1	8
Collared Dove					0		2		2	4	4
Cuckoo					0			1		1	1
Dunnock	1	1			2			1		1	3
Goldcrest					0			1		1	1
Goldfinch			2	1	3	4	3		7	14	17
Great Tit			1	2	3	1		1	1	3	6
Hooded Crow	1	4	2	1	8	3	2	2	2	9	17
House Sparrow					0			2		2	2
Jackdaw	2	2	2	1	7	1	2	4	2	9	16
Jay			1		1			1		1	2
Kestrel					0			1		1	1
Linnet		2	4		6	4	6	3	5	18	24
Long-tailed Tit				1	1		3	1		4	5
Magpie		2	1	1	4		1	2	1	4	8
Meadow Pipit	1	2	2		5	4	3	2		9	14
Mistle Thrush					0				1	1	1
Pheasant					0	1		1		2	2
Pied Wagtail		1	1		2			2	1	3	5
Reed Bunting					0		2			2	2
Robin	2	1	3	2	8	3	1	4	3	11	19
Rook					0				5	5	5
Siskin					0			2		2	2
Skylark	2	3			5	1	2			3	8
Snipe		1			1					0	1
Song Thrush	4	2	5	6	17	4	1	2	2	9	26
Sparrowhawk	1				1					0	1
Spotted Flycatcher					0				1	1	1

Starling				4	**4**		5		23	**28**	**32**
Stonechat		2			**2**		2			**2**	**4**
Swallow	1				**1**	2		2	2	**6**	**7**
Whitethroat					**0**	3		2	2	**7**	**7**
Willow Warbler	3			2	**5**	2	1	1	1	**5**	**10**
Woodpigeon	1	4	5	4	**14**	3	5	2	2	**12**	**26**
Wren	1	5	4	4	**14**	3	2	4	5	**14**	**28**
Total	46	39	45	47	**177**	59	52	56	82	**249**	**426**

A13.4.1.4 Breeding 2022

Species	April			Total	May			Total	Grand Total
	Transect				Transect				
	1	2	3		1	2	3		
Blackbird	1	2	1	**4**	1	2	1	**4**	**8**
Blackcap				**0**	2			**2**	**2**
Buzzard	1			**1**				**0**	**1**
Chaffinch				**0**	9	2	3	**14**	**14**
Chiffchaff	2			**2**				**0**	**2**
Coal Tit	1		1	**2**		1		**1**	**3**
Dunnock				**0**			1	**1**	**1**
Goldcrest	1			**1**		1		**1**	**2**
Goldfinch			2	**2**			4	**4**	**6**
Great Tit	1			**1**				**0**	**1**
Hooded Crow			1	**1**	1		3	**4**	**5**
Jackdaw			0	**0**				**0**	**0**
Kestrel		1		**1**	1			**1**	**2**
Linnet				**0**		4		**4**	**4**
Meadow Pipit		9	3	**12**		15	4	**19**	**31**
Robin	2		2	**4**	3		3	**6**	**10**
Rook		1		**1**		2		**2**	**3**
Siskin				**0**	1		2	**3**	**3**
Skylark	1	8	5	**14**				**0**	**14**
Song Thrush	1			**1**				**0**	**1**
Stonechat		1		**1**		2		**2**	**3**
Swallow				**0**		1		**1**	**1**
Willow Warbler	1		1	**2**	4	1	1	**6**	**8**
Woodpigeon	2			**2**		2	1	**3**	**5**
Wren	7	1	6	**14**	5		3	**8**	**22**
Grand Total	21	23	22	**66**	27	33	27	**87**	**153**

A13.4.2 Vantage Point Data

Provided below are the Data tables for the species recorded with the flightline data used for assessment of the CRM (Appendix 13.5) and ornithological baseline for Ballynalacken Windfarm Project. (Please note "nil sightings" were removed from the VP tables as these were not relevant to the CRM analysis).

Data is taken from:

- Winter 2020/2021;
- Summer 2021;
- Summer 2022;
- Winter 2021/2022; &
- Winter 2023/2024.

Methods of these Surveys are provided in Appendix 13.8. For Flightline locations see Figure 13.5.

A13.4.2.1 Flightline Data

A13.4.2.1.1 Winter 2020 Data Used

VP	Date	Surveyor	Species	Number	Time	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration (s)	Notes
PD VP2	23/10/2020	PD	Lesser Black-backed Gull	1	15:27					60			60	
PD VP2	16/11/2020	PD	Kestrel	1	14:57			5	10	15	15		45	

A13.4.2.1.2 Breeding 2021

VP Name	Date	Observer	Species	Number	Time of sighting	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
5	09/04/2021	MGW	Sparrowhawk	1	9:15			100	60				160	Mobbed by HC
5	09/04/2021	MGW	Sparrowhawk	1	9:30			20	80	20			120	
5	09/04/2021	MGW	Kestrel	1	9:40		30						30	
5	09/04/2021	MGW	Buzzard	3	11:20				100	100	80		280	
5	09/04/2021	MGW	Buzzard	1	12:20						80		80	
5	09/04/2021	MGW	Sparrowhawk	1	12:25	30	10						40	
5	09/04/2021	MGW	Buzzard	2	13:00		20	20	20	50			110	
5	09/04/2021	MGW	Buzzard	1	13:25				20	100	100	100	320	
5	09/04/2021	MGW	Buzzard	2	13:45			110					110	
5	09/04/2021	MGW	Kestrel	2	14:10		70						70	
6	15/04/2021	MGW	Buzzard	2	9:40			40	40	60			140	
6	15/04/2021	MGW	Kestrel	1	9:45		100						100	
6	15/04/2021	MGW	Golden Plover	60	10:10				20	100	100	100	320	
6	15/04/2021	MGW	Kestrel	1	10:25		20						20	
6	15/04/2021	MGW	Kestrel	1	10:40		20	60	60	60	60		260	
6	15/04/2021	MGW	Buzzard	1	10:55		30						30	
6	15/04/2021	MGW	Kestrel	1	10:55					160	160		320	
6	15/04/2021	MGW	Golden Plover	30	11:10				40				40	
6	15/04/2021	MGW	Buzzard	2	12:30		100	100	160				360	
6	15/04/2021	MGW	Sparrowhawk	1	13:05		30						30	
6	04/05/2021	MGW	Kestrel	1	10:05			70		20	50			
6	04/05/2021	MGW	Buzzard	1	10:30			40		40				
5	05/05/2021	MGW	Kestrel	1	14:30			30		30				
5	05/05/2021	MGW	Buzzard	2	14:50			1500		300	300	200	400	300
5	05/05/2021	MGW	Raven	2	16:10			25		25				
5	05/05/2021	MGW	Kestrel	1	16:20			60	30	30				
5	05/05/2021	MGW	Kestrel	1	18:10			160		160				

VP Name	Date	Observer	Species	Number	Time of sighting	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
5	05/05/2021	MGW	Buzzard	1	18:15			30	30					
5	10/06/2021	MGW	Buzzard	1	15:35		20						20	
5	10/06/2021	MGW	Buzzard	2	15:40	50	200	200					450	
5	10/06/2021	MGW	Buzzard	1	16:02	40	100	300					440	
5	10/06/2021	MGW	Buzzard	2	16:55	300	750	160					1210	
5	10/06/2021	MGW	Lesser Black-backed Gull	1	17:30		50						50	
5	10/06/2021	MGW	Kestrel	1	17:35		70						70	
5	10/06/2021	MGW	Kestrel	1	17:58	100	80						180	
5	10/06/2021	MGW	Kestrel	1	18:05	130	130						260	
5	10/06/2021	MGW	Kestrel	1	19:30	160	150						310	
5	10/06/2021	MGW	Buzzard	1	19:45		50	60					110	
6	16/06/2021	MGW	Raven	1	15:40			40					40	
6	16/06/2021	MGW	Buzzard	1	15:55				60	20			80	
6	16/06/2021	MGW	Buzzard	2	16:40				100	130	130		360	
6	16/06/2021	MGW	Kestrel	1	17:01		140						140	
6	16/06/2021	MGW	Kestrel	1	17:45		50						50	
6	16/06/2021	MGW	Kestrel	1	17:55			60					60	
6	16/06/2021	MGW	Buzzard	1	18:40	55							55	
6	16/06/2021	MGW	Buzzard	1	20:05			60	60	40			160	
6	16/06/2021	MGW	Buzzard	1	20:25				90				90	
5	01/07/2021	CK	Sparrowhawk	1	14:10			120					120	Flying over farmland towards woodland.
6	22/07/2021	OV	Buzzard	1	13:40				20	10	10		50	Sp: HS, SL
6	01/09/2021	MGW	Buzzard	1	10:25	30	30	30					90	
6	01/09/2021	MGW	Kestrel	1	11:45	15							15	
6	01/09/2021	MGW	Kestrel	1	11:50	160	60						220	
6	01/09/2021	MGW	Buzzard	1	12:15			100	100	100	60		360	

VP Name	Date	Observer	Species	Number	Time of sighting	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
6	01/09/2021	MGW	Raven	3	12:55	60	120	60	80				320	
6	01/09/2021	MGW	Raven	2	13:10		25						25	
6	01/09/2021	MGW	Buzzard	1	14:50		70	60					130	
6	01/09/2021	MGW	Buzzard	2	15:30			60	60	100			220	
5	02/09/2021	MGW	Buzzard	1	10:35	10							10	
5	02/09/2021	MGW	Raven	2	12:05			30					30	
5	02/09/2021	MGW	Kestrel	1	12:55	180	180						360	
5	02/09/2021	MGW	Kestrel	1	14:10	180	140						320	
5	02/09/2021	MGW	Buzzard	1	14:35	20	60						80	
5	02/09/2021	MGW	Kestrel	1	14:40		65						65	
5	23/09/2021	NC	Raven	2	11:52					64			64	Calling & commuting over agricultural land; lost sight behind hill
5	23/09/2021	NC	Raven	1	12:00						39		39	Calling & commuting over agricultural land
5	23/09/2021	NC	Buzzard	3	14:58					50	100	106	256	Calling & commuting over agricultural land
5	23/09/2021	NC	Kestrel	1	15:13					84			84	Hunting over agricultural land
5	23/09/2021	NC	Buzzard	1	15:13						318		318	Circling over agricultural land

VP Name	Date	Observer	Species	Number	Time of sighting	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
5	23/09/2021	NC	Kestrel	1	15:24					225			225	Hunting over scrub
5	23/09/2021	NC	Buzzard	1	16:06				10	34			44	Flying over agricultural land
6	24/09/2021	NC	Raven	1	11:31				17				17	Flying over agricultural land
6	24/09/2021	NC	Raven	1	13:02					29			29	Flying over agricultural land
6	24/09/2021	NC	Kestrel	1	14:06					57			57	Flying over agricultural land
PD VP1	14/04/2021	kn	Kestrel	1	8:30						30		30	dry sunny okta 2 wind 2mph NE
PD VP1	14/04/2021	kn	Buzzard	1	9:00						75		75	dry sunny okta 2 excellent visibility wind 2mph NE
PD VP1	14/04/2021	kn	Kestrel	1	8:30						30		30	dry sunny okta 2 wind 2mph NE
PD VP1	14/04/2021	kn	Buzzard	1	9:00						75		75	dry sunny okta 2 excellent visibility wind 2mph NE
PD VP1	14/04/2021	kn	Kestrel	1	14:30						90		90	dry excellent visibility.okta 5 wind 4mphSE
PD VP1	13/05/2021	GG	Buzzard	1	15.11						180		180	Sunny, clear, dry

VP Name	Date	Observer	Species	Number	Time of sighting	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
PD VP1	13/05/2021	GG	Buzzard	1	15.23						30		30	Sunny, clear, dry
PD VP1	13/05/2021	GG	Kestrel	1	15.32						120		120	Sunny, clear, dry
PD VP1	13/05/2021	GG	Buzzard	1	16.04						90		90	Sunny, clear, dry

A13.4.2.1.3 Winter 2021/2022

VP	Date	Surveyor	Species	Number	Time	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
PD VP2	29/03/2022	CK	Raven	1	11:35		30						30	RN observed flying over G, RG & F
PD VP2	29/03/2022	CK	Raven	1	12:20		20						20	RN observed flying over F & G
PD VP2	29/03/2022	CK	Buzzard	1	14:05	35							35	BZ observed flying over F & G, came to perch on tree (300s), flew again over RG & F after being mobbed by 2 HC
PD VP2	29/03/2022	CK	Buzzard	2	14:32			40	200				240	2 BZ observed flying over F
PD VP2	29/03/2022	CK	Buzzard	1	14:42		20						20	BZ observed flying over F
PD VP2	29/03/2022	CK	Buzzard	2	14:51			300					300	2 BZ observed flying over F
PD VP2	30/03/2022	LP	Buzzard	1	14:47	20	45						65	
PD VP2	30/03/2022	LP	Golden Plover	45	15:28				55				55	
PD VP2	30/03/2022	LP	Golden Plover	75	15:35					15			15	
PD VP2	30/03/2022	LP	Golden Plover	61	15:46					30			30	
PD VP2	30/03/2022	LP	Golden Plover	150	15:51	80	80			320			480	
PD VP2	30/03/2022	LP	Buzzard	1	16:35						90		90	
PD VP2	30/03/2022	LP	Buzzard	2	16:37						40		40	

VP	Date	Surveyor	Species	Number	Time	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
PD VP2	30/03/2022	LP	Buzzard	1	16:40			20					20	
PD VP2	30/03/2022	LP	Golden Plover	270	17:09				40				40	
PD VP2	30/03/2022	LP	Buzzard	1	17:46	15							15	
PD VP2	31/03/2022	LP	Golden Plover	31	9:23	45							45	Flushed from roost site- eventually landed back into adajcent field
PD VP2	31/03/2022	LP	Golden Plover	31	9:35	10	50						60	
PD VP2	31/03/2022	LP	Raven_Rn	3	10:31			60					60	
PD VP2	31/03/2022	LP	Golden Plover	10	13:46		20						20	
PD VP2	31/03/2022	LP	Golden Plover	12	13:50		30						30	
PD VP2	31/03/2022	LP	Buzzard	1	13:51		45						45	
PD VP1	30/03/2022	MGW	Buzzard	1	16:55			30					30	
PD VP1	31/03/2022	MGW	Buzzard	1	10:12				30	70	30		130	
PD VP1	31/03/2022	MGW	Buzzard	1	10:40					70			70	
PD VP1	31/03/2022	MGW	Kestrel	1	11:25		160	150					310	
PD VP1	31/03/2022	MGW	Buzzard	1	13:15	110	20						130	
PD VP1	31/03/2022	MGW	Sparrowhawk	1	13:25				30	70	30		130	
PD VP1	31/03/2022	MGW	Buzzard	2	15:15			20	60	20	20		120	

VP	Date	Surveyor	Species	Number	Time	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
PD VP1	31/03/2022	MGW	Sparrowhawk	1	17:10				60	20	70		150	
PD VP1	01/04/2022	MGW	Golden Plover	31	10:25				40	60			100	
PD VP1	01/04/2022	MGW	Golden Plover	11	11:30			30					30	
PD VP1	01/04/2022	MGW	Buzzard	1	12:42		20	20	60	60			160	
PD VP1	01/04/2022	MGW	Kestrel	1	13:35		20						20	
PD VP1	01/04/2022	MGW	Buzzard	1	13:45		20	20	20	20	80	80	240	
PD VP1	01/04/2022	MGW	Buzzard	1	13:55			20	20	20	50		110	
PD VP1	01/04/2022	MGW	Buzzard	2	16:25		20	30	30				80	
PD VP1	09/04/2022	MGW	Kestrel	1	8:50		70						70	
PD VP1	09/04/2022	MGW	Kestrel	1	10:30		50	35					85	
PD VP1	09/04/2022	MGW	Buzzard	1	10:35		10	10	10				30	
PD VP1	09/04/2022	MGW	Buzzard	1	11:35			10	20	20	20		70	
PD VP1	09/04/2022	MGW	Buzzard	1	12:50			20	50	20	20		110	
PD VP1	09/04/2022	MGW	Buzzard	1	16:05		75						75	
PD VP1	14/04/2022	MGW	Kestrel	1	9:38	120							120	
PD VP1	14/04/2022	MGW	Kestrel	1	9:50									
PD VP1	14/04/2022	MGW	Kestrel	1	10:05	440	60						500	

VP	Date	Surveyor	Species	Number	Time	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
PD VP1	14/04/2022	MGW	Buzzard	3	11:15			40	40	160	200		440	
PD VP1	14/04/2022	MGW	Kestrel	1	11:38	220	600						820	
PD VP1	14/04/2022	MGW	Buzzard	2	13:04				310	310			620	
PD VP1	14/04/2022	MGW	Buzzard	1	13:58	30							30	
PD VP1	16/04/2022	MGW	Buzzard	1	11:19		5	10	60	10			85	
PD VP1	16/04/2022	MGW	Sparrowhawk	1	11:19			20	30				50	
PD VP1	16/04/2022	MGW	Buzzard	1	12:05			30	20	160	300		510	
PD VP1	16/04/2022	MGW	Kestrel	1	12:55	5							5	
PD VP1	16/04/2022	MGW	Kestrel	1	14:55	120	200						320	
PD VP1	16/04/2022	MGW	Buzzard	1	16:52	20	20	120					160	
PD VP1	18/04/2022	MGW	Buzzard	2	7:45		30	30	90				150	
PD VP1	18/04/2022	MGW	Kestrel	1	8:51	75							75	
PD VP1	18/04/2022	MGW	Buzzard	1	11:20	55							55	
PD VP1	18/04/2022	MGW	Buzzard	2	13:05			40	40	40	45		165	
PD VP1	18/04/2022	MGW	Buzzard	1	14:52		30	30	30	30	190		310	
PD VP1	09/10/2021	PD	Buzzard	1	10:03					75	15		90	
PD VP1	01/04/2022	MGW	Golden Plover	31	10:25				40	60			100	

VP	Date	Surveyor	Species	Number	Time	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
PD VP1	01/04/2022	MGW	Golden Plover	11	11:30			30					30	
PD VP1	01/04/2022	MGW	Buzzard	1	12:42		20	20	60	60			160	
PD VP1	01/04/2022	MGW	Kestrel	1	13:35		20						20	
PD VP1	01/04/2022	MGW	Buzzard	1	13:45		20	20	20	20	80	80	240	
PD VP1	01/04/2022	MGW	Buzzard	1	13:55			20	20	20	50		110	
PD VP1	01/04/2022	MGW	Buzzard	2	16:25		20	30	30				80	
PD VP1	09/04/2022	MGW	Kestrel	1	8:50		70						70	
PD VP1	09/04/2022	MGW	Kestrel	1	10:30		50	35					85	
PD VP1	09/04/2022	MGW	Buzzard	1	10:35		10	10	10				30	
PD VP1	09/04/2022	MGW	Buzzard	1	11:35			10	20	20	20		70	
PD VP1	09/04/2022	MGW	Buzzard	1	12:50			20	50	20	20		110	
PD VP1	09/04/2022	MGW	Buzzard	1	16:05		75						75	
PD VP1	14/04/2022	MGW	Kestrel	1	9:38	120							120	
PD VP1	14/04/2022	MGW	Kestrel	1	9:50									
PD VP1	14/04/2022	MGW	Kestrel	1	10:05	440	60						500	
PD VP1	14/04/2022	MGW	Buzzard	3	11:15			40	40	160	200		440	
PD VP1	14/04/2022	MGW	Kestrel	1	11:38	220	600						820	

VP	Date	Surveyor	Species	Number	Time	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
PD VP1	14/04/2022	MGW	Buzzard	2	13:04				310	310			620	
PD VP1	14/04/2022	MGW	Buzzard	1	13:58	30							30	
PD VP1	16/04/2022	MGW	Buzzard	1	11:19		5	10	60	10			85	
PD VP1	16/04/2022	MGW	Sparrowhawk	1	11:19			20	30				50	
PD VP1	16/04/2022	MGW	Buzzard	1	12:05			30	20	160	300		510	
PD VP1	16/04/2022	MGW	Kestrel	1	12:55	5							5	
PD VP1	16/04/2022	MGW	Kestrel	1	14:55	120	200						320	
PD VP1	16/04/2022	MGW	Buzzard	1	16:52	20	20	120					160	
PD VP1	18/04/2022	MGW	Buzzard	2	7:45		30	30	90				150	
PD VP1	18/04/2022	MGW	Kestrel	1	8:51	75							75	
PD VP1	18/04/2022	MGW	Buzzard	1	11:20	55							55	
PD VP1	18/04/2022	MGW	Buzzard	2	13:05			40	40	40	45		165	
PD VP1	18/04/2022	MGW	Buzzard	1	14:52		30	30	30	30	190		310	
3	07/02/2022	MGW	Buzzard	1	10:25					40			40	
3	07/02/2022	MGW	Sparrowhawk	1	10:37				20	20	20		60	
3	07/02/2022	MGW	Sparrowhawk	4	11:05			20	20	70	20		130	2 pairs.
3	07/02/2022	MGW	Sparrowhawk	2	11:05					70			70	1 pair, that makes 3 pairs up athe same time with mapnote 3.

VP	Date	Surveyor	Species	Number	Time	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
3	07/02/2022	MGW	Buzzard	1	13:05			70	60				130	
3	07/02/2022	MGW	Sparrowhawk	1	13:58			60	30				90	
5	02/02/2022	MGW	Raven	2	9:28					20			20	
5	02/02/2022	MGW	Sparrowhawk	1	9:50		20	60					80	
5	02/02/2022	MGW	Sparrowhawk	1	10:35		60	50	20				130	
5	02/02/2022	MGW	Sparrowhawk	1	10:50		25	20	20				65	
5	02/02/2022	MGW	Sparrowhawk	2	11:05		80	40	40				160	Pair flight display.
5	02/02/2022	MGW	Sparrowhawk	2	11:35			75					75	Pair flight display.
5	02/02/2022	MGW	Kestrel	1	11:40		20	35					55	
5	02/02/2022	MGW	Kestrel	1	12:51	30	40	120					190	
5	02/02/2022	MGW	Kestrel	1	13:17		45	100	20				165	
5	02/02/2022	MGW	Kestrel	1	13:50			60	100	60	100		320	
3	27/01/2022	ML	Buzzard	1	12:17			20	20	200			240	1 Bz circled (hunting) over grassland.
3	27/01/2022	ML	Buzzard	1	12:35							30	30	1 Bz hunting over grassland.
3	27/01/2022	ML	Buzzard	2	12:37							120	120	2 Bz display behaviour over grassland.
3	27/01/2022	ML	Buzzard	2	14:17							60	60	2 Bz display behaviour over grassland.
3	27/01/2022	ML	Sparrowhawk	1	15:16							60	60	1 Sparrowhawk hunting over grassland
3	27/01/2022	ML	Buzzard	1	15:32							120	120	1 Bz hunting over grassland.

VP	Date	Surveyor	Species	Number	Time	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
5	23/02/2022	MGW	Sparrowhawk	2	9:40			150	90	100			340	
5	23/02/2022	MGW	Kestrel	1	10:55		100	110					210	
5	23/02/2022	MGW	Kestrel	2	11:20			300	200	110			610	
5	23/02/2022	MGW	Buzzard	3	12:40			40	30	30	30		130	30
5	23/02/2022	MGW	Kestrel	1	12:50		30	30	100	30			190	
5	23/02/2022	MGW	Kestrel	1	13:45		110	110					220	
3	18/01/2022	ML	Raven	2	12:54		120						120	2 RN displaying over G for 120s until out of sight.
3	18/01/2022	ML	Raven	2	14:14	30							30	2 RN displaying over G for 30s until out of sight.
3	18/01/2022	ML	Kestrel	2	15:37		20						20	2 K fly over field for 20s until out of sight in T.
5	21/01/2022	ML	Raven	1	11:30		20						20	1 RN flew over G for 20s until out of sight.
5	21/01/2022	ML	Buzzard	1	12:07					15			15	1 BZ flew over G for 15s until out of sight.
5	21/01/2022	ML	Raven	1	12:36				5				5	1 RN flew over G for 5s until out on sight.
5	21/01/2022	ML	Kestrel	1	15:27					5			5	1 K. flew over G for 5s until out on sight.
3	17/02/2022	RD	Sparrowhawk	1	9:50			60					60	1 SP flew over G for 60s, lost sight
3	17/02/2022	RD	Buzzard	2	10:35					350			350	2 BZ circled over G for 200s, displaying over G for 200s, lost sight
3	17/02/2022	RD	Buzzard	1	10:52					300			300	1 BZ soared over F for 100s, circled over G for 200s, lost sight

VP	Date	Surveyor	Species	Number	Time	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
3	17/02/2022	RD	Kestrel	1	13:06	20	50	50					120	1 K hunted in G for 100s, flew over F for 20s lost sight
3	17/02/2022	RD	Raven	4	15:20			100					100	4 RN flew over G for 100s, lost sight.
5	11/02/2022	RD	Raven	4	11:17		30	30					60	4 RN flre over F for 60s, lost sight
5	11/02/2022	RD	Kestrel	1	12:55		50	70					120	1 K hunted in G for 20s, flew over F for 50s, hunted in G for 40s, flew over F for 10s, lost sight
5	11/02/2022	RD	Buzzard	1	13:05					300			300	1 BZ circled over F for 100s, circled over G for 200s, lost sight.
3	28/03/2022	CMCK	Buzzard	1	12:09						330		480	1 BZ circling approx. 100m above ground
3	28/03/2022	CMCK	Buzzard	1	12:15		70	50					480	1 BZ flying over farmland and forestry
5	07/03/2022	JOC	Buzzard	1	10:02	30							30	
5	07/03/2022	JOC	Kestrel	1	10:49	130							130	
5	07/03/2022	JOC	Buzzard	1	13:32				60				60	
5	07/03/2022	JOC	Buzzard	1	14:54				60	30	60		150	
3	03/03/2022	JOC	Buzzard	1	9:45			60	90				150	
3	03/03/2022	JOC	Golden Plover	30	10:55				120				120	
3	03/03/2022	JOC	Buzzard	2	11:10			60	60	60	240		420	
3	03/03/2022	JOC	Buzzard	1	11:20		20	40					60	
3	03/03/2022	JOC	Buzzard	2	12:00				60	60	120		240	
3	03/03/2022	JOC	Buzzard	1	13:10		20						20	
3	03/03/2022	JOC	Buzzard	1	15:59			10	15	15	60		100	

VP	Date	Surveyor	Species	Number	Time	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration	Notes
PD VP2	13/05/2021	GG	Buzzard	1	15:11			5	10	15	150		180	
PD VP2	13/05/2021	GG	Buzzard	1	15:23			15	15				30	
PD VP2	13/05/2021	GG	Kestrel	1	15:32		30	15	15	15	45		120	
PD VP2	13/05/2021	GG	Buzzard	1	16:04						90		90	
PD VP2	14/04/2021	KN	Kestrel	1	08:30					30			30	
PD VP2	14/04/2021	KN	Buzzard	1	09:00			15	50				75	
PD VP2	14/04/2021	KN	Kestrel	1	08:30					30			30	
PD VP2	14/04/2021	KN	Buzzard	1	09:00			15	50				75	
PD VP2	14/04/2021	KN	Kestrel	1	14:30					90			90	

A13.4.2.1.4 Breeding 2022

VP Name	Date	Observer	Species	Number	Time of sighting	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration (s)	Bird Notes
PD VP1	25/04/2022	DMC	Kestrel	1	11:58		60						60	
5	27/04/2022	DMC	Buzzard	2	10:48			30	180				210	
5	27/04/2022	DMC	Kestrel	1	11:20		120						120	
5	27/04/2022	DMC	Raven	1	11:27		45	45					90	
5	27/04/2022	DMC	Raven	1	11:31	10	20						30	
5	27/04/2022	DMC	Buzzard	1	11:34			30					30	
5	27/04/2022	DMC	Buzzard	1	11:40	20	10						30	
5	27/04/2022	DMC	Buzzard	1	14:07		5	60					65	
5	27/04/2022	DMC	Kestrel	1	14:12		40						40	
5	27/04/2022	DMC	Kestrel	1	14:52		35						35	
5	27/04/2022	DMC	Buzzard	1	16:04		30	60					90	
6	28/04/2022	CK	Buzzard	1	10:56					60	180		240	BZ observed flying over G(180) & RG(60)
6	28/04/2022	CK	Buzzard	1	12:46					120	60	120	300	BZ observed flying over HB(20), RG(200) & G(80)
5	18/05/2022	ML	Kestrel	1	15:05		10						10	1 K hunting over forestry for 10s.
5	18/05/2022	ML	Buzzard	1	15:08	5							5	1 Bz circling over RG for 5s.
5	18/05/2022	ML	Buzzard	2	15:15	10							10	2 Bz displaying over forestry for 10s.
5	18/05/2022	ML	Kestrel	1	16:26			25					25	1 K hovering over RG for 25s.
5	18/05/2022	ML	Sparrowhawk	1	19:00	5							5	1 SH flying over RG for 5s.
6	24/05/2022	DMC	Buzzard	1	9:50		20						20	
6	24/05/2022	DMC	Buzzard	2	11:19		60	60					120	
6	24/05/2022	DMC	Kestrel	1	14:26		60						60	
PD VP1	28/06/2022	DMC	Buzzard	1	16:26		10	20	30				60	

VP Name	Date	Observer	Species	Number	Time of sighting	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration (s)	Bird Notes
PD VP1	28/06/2022	DMC	Raven	1	18:34			30					30	
5	27/06/2022	DMC	Buzzard	1	14:41			60	10	30			100	
5	27/06/2022	DMC	Kestrel	1	16:08	2	13	50					65	Caught prey
5	27/06/2022	DMC	Kestrel	1	16:28	2	58	10					70	Caught prey
5	27/06/2022	DMC	Peregrine	1	18:37			5	25				30	
5	27/06/2022	DMC	Kestrel	1	19:00		10	50					60	
5	27/06/2022	DMC	Raven	1	19:11			30					30	
PD VP1	12/07/2022	DMC	Buzzard	1	12:28		10	30	60				100	
PD VP1	12/07/2022	DMC	Sparrowhawk	1	15:29			30					30	
5	13/07/2022	DMC	Buzzard	1	15:00			30					30	
5	13/07/2022	DMC	Raven	2	15:12	30							30	
5	13/07/2022	DMC	Buzzard	1	15:36		360						360	
5	13/07/2022	DMC	Kestrel	4	15:37		1200						1200	
5	13/07/2022	DMC	Kestrel	5	16:05		900						900	
5	13/07/2022	DMC	Raven	6	16:55				60				60	
5	13/07/2022	DMC	Kestrel	5	18:32		2700						2700	
5	13/07/2022	DMC	Buzzard	1	19:21			60	120				180	
5	13/07/2022	DMC	Kestrel	5	20:02		1200						1200	Swift pair
6	14/07/2022	DMC	Kestrel	1	11:16			40					40	carrying prey
6	14/07/2022	DMC	Buzzard	1	12:05			30	30				60	
5	08/08/2022	DMC	Kestrel	1	14:57		120						120	
5	08/08/2022	DMC	Kestrel	1	15:20		120	60					180	
5	08/08/2022	DMC	Kestrel	1	15:33		300	60					360	
5	08/08/2022	DMC	Kestrel	1	15:56		10	60					70	
5	08/08/2022	DMC	Kestrel	1	16:13		180	60					240	
5	08/08/2022	DMC	Raven	1	16:19		10	20					30	
5	08/08/2022	DMC	Raven	1	17:00			60					60	
5	08/08/2022	DMC	Buzzard	1	18:10			45					45	

VP Name	Date	Observer	Species	Number	Time of sighting	<10m	10-20m	20-30m	30-40m	40-50m	50-160m	>160m	Total Duration (s)	Bird Notes
5	08/08/2022	DMC	Kestrel	1	18:40		60						60	
5	08/08/2022	DMC	Kestrel	4	18:53		1200						1200	
6	09/08/2022	DMC	Kestrel	1	13:16		30	90					120	
6	09/08/2022	DMC	Sparrowhawk	1	15:31			5	30				35	
6	09/08/2022	DMC	Buzzard	1	16:26			120					120	
PD VP1	10/08/2022	DMC	Grey Heron	1	11:36		30	30					60	
PD VP1	10/08/2022	DMC	Buzzard	1	14:26			60	60				120	
PD VP1	10/08/2022	DMC	Sparrowhawk	1	14:51		30						30	
PD VP1	13/09/2022	DMC	Buzzard	2	11:18		10	45					55	2 BZ circling together.
6	12/09/2022	DMC	Raven	1	11:17			35					35	
6	12/09/2022	DMC	Kestrel	1	14:24		30						30	
6	12/09/2022	DMC	Buzzard	1	14:48		10	30					40	
6	12/09/2022	DMC	Buzzard	2	16:27			80					80	2 BZ circling together.

A13.4.2.1.5 Winter 2023/2024

VP Name	Date	Observer	Species	Number	Time of Sighting	< 10m	10-20m	20-30m	30-40m	40-50m	50-200m	> 200m	Total Duration (s)	Bird Notes
PDVP1	18/10/2023	NA	Kestrel	1	10:52	8	2						10	
PDVP1	18/10/2023	NA	Kestrel	1	11:36	5	10	5					20	
PDVP1	18/10/2023	NA	Sparrowhawk	1	11:44	11	1						12	
PDVP1	18/10/2023	NA	Raven	2	11:59		5	15	20	10			50	
PDVP1	18/10/2023	NA	Buzzard	1	13:03					50	40		90	Being mobbed by a raven
PDVP1	18/10/2023	NA	Raven	1	13:10	5	10	10					25	
PDVP1	18/10/2023	NA	Buzzard	1	13:21			20	30				50	
PDVP1	18/10/2023	NA	Raven	2	13:37	5	15	15	5				40	
PDVP1	18/10/2023	NA	Kestrel	1	14:06	2	1	1	4				8	
PDVP1	18/10/2023	NA	Kestrel	1	14:09	25	5						30	
PDVP1	06/11/2023	NA	Kestrel	1	13:14		20	45					65	
PDVP1	06/11/2023	NA	Buzzard	1	13:16		80	70					150	
PDVP1	06/11/2023	NA	Kestrel	1	13:20		2	8					10	
PDVP1	06/11/2023	NA	Buzzard	1	13:22		10	20					30	
PDVP1	06/11/2023	NA	Buzzard	1	13:22	5	25	30	10				70	
PDVP1	06/11/2023	NA	Buzzard	1	13:42	5	10	30					45	
PDVP1	06/11/2023	NA	Kestrel	1	13:54	5	15						20	
PDVP1	06/11/2023	NA	Kestrel	1	14:02					50	80		130	
PDVP1	06/11/2023	NA	Kestrel	1	14:11			160	130				290	
PDVP1	06/11/2023	NA	Buzzard	1	14:19	5	15	40	60	20			140	
PDVP1	06/11/2023	NA	Buzzard	1	14:25	5	35	90	60				190	
PDVP1	06/11/2023	NA	Buzzard	1	14:26		30	80	70	20			200	
PDVP1	06/11/2023	NA	Buzzard	1	14:37	5	15	15	15				50	
PDVP1	06/11/2023	NA	Kestrel	1	14:44	5	5	20	15	10			55	
PDVP1	06/11/2023	NA	Buzzard	1	14:49	10	90	60	30				190	

VP Name	Date	Observer	Species	Number	Time of Sighting	< 10m	10-20m	20-30m	30-40m	40-50m	50-200m	> 200m	Total Duration (s)	Bird Notes
VP5	24/10/2023	LK	Buzzard	1	14:50	20							20	
VP5	24/10/2023	LK	Buzzard	1	15:17		40	45					85	
VP5	24/10/2023	LK	Kestrel	1	15:46		15						15	Flew across field; perched on fencepost; flew to the ground; flew to tree and perched; through flew back past farmyard.
VP5	24/10/2023	LK	Kestrel	1	15:59	10							10	
VP5	24/10/2023	LK	Mallard	4	16:18		8							
VP5	24/10/2023	LK	Kestrel	1	16:23	26							26	
VP5	24/10/2023	LK	Kestrel	1	16:40	6							6	
VP5	24/10/2023	LK	Kestrel	1	16:42	5							5	Perched on chimney of house
VP5	24/10/2023	LK	Kestrel	1	17:22	12							12	
VP5	24/10/2023	LK	Kestrel	1	17:28	8	10						18	Flew to telephone pole; perched; attacked by rooks.
VP5	24/10/2023	LK	Kestrel	1	17:31	11							11	
VP5	24/10/2023	LK	Kestrel	1	17:50		13						13	
VP5	24/10/2023	LK	Kestrel	1	17:51	13							13	
VP7	17/10/2023	LK	Kestrel	1	11:12		10						10	
PDVP1	08/11/2023	LK	Buzzard	1	13:34	3	20						23	Being attacked by corvids
PDVP1	08/11/2023	LK	Kestrel	1	13:40	8	10						18	Hunting, then attacked by corvid
PDVP1	08/11/2023	LK	Kestrel	1	16:11		128						128	

VP Name	Date	Observer	Species	Number	Time of Sighting	< 10m	10-20m	20-30m	30-40m	40-50m	50-200m	> 200m	Total Duration (s)	Bird Notes
PDVP1	08/11/2023	LK	Kestrel	1	16:16		58						58	
PDVP1	08/11/2023	LK	Buzzard	1	16:42		100	80					180	
VP5	20/11/2023	HM	Kestrel	1	12:31		2	5					7	
VP5	20/11/2023	HM	Kestrel	1	12:53	5	5	20					30	
VP5	20/11/2023	HM	Kestrel	1	13:12			25					25	
VP5	20/11/2023	HM	Kestrel	2	13:17		40	20					60	
VP5	20/11/2023	HM	Kestrel	1	13:23		180	40					220	
VP5	20/11/2023	HM	Kestrel	1	13:28	15							15	
VP5	20/11/2023	HM	Kestrel	1	13:34		2	3	10				15	
VP5	20/11/2023	HM	Kestrel	1	13:43		20	40					60	
VP5	20/11/2023	HM	Kestrel	1	14:07		85						85	
VP5	20/11/2023	HM	Kestrel	1	14:36			40	20				60	
VP5	20/11/2023	HM	Sparrowhawk	1	14:50			60					60	
VP5	20/11/2023	HM	Kestrel	1	14:59		30	30					60	
VP5	20/11/2023	HM	Kestrel	1	15:51				60				60	
VP5	20/11/2023	HM	Buzzard	1	15:57			50	10				60	
VP5	20/11/2023	HM	Buzzard	1	16:19		30						30	
VP5	20/11/2023	HM	Kestrel	1	16:29		15						15	
VP5	21/11/2023	HM	Kestrel	1	13:44		15	5					20	Over clear fell for 20 seconds can't get this to change on Qfield
VP5	21/11/2023	HM	Buzzard	1	13:49	10							10	
VP5	21/11/2023	HM	Buzzard	1	14:16	40	20						60	
VP5	21/11/2023	HM	Kestrel	1	14:14	40	20						60	Kestrel attacking buzzard
VP5	21/11/2023	HM	Kestrel	1	14:29	30							30	
VP5	21/11/2023	HM	Kestrel	2	14:33				120				120	

VP Name	Date	Observer	Species	Number	Time of Sighting	< 10m	10-20m	20-30m	30-40m	40-50m	50-200m	> 200m	Total Duration (s)	Bird Notes
VP7	09/11/2023	LK	Kestrel	1	12:22	8							8	
VP7	10/11/2023	LK	Kestrel	1	10:16		24						24	
PDVP1	02/01/2024	JOH	Raven	1	13:02			30					30	
PDVP1	02/01/2024	JOH	Raven	1	13:59		40						40	Perches on telephone pole
VP5	12/12/2023	NL	Common Gull	2	12:50			25					25	
PDVP1	07/02/2024	JOC	Raven	1	13:08		25						25	
PDVP1	07/02/2024	JOC	Raven	2	14:01		40	20	60				120	
PDVP1	07/02/2024	JOC	Kestrel	1	14:05			25					25	
VP5	07/02/2024	KME	Kestrel	1	10:13		30						30	
VP5	07/02/2024	KME	Kestrel	1	11:04		15						15	
VP7	17/01/2024	JOH	Raven	2	11:23				15				15	
VP7	17/01/2024	JOH	Snipe	2	11:34	10							10	Chased by RO
VP7	17/01/2024	JOH	Snipe	2	11:57	15							15	Flushed by fox
VP7	17/01/2024	JOH	Buzzard	1	13:42			35	10				45	Perches in tree in between circling. Mobbed by flock of RO and HC
PDVP1	31/01/2024	JOH	Raven	1	09:29			80					80	Chased by JD
PDVP1	31/01/2024	JOH	Raven	1	13:40	5	20						25	Perched on ground feeding on bread for 10 mins
PDVP1	31/01/2024	JOH	Buzzard	1	14:21			20	50	100	280		450	
PDVP1	31/01/2024	JOH	Raven	1	15:08	10							10	
VP7	30/01/2024	JOH	Sparrowhawk	1	12:19	25							25	
PDVP1	14/03/2024	NA	Buzzard	1	11:01	25	60	20					105	
PDVP1	14/03/2024	NA	Buzzard	1	11:08	10	20	40	20				90	
PDVP1	14/03/2024	NA	Kestrel	1	11:14		15	20	5				40	

VP Name	Date	Observer	Species	Number	Time of Sighting	< 10m	10-20m	20-30m	30-40m	40-50m	50-200m	> 200m	Total Duration (s)	Bird Notes
PDVP1	14/03/2024	NA	Kestrel	1	11:30	5	42	5					52	
PDVP1	14/03/2024	NA	Buzzard	1	11:40	10	30	80	20				140	
PDVP1	14/03/2024	NA	Kestrel	1	11:46	20	40	20					80	
PDVP1	14/03/2024	NA	Buzzard	1	12:01	5	40	30					75	
PDVP1	14/03/2024	NA	Kestrel	1	12:05	40	140	20					200	
PDVP1	14/03/2024	NA	Kestrel	1	12:10	20	10						30	
PDVP1	14/03/2024	NA	Kestrel	1	12:14		45	100	20				165	
PDVP1	14/03/2024	NA	Buzzard	2	12:17		5	10	30	30	40		115	
PDVP1	14/03/2024	NA	Buzzard	2	12:27	10	10	30	50	50	20		170	
PDVP1	14/03/2024	NA	Kestrel	1	12:30			25					25	
PDVP1	14/03/2024	NA	Buzzard	1	12:34	5	15	55					75	
PDVP1	14/03/2024	NA	Buzzard	1	15:39		30	70	140	300	60		600	
PDVP1	14/03/2024	NA	Buzzard	1	12:43		20	80	100	30			230	
PDVP1	14/03/2024	NA	Buzzard	1	13:00		60	200	200	20			480	
PDVP1	14/03/2024	NA	Buzzard	1	13:02			50	100	100			250	
PDVP1	14/03/2024	NA	Sparrowhawk	1	13:02	10	10						20	Mobbing buzzard
PDVP1	14/03/2024	NA	Buzzard	2	13:13	5	145	50	10				210	
PDVP1	14/03/2024	NA	Buzzard	1	13:19		30	120	20				170	
PDVP1	14/03/24	NA	Sparrowhawk	1	13:37	10	30	100	80				220	
PDVP1	14/03/24	NA	Buzzard	1	14:33		15	110	5				130	
PDVP1	14/03/2024	NA	Buzzard	1	14:35		15	110	20				145	
PDVP1	14/03/2024	NA	Buzzard	1	14:40		20	85	10				115	
PDVP1	14/03/2024	NA	Peregrine	1	14:41	5	5	5					15	
PDVP1	14/03/2024	NA	Sparrowhawk	1	14:51	10	15	20	40	30			115	
PDVP1	14/03/24	NA	Buzzard	1	14:58	10	20	120	30				180	
PDVP1	14/03/2024	NA	Buzzard	1	15:05	5	15	5					25	
PDVP1	14/03/2024	NA	Buzzard	1	15:11		5	30					35	
PDVP1	14/03/2024	NA	Buzzard	1	15:15		20	40	20				80	

VP Name	Date	Observer	Species	Number	Time of Sighting	< 10m	10-20m	20-30m	30-40m	40-50m	50-200m	> 200m	Total Duration (s)	Bird Notes
PDVP1	14/03/2024	NA	Sparrowhawk	1	15:20		2	3					5	
PDVP1	14/03/2024	NA	Kestrel	1	15:22		10	20	20	10			60	
PDVP1	14/03/2024	NA	Kestrel	1	15:22	10	30	80	80	80			280	Mobbing other kestrel
PDVP1	14/03/2024	NA	Buzzard	1	15:38				65				65	
PDVP1	14/03/2024	NA	Sparrowhawk	1	15:47		10	10	15	10			45	
PDVP1	14/03/2024	NA	Buzzard	1	15:58		10	50	5				65	
PDVP1	14/03/2024	NA	Buzzard	2	16:00		30	70	20				120	
PDVP1	14/03/2024	NA	Buzzard	1	16:09	20	80	100	100	15			315	
PDVP1	14/03/2024	NA	Buzzard	1	16:49	5	20	50	15				90	
PDVP1	14/03/2024	NA	Buzzard	2	16:54	30	200	200	200	30			660	
PDVP1	14/03/2024	NA	Buzzard	1	16:59	10	40	100	100	100	10		360	
PDVP1	14/03/2024	NA	Lesser Black-backed Gull	4	17:24						55		55	
VP5	13/03/2024	KME	Kestrel	1	07:47		30						30	
VP5	13/03/2024	KME	Kestrel	1	08:01		60						60	
VP5	13/03/2024	KME	Snipe	2	08:24	5	20	5					30	
VP5	15/03/2024	NA	Sparrowhawk	1	09:08	5	15	30					50	
VP5	15/03/2024	NA	Kestrel	1	09:23	50	10						60	
VP5	15/03/2024	NA	Buzzard	1	09:31			10					10	
VP5	15/03/2024	NA	Kestrel	1	09:33	30	500	30					560	
VP5	15/03/2024	NA	Kestrel	1	09:40		30	20					50	
VP5	15/03/2024	NA	Buzzard	1	09:48				50				50	
VP5	15/03/2024	NA	Kestrel	1	09:54	40	250	100					390	
VP5	15/03/2024	NA	Buzzard	2	10:08					130	50		180	
VP5	15/03/2024	NA	Buzzard	1	10:17		30	60	150	100	50		390	
VP5	15/03/2024	NA	Kestrel	1	10:20	10	30	100	70	30			240	
VP5	15/03/2024	NA	Kestrel	1	10:26			90					90	

VP Name	Date	Observer	Species	Number	Time of Sighting	< 10m	10-20m	20-30m	30-40m	40-50m	50-200m	> 200m	Total Duration (s)	Bird Notes
VP5	15/03/2024	NA	Kestrel	1	10:28	50	50						100	
VP5	15/03/2024	NA	Buzzard	1	10:28		40	40	40				120	
VP5	15/03/2024	NA	Sparrowhawk	1	10:42	20	20	40	40				120	
VP5	15/03/2024	NA	Buzzard	1	10:42			20	30	10			60	
VP5	15/03/2024	NA	Sparrowhawk	1	10:47	15							15	
VP5	15/03/2024	NA	Buzzard	1	10:54		25	45	20				90	
VP5	15/03/2024	NA	Sparrowhawk	1	11:41	40	50	50	10				150	
VP5	15/03/2024	NA	Kestrel	1	11:35			200	150	80			430	
VP5	15/03/2024	NA	Buzzard	2	11:35	30	70	100	100	80			380	
VP5	15/03/2024	NA	Buzzard	2	11:55	50	100	140	140	40			470	
VP5	15/03/2024	NA	Buzzard	1	11:55	30	100	100	150	50			430	
VP5	15/03/2024	NA	Buzzard	2	11:58		20	50	100	50	50		270	
VP5	15/03/2024	NA	Buzzard	1	12:08	5	25						30	
VP5	15/03/2024	NA	Buzzard	1	12:13	8							8	
VP5	15/03/2024	NA	Sparrowhawk	1	12:32		30	60					90	
VP5	15/03/2024	NA	Kestrel	1	12:36	60	140	60					260	
VP5	15/03/2024	NA	Kestrel	1	12:39		70						70	
VP5	15/03/2024	NA	Buzzard	1	12:38		50	150	150	50			400	
VP5	15/03/2024	NA	Buzzard	1	12:43		100	40					140	
VP5	15/03/2024	NA	Buzzard	2	12:44				20	60	30		110	
VP5	15/03/2024	NA	Buzzard	1	12:54	30	10						40	
VP5	15/03/2024	NA	Buzzard	1	12:56						150		150	
VP5	15/03/2024	NA	Buzzard	1	13:10	5	5	10	30				50	
VP5	15/03/2024	NA	Buzzard	1	13:23	30	20						50	
VP5	15/03/2024	NA	Buzzard	1	13:28	15	40	5					60	
VP7	28/03/2024	MGW	Golden Plover	28	08:40					360	360		720	Mapnote 1 and 6 are the same.

VP Name	Date	Observer	Species	Number	Time of Sighting	< 10m	10-20m	20-30m	30-40m	40-50m	50-200m	> 200m	Total Duration (s)	Bird Notes
VP7	28/03/2024	MGW	Golden Plover	28	08:55				110	200			310	Mapnote 2 and 8 are the same.
VP7	28/03/2024	MGW	Golden Plover	35	09:20				100	200	330		630	1st group.
VP7	28/03/2024	MGW	Golden Plover	75	09:20					100	325		425	2nd group, 110 in total.
VP7	28/03/2024	MGW	Buzzard	1	09:35						65		65	
VP7	28/03/2024	MGW	Golden Plover	31	09:50					300	415		715	Mapnote 1 and 6 are the same.
VP7	28/03/2024	MGW	Grey Heron	1	10:15			15					15	
VP7	28/03/2024	MGW	Golden Plover	90	10:35					300	225		525	Mapnote 2 and 8 are the same.
VP7	28/03/2024	MGW	Kestrel	1	10:45				75	75			150	
VP7	28/03/2024	MGW	Golden Plover	90	12:05				65	110			175	
VP7	28/03/2024	MGW	Buzzard	2	12:15				110	210	230		550	
VP7	28/03/2024	MGW	Buzzard	3	12:15				130	130			260	5 birds up at the same time.
VP7	28/03/2024	MGW	Grey Heron	1	13:20			45					45	
VP7	28/03/2024	MGW	Golden Plover	100	13:30						65		65	

A13.4.3 Breeding Bird Survey Data

Provided below are the Data tables for the breeding bird surveys conducted to provide the ornithological baseline for the Ballynalacken Windfarm Project.

Breeding seasons were conducted between March 2021 to September 2021 and March 2022 to September 2022.

Target groups were Breeding Raptors (Peregrine/Kestrel, Buzzard and Barn Owl); Breeding Waders; & Breeding Woodcock Surveys.

A13.4.3.1 Breeding Raptor Data

Breeding Raptor Results

Date	Sign/Sighting	Species	Sex	Number	Time of sighting
21/04/2021	Hunting	Kestrel		1	7:40
21/04/2021	Soaring	Buzzard		1	8:40
21/04/2021	Hunting	Kestrel	Female	1	9:30
21/04/2021	Hunting	Kestrel	Male	1	10:00
21/04/2021	Hunting	Kestrel		1	11:00
21/04/2021	Soaring	Buzzard		2	11:10
21/04/2021	Soaring	Buzzard		1	11:50
21/04/2021	Soaring	Buzzard		1	12:30
21/04/2021	Hunting	Kestrel		1	13:05
21/04/2021	Soaring	Buzzard		1	14:10
21/04/2021	Soaring	Buzzard		1	15:00
25/05/2022		Kestrel		1	13:31
27/05/2021	Soaring	Buzzard		1	8:30
27/05/2021	Hunting	Kestrel		1	9:10
27/05/2021	Hunting	Kestrel	Male	1	10:20
27/05/2021	Hunting	Buzzard		1	10:40
27/05/2021	Hunting	Kestrel	Male	1	11:00
27/05/2021	Soaring	Buzzard		1	11:50
27/05/2021	Soaring	Buzzard		1	12:20

27/05/2021	Hunting	Buzzard		1	13:00
27/05/2021	Soaring	Buzzard		1	13:20
22/06/2021	Hunting	Buzzard		1	11:20
22/06/2021	Hunting	Sparrowhawk		1	12:10
22/06/2021	Soaring	Buzzard		1	12:30
22/06/2021	Hunting	Buzzard		1	13:10
22/06/2021	Hunting	Kestrel	Male	1	13:30
22/06/2021	Soaring	Buzzard		1	14:10
22/06/2021	Hunting	Kestrel	Male	1	15:10
22/06/2021	Hunting	Buzzard		1	15:20
22/06/2021	Hunting	Kestrel	Male	1	15:55
22/06/2021	Soaring	Buzzard		1	16:20
22/06/2021	Soaring	Buzzard		1	16:50

Breeding Raptor Suitability Effort April 2022

Date	Observer	Rain	Cloud	Visibility (km)	Wind Speed	Wind Direction	Temp	Start Time	End Time	Duration of survey (sec)	Location of sighting (co-ordinate /Grid ref)	Kestrel/ Peregrine sighting	Kestrel/ Peregrine Evidence	Site Type	Suitability of the site for Barn Owls	Map Note
13/ 04/ 2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	645780 678337	Nil sightings	Nil sightings	Traditional Agricultural building	High	A
4/13/ 2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	648135 672971	Nil sightings	Nil sightings	Traditional Agricultural building	High	B
4/13/ 2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	647974 674113	Nil sightings	Nil sightings	Traditional Agricultural building	Intermediate	C
4/13/ 2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	648163 677373	Nil sightings	Nil sightings	Traditional Agricultural building	High	D
4/13/ 2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	647804 678538	Nil sightings	Nil sightings	Traditional Agricultural building	High	E
4/13/ 2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	645394 677546	Nil sightings	Nil sightings	Ruin	High	F
4/13/ 2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	646175 676704	Nil sightings	Nil sightings	Ruin	High	G

Breeding Raptor Activity Efforts

Date	Observer	Rain	Cloud	Visibility (km)	Wind Speed	Wind Direction	Temp.	Start Time	End Time	Duration of survey (sec)
21/04/2021	MGW	Dry	2/8	16	F1	N	5	7:30	16:00	36800
27/05/2021	MGW	Light	3/8	16	F1	SE	11	8:15	13:30	18900
22/06/2021	MGW	Dry	6/8	16	F1	N	15	11:15	17:00	20700
25/05/2022	DMC	Occasional showers	8/8	16	F4	WSW	14	11:05	12:05	3600
25/05/2022	DMC	Occasional showers	8/8	16	F4	WSW	14	12:21	13:21	3600
25/05/2022	DMC	Occasional showers	8/8	16	F4	WSW	14	13:31	14:31	3600
23/06/2022	OV	Dry	6/8	20	F1	S	15	7:00	8:00	3600
23/06/2022	OV	Dry	6/8	20	F1	S	15	8:02	9:02	3600
23/06/2022	OV	Dry	6/8	20	F1	S	15	10:30	11:30	3600
23/06/2022	OV	Dry	6/8	20	F1	S	15	12:00	13:00	3600
23/06/2022	EH	Dry	8/8	1	F1	S	15	10:20	11:20	3600
23/06/2022	EH	Dry	8/8	1	F1	S	15	11:50	12:50	3600
15/07/2022	DMC	None	7/8	16	F2	WNW	20	10:31	11:31	3600
15/07/2022	DMC	None	7/8	16	F2	WNW	20	11:37	13:07	5400
15/07/2022	DMC	None	7/8	16	F2	WNW	20	13:16	14:46	5400

A13.4.3.2 Barn Owl

Barn Owl Suitability Results

Date	Observer	Rain	Cloud	Visibility (km)	Wind Speed	Wind Direction	Temp.	Start Time	End Time	Duration of survey (sec)	Time of sighting	Location of sighting (co-ordinate/Grid ref)	Barn Owl Evidence	Site Type	Suitability of the site for Barn Owls	Notes
13/04/2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	10:30	645780 678337	Nil sightings	Traditional Agricultural building	High	
13/04/2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	12:50	648135 672971	Nil sightings	Traditional Agricultural building	High	
13/04/2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	12:58	647974 674113	Nil sightings	Traditional Agricultural building	Intermediate	
13/04/2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	14:16	648163 677373	Nil sightings	Traditional Agricultural building	High	
13/04/2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	14:22	647804 678538	Nil sightings	Traditional Agricultural building	High	
13/04/2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	14:32	645394 677546	Nil sightings	Ruin	High	Outside buffer
13/04/2022	CK	Dry	8/8	20	F1	S	12	10:10	15:00	17400	14:40	646175 676704	Nil sightings	Ruin	High	

Barn Owl Activity Results

Date	Observer	Rain	Cloud	Visibility (km)	Wind Speed	Wind Direction	Temp	Start Time	End Time	Duration of survey (sec)	Time of sighting	Location of sighting (co-ordinate/Grid ref)	Barn Owl Evidence	Site Type	Suitability of the site for Barn Owls	Notes
19/07/2021	EMD	None	0/8				24	20:40	22:40		Nil Sightings					
27/06/2022	DMC	Occasional showers	8/8	16	F2	SW	13	21:57	23:27	4500	21:57	646172.0, 676698.5	Nil sightings	Traditional Agricultural building	Intermediate	
13/07/2022	DMC	None	1/8	16	F2	W	15	21:49	23:19	21600	21:49	646170.0, 676704.5	Nil sightings	Traditional Agricultural building	Intermediate	Bats foraging around trees next to building
08/08/2022	DMC	None	1/8	16	F1	W	16	21:10	22:40	5400	21:10	646170.0, 676704.5	Nil sightings	Traditional Agricultural building	High	

A13.4.3.3 Breeding Wader Data

Breeding Wader Survey Efforts

survey	Date	Observer	Rain	Cloud	Visibility (km)	Wind Speed	Wind Direction	Temp.	Start Time	End Time	Duration of survey (sec)
Breeding Waders	21/04/2021	MGW	Dry/None	2/8	16	F1	N	5	07:30:00	16:00:00	30600
Breeding Waders	25/05/2021	MGW	Dry	8/8	16	F2	W	9	06:50:00	11:50:00	18000
Breeding Waders	22/06/2021	MGW	Dry	7/8	13	F1	N	5	05:30:00	11:15:00	20700
Breeding Waders	23/07/2021	EC	Dry	0/8	16	F2	W	22	06:30:00	09:30:00	10800
Breeding Waders	21/04/2022	CK	Dry	5/8	16	F2	SE	10	07:20:00	09:00:00	6000
Breeding Waders	25/05/2022	DMC	None	8/8	16	F3	WSW	13	08:45:00	09:14:00	1740
Breeding Waders	25/05/2022	DMC	None	8/8	16	F3	WSW	13	09:17:00	09:56:00	1980
Breeding Waders	25/05/2022	DMC	None	8/8	16	F3	WSW	13	09:59:00	10:20:00	1260
Breeding Waders	25/05/2022	DMC	None	8/8	16	F3	WSW	13	10:26:00	10:57:00	1860
Breeding Waders	23/06/2022	EH	Dry	4/8	15	F1	NE	13	06:45:00	09:05:00	10800

Breeding Wader Results

survey	Date	Species	Number	Time of sighting	Notes
Breeding Waders	21/04/2021	Nil Sightings			
Breeding Waders	21/04/2021	Snipe_SN	1	10:30	Flushed
Breeding Waders	21/04/2021	Nil Sightings			
Breeding Waders	21/04/2021	Nil Sightings			
Breeding Waders	25/05/2021	Nil Sightings			Nil sightings during this survey effort. SN sightings were recorded during the woodcock surveys on the 05/06/21 and 06/05/21. Male heard in square 51/52. Heard flight call 3 times in the same area. Also in square 30.
Breeding Waders	22/06/2021	Nil Sightings			
Breeding Waders	23/07/2021	Nil Sightings			
Breeding Waders	21/04/2022	Nil Sightings			Section of bog with low heather. Multiple RG fields with plentiful rushes & gorse. Sheep grazing. Numerous skylark. No waders or evidence of wader nests found.

Breeding Waders	21/04/2022	Nil Sightings			RG field with rushes, lots of dense rank grasses & immature gorse cover. No evidence of breeding waders. Left prematurely due to cattle grazing in area.
Breeding Waders	21/04/2022	Nil Sightings			Rushy field of RG. No evidence of breeding waders.
Breeding Waders	21/04/2022	Nil Sightings			RG field. No evidence of breeding waders seen.
Breeding Waders	25/05/2022	Nil Sightings			rushy wet field
Breeding Waders	25/05/2022	Nil Sightings			Rushy fields with half of area covered in low heather and bog cotton; plentiful MP
Breeding Waders	25/05/2022	Nil Sightings			wet field with gorse
Breeding Waders	25/05/2022	Nil Sightings			rushy wet field
Breeding Waders	23/06/2022	Nil Sightings			Local said that it fills with water in Autumn/Winter and has seen some wildfowl - Couldn’t identify species

A13.4.3.4 Breeding Woodcock Surveys

Breeding Woodcock Surveys

Date	Observer	Rain	Wind Speed	Wind Direction	Start Time	End Time	Duration of survey (sec)	Coordinates (ITM)	Species	No. seen	No. heard	No. seen & heard	Sex	Habitat	Notes
05/05/ 2021	MGW	Dry/None	F1	N	20:45	22:00	4500	648181 674811 (Site 1)	Woodcock		1	4		Conifer	Snipe_SN x2 heard flight call
06/05/ 2021	MGW	Dry/None	F1	NW	20:45	22:00	4500	649431 676824 (Site 2)	Woodcock		1			Conifer	Snipe_SN x3 heard flight call
14/05/ 2021	MGW	Dry/None	F1	S	21:05	22:20	4500	649431 676824 (Site 2)	Woodcock	3	1	2		Conifer	
08/06/ 2021	MGW	Dry	F2	S	21:35	22:50	4500	649431 676824	Woodcock		1			Conifer	1 Heard.
09/06/ 2021	MGW	Dry	F1	S	21:35	22:50	4500	648181 674811	Woodcock			3		Conifer	3 Seen + Heard.
10/06/ 2021	MGW	Dry	F2	S	21:40	22:55	4500	647343 676936	Nil Sightings					Conifer	
23/05/ 2022	DMC	None	F1	SW	21:17	22:32	4500	649051.4 674108.9	Woodcock	2	1	3	Male	Conifer	
18/05/ 2022	ML	None	F1	SW	21:12	22:27	4500	649469 674332	Nil Sightings						648872, 673689 Curlew seen at 21:49
28/06/ 2022	DMC	None	F2	SW	21:42	22:57	4500	649050.5 674114.0	Woodcock			7		Conifer	Woodcock flying in a pair calling to each other 1st & 2nd bout, Male roding after

A13.4.3.5 Kingfisher - Watercourse Suitability Surveys

Survey	Watercourse	Date	Surveyor	Start Time	Finish Time	Target Species recorded	Signs of target sp.	Signs of target sp Notes	Nesting/habitat Potential	Nesting/habitat Potential Notes
Watercourse Survey	(Rathduff_15; 15R24; IE_SE_15N011400)	18/05/2022	OV	12:30	13:40	Nil Sightings	No		Low	No water present at crossing point
Kingfisher-Dipper-Wagtail	(Rathduff_15; 15R24; IE_SE_15N011400)	21/04/2022	CK	9:45	11:15	Nil Sightings			Low	No water present in stream eastern side @ crossing point.
Kingfisher-Dipper-Wagtail	(Rathduff_15; 15R24; IE_SE_15N011400)	21/04/2022	CK	9:45	11:15	Nil Sightings			Low	No dippers or wagtails present @ 644509 672748
Kingfisher-Dipper-Wagtail	(River Nore; 15N01; IE_SE_15N011400)	21/04/2022	CK	9:45	11:15	Nil Sightings			Intermediate	Possible banks for KF nesting @ 644136 672509 although river is quite low. Otter/Pine marten/mink mammal burrow @644308 671334. Prints unclear. Photos in folder.

A13.4.4 Hen Harrier Roost Surveys

Provided below are the Data tables for the Hen Harrier Roost Surveys conducted to provide the ornithological baseline for the Ballynalacken Windfarm Project.

Surveys were recorded in Winter 2021/2022 and Winter 2022/2023.

A13.4.4.1 Hen Harrier Roost Results

Survey	ITM Co-ordinates	Date	Observer	Rain	Cloud	Visibility (km)	Wind Speed	Wind Direction	Temp.	Start Time	End Time	Duration of survey (sec)	Species
HH Roost Watch	647036 675472	20/12/2021	RD	Dry	8/8	10	F1	SE	7	14:48	16:50	7200	Nil Sightings
HH Roost Watch	647515 676184	27/01/2022	MGW	Dry	6/8	16	F1	W	9	16:00	17:50	5400	Nil Sightings
HH Roost Watch	647460 676274	04/02/2022	RD	Dry	5/8	15	F1	SW	4	16:00	18:00	7200	Nil Sightings
HH Roost Watch	647540 676688	23/03/2022	CMCK	Dry/None	2/8	20	F2	SE	15	15:45	19:15	9000	Nil Sightings
HH Roost Watch	647602.36 676100.55	23/10/2023	LK	Constant Rain	8/8	5	F3	E	12	17:50	18:50	4200	Nil sightings
HH Roost Watch	647586.11 676076.81	07/11/2023	LK	None	6/8	20	F1	SW	10	16:20	17:20	3600	Nil sightings
HH Roost Watch	647454.25 676103.21	12/12/2023	DMC	None	6/8	10	F2	NNW	7	15:40	17:10	5400	Nil sightings
HH Roost Watch	647663.68 675881.09	22/01/2024	KME	Occasional showers	6/8	12	F3	W	5°c	15:24	17:24	7200	Nil sightings

HH Roost Watch	648006.51 674697.32	08/02/2024	JOC	Light drizzle	8/8	5	F2	E	7	16:56	18:06	4200	Nil Sightings
HH Roost Watch	647891.48 674615.53	12/03/2024	NA	None	7/8	12	F3	SW	14	17:59	18:59	3600	Nil sightings

A13.4.5 Ireland Wetland Bird Survey (I-WeBS) Results

Provided below is the species abundance results for the I-WeBS visits at the proposed Ballynalacken Windfarm Project in winter 2021/2022 and winter 2023/2024. This data is addressed in Section EIAR 13.3.6 of Chapter 13: Biodiversity.

For camera deployment dates, survey methodology, See Appendix 13.8.

A13.4.5.1 I-WeBS Counts 2021-2022

Species	Winter 2021/22				
	Jan	Feb	Mar	Dec	Grand Total
Black-headed Gull	0	0	11	0	**11**
Coot	1	2	2	0	**5**
Grey Heron	3	1	0	0	**4**
Little Grebe	3	0	0	0	**3**
Mallard	50	20	26	0	**96**
Moorhen	10	1	3	0	**14**
Mute Swan	22	15	8	0	**45**
Pochard	0	0	4	0	**4**
Teal	10	5	0	0	**15**

A13.4.5.2 I-WeBS Counts 2023/2024

Species	Winter 2023/2024						
	Oct	Nov	Dec	Jan	Feb	Mar	Total
Black-headed Gull		5		1			**6**
Common Gull		5					**5**
Coot	2	18					**20**
Dipper				1	1		**2**
Golden Plover		12					**12**
Grey Heron	6	3	1	4	1	2	**17**
Grey Wagtail				1			**1**
Kingfisher	1			1	1		**3**
Lapwing			63	206			**269**
Lesser Black-backed Gull				84			**84**
Little Egret		1	1	2	3		**7**
Little Grebe	5	6	1	4			**16**
Mallard	44	41	3	112	26	4	**230**
Moorhen	3	6	3	13	7	1	**33**
Mute Swan	5	12	6	28	9	3	**63**
Snipe				1			**1**
Teal			3	84			**87**
Whooper Swan			15				**15**
Wigeon				233		1	**234**

Appendix 13.5: Collision Risk Modelling

Appendix to Chapter 13: Biodiversity

Appendix 13.5: Collision Risk Modelling

Ecopower Developments Ltd.

Ballynalacken Wind Farm

Appendix 13.5 – Collision Risk Modelling

October 2024

INIS Environmental Consultants Ltd.

Suite 16,
Clare Technology Park,
Gort Road,
Ennis,
County Clare
Ireland.

Quality Assurance

The findings outlined within this report and the data we have provided are to our knowledge true and express our bona fide professional opinions. This report has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) Code of Professional Conduct. Where pertinent CIEEM Guidelines used in the preparation of this report include the *Guidelines for Ecological Report Writing* (CIEEM, 2017a), *Guidelines for Preliminary Ecological Appraisals* (CIEEM, 2017b) and *Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine* (CIEEM, 2019). CIEEM Guidelines include model formats for Preliminary Ecological Appraisal and Ecological Impact Assessment. Also, where pertinent, evaluations presented herein take cognisance of recommended Guidance from the EPA such as *Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2017), and in respect of European sites, *Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC* (European Commission, 2018).

Due cognisance has been given at all times to the provisions of the *Wildlife Acts 1976 - 2023,* the *European Union (Natural Habitats) Regulations. SI 378/2005*, the *European Communities (Birds and Natural Habitats) Regulations 2011,* EU Regulation on Invasive Alien Species under *EU Regulation 1143/2014*, the EU Birds *Directive 2009/147/EC* and the EU *Habitats Directive 92/43/EEC*.

No method of assessment can completely remove the possibility of obtaining partially imprecise or incomplete information. Any limitation to the methods applied or constraints however are clearly identified within the main body of this document.

Notice

This report was produced by INIS Environmental Consultants Ltd. (INIS) on behalf of Ecopower Developments Ltd., the client, for the specific purpose of undertaking an assessment of collision risk for target bird species at the proposed Ballynalacken Wind Farm, Co. Kilkenny, with all reasonable skill, care and due diligence within the terms of the contract with the client, incorporating our terms and conditions and taking account of the resources devoted to it by agreement with the client.

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Table of Contents

Appendices

A13.5.1. INTRODUCTION

Inis Environmental Consultants Ltd. (INIS) was commissioned to undertake an assessment of collision risk for potentially sensitive avian receptors at the proposed Ballynalacken Windfarm in Co. Kilkenny using standardised Collision Risk Modelling (CRM) methods.

A13.5.1.1. Constraints and Limitations

There are a number of constraints and limitation associated with pre-planning ecological assessments of potential development sites, as well as constraints and limitations inherent to the collection and analysis of field-based ecological data (Band *et al.* 2012; SNH, 2017).

The data evaluated here comprises:

- Bird flight data from timed Vantage Point (VP) watches, clipped to the proposed development footprint with a 1km buffer and consisting of flights within the rotor-swept heights (20-200m). Flight duration (in seconds) for all bird observations, along with data relevant to each flight record (date, timing, weather conditions, VP location (number), etc.), are included;
- Vantage Point survey effort data (recorded as hours of observations) on a monthly basis during the breeding season (April to September for 2021 and 2022) and wintering season (October 2021 to March 2022 and October 2023 to March 2024);
- Area viewed from each VP collectively (in hectares);
- Area of the wind farm footprint (plus 1km buffer) as indicated above; and
- Description and metrics for the wind farm as a whole, as well as for individual turbines.

Over the period of monitoring of bird flight activity at Ballynalacken, several changes were made to the layout of the proposed project. This iterative approach is recommended as Best Practice in the design of wind farms (IWEA, 2012), but means in the project area changing over time to reflect changes to the proposed turbine layout. In order to maximise coverage of the revised layout areas, VPs changed to reflect Best Practice guidance (SNH, 2017) in the selection of VP locations. This is an essential and positive factor in the iterative approach adopted, but it makes the interpretation of VP data more complicated, especially around viewshed analysis of VP coverage. This has been ameliorated through the presentation of two models during the winter season, reflecting the changes to the VPs used, the proposed turbine layout and viewshed coverage. Furthermore the methodology presented here involves using a 1km buffer to clip flight lines. This is beyond the minimum indicated by Best Practice guidelines (800m buffer). Therefore, the CRM results presented here indicate a substantially more conservative (i.e. higher) estimate of collision risk than is likely to be the case by incorporating additional flight lines within this extended buffer. This precautionary approach therefore allows a more robust evaluation of potential impacts (if any) arising from the data presented here.

Note that the CRM assumes coverage of 100% of the required viewshed. It is widely acknowledged that this is not achievable in practice, as the number of VPs required in undulating landscapes would be excessive. As a result, viewshed sufficiency is calculated and incorporated into the final model outputs as a corrective factor to offset any reduction in viewshed sufficiency.

For field-based surveys, the availability of suitable weather conditions for completing surveys, with good visibility and little wind or rain of paramount importance, must be considered. The avian flight data presented here were all collected in optimal weather conditions, as determined by Best Practice guidance. In some circumstances, this required re-arrangement of monthly schedules, with some VPs being surveyed twice in one month to compensate for months when no survey work took place. These are clearly indicated within the data and are presented in **Appendix A**. It should be noted that such scheduling falls well within the tolerances of Best Practice guidelines for such survey work. In all cases, Best Practice guidance on selection and surveying at VPs has been adhered to throughout the work being reported.

When recording birds in flight, exact determination of ground location and flight height, both of which are essential to calculating collision risk, can be subject to variation between observers. It is therefore required to allow some margin of error for determining the exact location of flying birds, and this has been included within the CRM presented here by the inclusion of all recorded flight lines in an expanded 1km buffer zone, and also including data from all flight lines that intersect with this extended buffer, i.e. if a flight line originated within the buffer zone, but flew beyond the 1km boundary, the flight was continuously recorded, and the time flying outside the buffer also included within the CRM calculations. Similarly for flight height, with a lowest swept area of 20m and a maximum swept height of 142.5m for the turbine model (Vestas V117 - 4.2MW) proposed for Ballynalacken Wind Farm, all bird records consisting of flight heights between 20m and 200m are included in the model. The 200m maximum in the model is based on the height bands utilized in 2023/2024 Vantage Point recording sheet, 0-10m, 10-20m, 20-30m, 40-50m, 50-200m and >200m. Data in the previous years used differing height band records 0-10m, 10m-20m, 20-30m, 40-50m, 50-160m, >160m.

Collectively, the inclusion of these data offers additional precaution in determining collision risk, supporting more robust outputs and interpretation of results than would otherwise be the case.

A13.5.1.2. Statement of Authority

Dr Alex Copland BSc PhD MIEnvSc MCIEEM is Technical Director with INIS and undertook the Collision Risk Modelling and drafted this report. He is a full member of both the Chartered Institute of Ecology and Environmental Management (CIEEM) and the Institute of Environmental Sciences (IES) and has over 25 years of professional experience working in both statutory and private companies, in third-level research institutions and with environmental NGOs. He is proficient in experimental design and data analysis and has managed several large-scale, multi-disciplinary ecological projects. These have included research and targeted management work for species of conservation concern, the design and delivery of practical conservation actions with a range of stakeholders and end-users, education and interpretation on the interface between people and the environment and the development of co-ordinated, strategic plans for birds and biodiversity. He has written numerous scientific papers, developed and contributed to evidence-based position papers, visions and strategies on birds and habitats in Ireland. He has supervised the successful completion of research theses for several post-graduate students, including doctoral candidates. He also sits on the Editorial Panel of the scientific journal, *Irish Birds*, which publishes original ornithological research relevant to Ireland's avifauna.

Mr Conor Daly ACIEEM BSc MSc is an Ecologist with INIS that checked this report. Conor was awarded a 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 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.

Howard Williams BSc CEnv MCIEEM CBiol MRSB MIFM (Principal Ecologist and CEO INIS) signed off on this report. Howard is a Chartered Environmentalist and a Chartered Biologist and has written and managed many Article 6 Appropriate Assessments and Ecological Impact Assessments for more than €2billion of major infrastructure in Ireland. Howard is an expert in the field of avian ecology in addition to having considerable knowledge and experience producing management strategies/prescriptions for a range of protected species, both terrestrial and aquatic.

A13.5.1.3. Site and Development Description

The Proposed Ballynalacken Wind Farm is located in Co. Kilkenny, c.4.3km East-northeast of Ballyragget and 4.2km to the West-northwest of Castlecomer. The receiving environment for proposed development is representative of lowland habitats of the surrounding area, and includes lands under active management for agriculture and forestry.

The layout of the proposed development consists of 12 turbines. One turbine model (Vestas V117-4.2MW) has been identified for the proposed development (see **Table 1**). Note that, as all flight data between 20m and 200m is used for the modelling presented here, to cover the proposed tip height (142.5m) and hub height (84m; so a lowest swept height of 25.5m). The specifications of the proposed turbine used are shown in **Table 1**.

***Table 1** Turbine specifications the proposed Ballynalacken Wind Farm*

Technical information	Data used
Indicated wind turbine model	Vestas V117
Number of turbines	12
Number of blades per turbine	3
Rotor diameter	117m
Rotor radius	58.5m
Rotor blade maximum chord	4.0m
Pitch angle of the blade during normal operation[1]	30°
Rotation speed	12rpm
Rotation period	5.0s
Lowest swept area of blade	25.5m
Turbine operation time[2]	85%

[1] *The pitch angle of the blade is determined by wind speed, which is variable depending upon geographical location, landscape, local topographic factors, etc. To maintain a constant operating speed for a turbine, altering the pitch angle of the blade is used. This is usually determined by wind speed, with higher wind speeds requiring greater pitch angle to "feather" the wind and thereby control the rotation speed. The figure of 30° used here is derived from Band (2012) which gives an average pitch along the blade length of between 25 – 30 degrees (30° results in greater likelihood of effects and is used within this model which has adopted a precautionary approach to the determination of risk).*

[2] *European Wind Energy Association (2020) gives the average operation time of a turbine of between 70% and 85% of the time; 85% is used in this model as this adopts the precautionary approach.*

A13.5.1.4. Background to bird species assessed

The species selected for the Collision Risk Model are shown in **Table 2** (breeding seasons 2021 & 2022), **Table 3a** (2021-22 wintering season) and Table 1.3b (2023-24 wintering season). Whilst some birds can occur at a site all year round, there tends to be differing activity levels between breeding and non-breeding seasons. This can be seen by the differences in activity between **Table 2** and **Tables 3a** & **3b** where, for example, raptors (e.g. Kestrel) are more regularly observed in summer months compared to winter. Conversely, wintering waders (including Golden Plover and Snipe) are more frequent in winter months. To accurately reflect the changing avifauna between seasons, separate CRMs are presented for wintering and breeding seasons.

Target species for the proposed development are based upon likely collision risk as well as their status as Birds of Conservation Concern in Ireland (BoCCI) Red or Amber Lists (Gilbert *et al*. 2021). Target species were all waterfowl, raptors, owls, waders, gulls, herons and Cormorant *Phalcrocorax carbo*.

From this target species list, six species were recorded during breeding season VP Watches (see **Table 2**; Raven *Corvus corax* was not included in the CRM as it was not identified as a target species). Of the remaining species, only those with sufficient flight activity (defined as a minimum total of five flights or minimum of ten individuals of each target species recorded in during each season of analysis; numbers below these thresholds are likely to exhibit negligible collision risk) are considered. This resulted in four species being assessed during the breeding season (Buzzard *Buteo buteo*, Kestrel *Falco tinnunculus* and Sparrowhawk *Accipiter nisus*; see **Table 2**). Golden Plover *Pluvialis apricaria* was retained for analysis as, although the number of bouts (4) was below the threshold for analysis (5), the number of individuals was relatively high (132).

Table 2 *Breeding season flight data for target species from Vantage Point Surveys*

Species	Total Number of Bouts	Total Number of Individuals	Total Duration of Bouts (s)	Inclusion in CRM
Buzzard	**49**	**66**	**12,435**	**Yes**
Golden Plover	**4**	**132**	**23,830**	**Yes**
Grey Heron	1	1	30	No
Kestrel	**23**	**23**	**1,937**	**Yes**
Raven	15	25	1,363	No
Sparrowhawk	**5**	**5**	**465**	**Yes**

A total of nine species were recorded during winter season VP surveys (see **Table 3a** and **Table 3b**). As with the breeding season, Raven was excluded from the CRM analysis as it was not a target species. Of the remaining eight species, four (Buzzard, Golden Plover, Kestrel and Sparrowhawk) were selected for analysis as their occurrence exceeded the threshold in each survey season.

Table 3a *Winter 2021-22 season flight data for target species from Vantage Point Surveys*

Species	Total Number of Bouts	Total Number of Individuals	Total Duration of Bouts (s)	Inclusion in CRM
Buzzard	**48**	**64**	**11,925**	**Yes**
Golden Plover	**6**	**631**	**67,830**	**Yes**
Kestrel	**18**	**19**	**2,790**	**Yes**
Lesser Black-backed Gull	1	1	60	No
Raven	5	14	805	No
Sparrowhawk	**11**	**17**	**2,030**	**Yes**

Table 3b *Winter 2023-24 season flight data for target species from Vantage Point Surveys*

Species	Total Number of Bouts	Total Number of Individuals	Total Duration of Bouts (s)	Inclusion in CRM
Buzzard	**59**	**71**	**11,065**	**Yes**
Golden Plover	**8**	**477**	**174,430**	**Yes**
Grey Heron	2	2	60	No
Kestrel	**32**	**34**	**2,713**	**Yes**
Lesser Black-backed Gull	1	4	220	No
Peregrine	1	1	5	No
Raven	7	11	440	No
Snipe	1	2	10	No
Sparrowhawk	**8**	**8**	**563**	**Yes**

By coincidence, all species selected for assessment were the same in both breeding and winter season. For the four species being assessed, biometric data is required for inputting to the CRM. These are shown in **Table 4**, along with the recommended avoidance rates for use with the CRM (SNH, 2017).

Table 4 *Bird species biometrics and avoidance rates for use in CRM*

Biometric parameter	Buzzard	Golden Plover	Kestrel	Sparrowhawk
Length (bill to tail)	0.57m	0.29m	0.35m	0.38m
Wingspan	1.28m	0.76m	0.80m	0.70m
Flight speed[2]	11.6ms^{-1}	17.9ms^{-1}	10.1ms^{-1}	10.0ms^{-1}
Collision Avoidance rate (%)[3]	98%	98%	95%	98%

Data sourced from https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/bird-a-z/ [Accessed May 2024]

[2] Data sourced from Alerstam *et al*. (2007); for Golden Plover, data for Grey Plover *Pluvialis squatarola* are used.

[3] Avoidance rates sourced from SNH (2019)

A13.5.2. METHODOLOGICAL APPROACH

Collision Risk Modelling adopts a mathematical approach to determining the likelihood of a bird species colliding with wind turbine rotors at a pre-defined site and is fully described by Band *et al*. (2007) and Scottish Natural Heritage (SNH, 2000), with supporting information provided by Scottish Natural Heritage (SNH, 2019). This determination is based upon field data collected at the proposed wind farm site. The output from the model indicates the number of birds likely to collide with rotors of all turbines within the wind farm per year of operation of the wind farm as a whole. The inverse of this (i.e., the number of years over which a single fatality would be likely) is also often indicated.

Data on the site (such as the number, size, dimensions and likely functioning of the turbines proposed for the site; see **Table 1**) forms part of the model, along with biometric data on the bird species themselves (see **Table 4**). These are reconciled against standardised field data collected using systematic and prescribed Best Practice methods on birds flying through the proposed site (SNH, 2017). Collectively, these data are then used to determine the number of bird flights through the rotors of all turbines within the area on an annual basis (CRM Stage 1) as well as the probability that a bird flying through the turbine will collide with the rotors (CRM Stage 2). The product of the numerical output from these two stages of assessment indicates the number of birds likely to collide with the rotors if no avoiding action is being taken by the bird species in question. This value is then corrected using published avoidance rates (CRM Stage 3; see **Table 4**), to give a final indication of collision risk (number of bird colliding with the rotors per annum).

A13.5.2.1. Collection of field data

The CRM is based upon data collected from VPs at the proposed Ballynalacken Wind Farm, during the breeding season (April to September inclusive), for two years (2021 and 2022) and two wintering seasons (October 2021 to March 2022 and October 2023 to March 2024). These data are collected following strict adherence to Best Practice methods (SNH, 2017).

A13.5.2.2. CRM Stage 1: Determination of Bird Species Activity

Stage 1 of the CRM determines the number of transits through the rotors for a given period. For the calculation below, this is expressed as the number of birds flying through the rotors per breeding season (April to September inclusive) or winter season (October to March inclusive). The data used and calculations performed are shown in **Table 5** (for the breeding season), **Table 6a** (for the 2021-22 wintering season) and **Table 6b** (for the 2023-24 wintering season.

A full description of all the parameters used, and the derivation for calculations for the models, is presented in **Appendix B**.

***Table 5** Parameters used in the CRM for all bird species (breeding season)*

Model Parameter	Short Code	Buzzard	Golden Plover	Kestrel	Sparrowhawk
Survey Area Visible from Vantage Points	Acc	1,479	1,479	1,479	1,479
Flight Risk Area	A_{FR}	1,209	1,209	1,209	1,209
Total Survey Time	T	777,600	777,600	777,600	777,600
Length of Breeding Season	T_{SS}	183	183	183	183
Daily Duration of Activity	T_{DD}	15	15	15	15
Duration of Activity at Rotor Height	T_{TH}	12,435	23,830	1,937	465
Proportion of Activity at Rotor Height: (T_{TH}/T)	t	**0.015992**	**0.030646**	**0.002491**	**0.000598**
Flight Activity in Visible Area (per hectare): (t/Acc)	F	**1.08E-05**	**2.07E-05**	**1.68E-06**	**4.04E-07**
Flight Time within Flight Risk Area: (A_{FR}*F)	t_{FR}	**1.31E-02**	**2.51E-02**	**2.04E-03**	**4.89E-04**
Occupancy of the Flight Risk Area (hrs/breeding season): (T_{SS}*T_{DD}*t_{FR})	n	**36.079187**	**69.140895**	**5.620055**	**1.349161**
Flight Risk Volume (m^3)	Vw	1,414,530,000	1,414,530,000	1,414,530,000	1,378,260,000
Combined Rotor Volume (m^3)	Vr	589,602	553,478	561,219	536,482
Occupancy of Rotor Volume (bird-secs): ((Vr/Vw)*n)	b	**54.138490**	**97.392493**	**8.027180**	**1.890559**
Transit Time through Rotors	v	0.39	0.24	0.43	0.44
Number of Transits through Rotors (per season): (b/v)	b_{FR}	**137.419361**	**406.369607**	**18.637821**	**4.316344**
Viewshed sufficiency (%)	Vs	**98%**	**98%**	**98%**	**98%**
Corrected Number of Transits through Rotors (per season): (bFR/Vs)	b_C	**140.223838**	**414.662865**	**19.018185**	**4.404433**

Table 6a *Parameters used in the CRM for all bird species (winter season 2021-22)*

Model parameter		Buzzard	Golden Plover	Kestrel	Sparrowhawk
Survey Area Visible from Vantage Points	Acc	1,794	1,794	1,794	1,794
Flight Risk Area	A_{FR}	1,209	1,209	1,209	1,209
Total Survey Time	T	608,400	608,400	608,400	608,400
Length of Winter Season	T_{SS}	182	182	182	182
Daily Duration of Activity	T_{DD}	12	12	12	12
Duration of Activity at Rotor Height	T_{TH}	11,925	67,830	2,790	2,030
Proportion of Activity at Rotor Height: (T_{TH}/T)	t	**0.019601**	**0.111489**	**0.004586**	**0.003337**
Flight Activity in Visible Area (per hectare): (t/Acc)	F	**1.09E-05**	**6.21E-05**	**2.56E-06**	**1.86E-06**
Flight Time within Flight Risk Area: (A_{FR}*F)	t_{FR}	**1.32E-02**	**7.51E-02**	**3.09E-03**	**2.25E-03**
Occupancy of the Flight Risk Area (hrs/breeding season): (T_{SS}*T_{DD}*t_{FR})	n	**29.165680**	**165.895858**	**6.823669**	**4.964892**
Flight Risk Volume (m^3)	Vw	1,414,530,000	1,414,530,000	1,414,530,000	1,414,530,000
Combined Rotor Volume (m^3)	Vr	589,602	553,478	561,219	565,089
Occupancy of Rotor Volume (bird-secs): ((Vr/Vw)*n)	b	**43.764453**	**233.682411**	**9.746313**	**7.140310**
Transit Time through Rotors	v	0.39	0.24	0.43	0.44
Number of Transits through Rotors (per season): (b/v)	b_{FR}	**111.087014**	**975.038497**	**22.629371**	**16.302077**
Viewshed sufficiency (%)	Vs	**94%**	**94%**	**94%**	**94%**
Corrected Number of Transits through Rotors (per season): (bFR/Vs)	b_C	**118.177674**	**1037.274996**	**24.073799**	**17.342636**

Table 6b *Parameters used in the CRM for all bird species (winter season 2023-24)*

Model parameter		Data used			
		Buzzard	Golden Plover	Kestrel	Sparrowhawk
Survey Area Visible from Vantage Points	Acc	1,465	1,465	1,465	1,465
Flight Risk Area	A_{FR}	1,209	1,209	1,209	1,209
Total Survey Time	T	388,800	388,800	388,800	388,800
Length of Breeding Season	T_{SS}	183	183	183	183
Daily Duration of Activity	T_{DD}	12	12	12	12
Duration of Activity at Rotor Height	T_{TH}	11,065	174,430	2,713	563
Proportion of Activity at Rotor Height: (T_{TH}/T)	t	**0.028459**	**0.448637**	**0.006978**	**0.001448**
Flight Activity in Visible Area (per hectare): (t/Acc)	F	**1.94E-05**	**3.06E-04**	**4.76E-06**	**9.88E-07**
Flight Time within Flight Risk Area: (A_{FR}*F)	t_{FR}	**2.35E-02**	**3.70E-01**	**5.76E-03**	**1.20E-03**
Occupancy of the Flight Risk Area (hrs/breeding season): (T_{SS}*T_{DD}*t_{FR})	n	**51.857659**	**817.490416**	**12.714851**	**2.638578**
Flight Risk Volume (m^3)	Vw	1,414,530,000	1,414,530,000	1,414,530,000	1,414,530,000
Combined Rotor Volume (m^3)	Vr	589,602	553,478	561,219	565,089
Occupancy of Rotor Volume (bird-secs): ((Vr/Vw)*n)	b	**77.814816**	**1151.524416**	**18.160748**	**3.794698**
Transit Time through Rotors	v	0.39	0.24	0.43	0.44
Number of Transits through Rotors (per season): (b/v)	b_{FR}	**197.516820**	**4804.728917**	**42.166334**	**8.663693**
Viewshed sufficiency (%)	Vs	**97%**	**97%**	**97%**	**97%**
Corrected Number of Transits through Rotors (per season): (bFR/Vs)	b_C	**203.625588**	**4953.328781**	**43.470448**	**8.931643**

A13.5.2.3. CRM Stage 2: Determination of Collision Risk

The probability of a bird flying through the rotors and colliding with the blades is determined in Stage 2 of the CRM. The probability of a collision depends upon the bird's size (both length and wingspan) and flight speed. In order to simplify the calculations, birds are assumed to be of simple cruciform shape, with the wings half-way down the length of the bird. Characteristics of the turbine and rotor blades are also required, including the width and pitch of the rotor blades and the rotation speed of the turbine. The turbine blade is assumed to have no thickness for Stage 2 of the CRM, although rotor blade depth is considered in Stage 1 of the model.

The risk of a bird colliding with the rotor blades changes depending upon whether it passes through the rotor swept area next to the hub (where the blades have a wider chord width, occupy a large volume of the airspace and are travelling quite slowly) or towards the blade tips (where the blades are only present for a small proportion of the time, have a short chord width and are travelling faster). Closer to the hub, the wingspan of the bird compared to the physical distance between the blades is the controlling factor. Towards the blade tips, it is the length of the bird that offers and greater contribution to the determination of collision risk.

The bird is assumed to enter the rotor swept area at random anywhere on the disc. The calculations determine the collision risk at 20 locations along the length of the rotor blade (in intervals of 0.05R, where R is the radius of the rotor swept area) using numerical integration of various elements in relation to the rotors (notably chord width and angular velocity of the blade) and the Bird (such as the point at which the bird enters the rotor along the radius and the flight speed of the bird). These are calculated for both up-wind and down-wind flights and averaged to give a probability of collision per season, assuming no avoiding action is taken.

These calculations are performed in the SNH collision risk model[1], where the relevant data on the turbines and bird species are entered, and the model estimates the probability of a collision when a bird flies through the rotor area. This calculation is based solely upon the behaviour and structure of the bird and the specifications of the turbines. Only a single calculation is therefore required for all the VP data collected.

For the proposed development, the average probability of a bird passing through the rotor swept area and colliding with the rotors (if it takes no avoiding action) for the proposed turbine is shown in **Table 7**.

Table 7 *Risk of collision for birds passing through turbine swept areas*

Turbine model	Buzzard	Golden Plover	Kestrel	Sparrowhawk
Vestas V117	9.2%	5.6%	9.1%	9.4%

[1] https://www.nature.scot/wind-farm-impacts-birds-calculating-probability-collision [accessed June 2024]

A13.5.3. Results

The overall collision risk model output from the first two stages is the number of bird collisions per annum. This is the product of the number of transits through the rotors per season and the probability of a bird passing through the rotor swept area colliding with the blade.

It has been well documented that birds demonstrate avoidance of wind turbines. This includes macro-avoidance, where birds avoid the whole wind farm area, as well as micro-avoidance, where birds fly within the wind farm but avoid the turbines and blades. The documented level of avoidance for different species varies (SNH, 2019), and published avoidance rates for the bird species being assessed at the proposed development are shown in **Table 8**.

Incorporation of these avoidance rates forms part of the stage of the CRM to determine collision risk for the species assessed.

A13.5.3.1. Collision Risk Assessment

Collision Risk Modelling outputs are provided in **Table 8** for the four species considered for the breeding season.

Table 8 *Risk of collision for birds passing through turbine swept area (breeding season)*

	Buzzard	Golden Plover	Kestrel	Sparrowhawk
Collisions/annum (no avoiding action)	**11.01**	**19.75**	**1.47**	**0.36**
Collision Avoidance Rate (%)[1]	98%	98%	95%	98%
Collisions/annum (with avoidance)	**0.2202**	**0.3950**	**0.0737**	**0.0072**
Collision likelihood (years)	**4.54**	**2.53**	**13.57**	**139.03**
Lifetime collisions (25-years)	**5.51**	**9.87**	**1.84**	**0.18**

[1] Avoidance rates sourced from SNH (2019)

Golden Plover has the highest collision risk of the four species assessed, with an estimated collision risk of 0.3950 collisions per annum, indicating a collision once every 2.53 years (see **Table 8**). Buzzard had the second highest collision with a collision once every 4.54 years.

Collision risk for kestrel was assessed to only be 0.0737 per annum. This supports a collision once every 13.57 years.

As expected, due to the low levels of observed flight activity (see **Table 2**), Sparrowhawk has the lowest risk of collision for the four species assessed with an estimated collision likelihood of approximately 0.0072 bird collisions per annum (see **Table 8**), equating to one collision every 139.03 years.

__Table 9__ Risk of collision for bird passing through turbine swept area (winter data combined)

	Buzzard	Golden Plover	Kestrel	Sparrowhawk
Collisions per annum (no avoiding action) winter 2021/2022	9.28	49.40	1.87	1.38
Corrected for proportion of Survey time (61%) Winter 2021/2022	5.66	30.14	1.14	0.84
Collisions per annum (no avoiding action) winter 2023/2024	15.99	235.90	3.37	0.71
Corrected for proportion of Survey time (39%) Winter 2023/2024	6.23	91.98	1.31	0.28
Total Collision per annum (No avoiding action) All winters	11.90	122.12	2.45	1.12
Collision Avoidance rate (%)[1]	98%	98%	95%	98%
Collisions per annum with avoidance	0.2379	2.4423	0.1226	0.0224
Collision likelihood in years	4.20	0.41	8.16	44.69
Lifetime collisions (25-years)	5.947	61.0585	3.065	0.559

[1] Avoidance rates sourced from SNH (2019)

CRM results for the two wintering seasons are shown in **Table 9**. The winter 2021-22 data contribute 61.0% of all survey time, with the winter 2023-24 data making up 39.0% of survey time (see **Appendix A**; **Table A-2**). Using these ratios, we can combine the collision risk data together to produce a single metric for collision likelihood for each of the four species assessed (See **Table 9**).

In winter, Golden Plover has the highest collision risk of the four species assessed, with an estimated collision risk of 2.4423 collisions per annum (see **Table 9**).

Sparrowhawk has the lowest risk of collision for the four species assessed with an estimated collision likelihood of approximately 0.0326 bird collisions per annum with regards to the winter season (see **Table 9**), equating to one collision every 30.64 years.

Both Buzzard and Kestrel had relatively low collision risk for their winter populations. Buzzard and Kestrel were assessed to have 0.2379 and 0.1226 collisions per annum respectively. This equates to a collision once every 4.2 and 8.16 years respectively

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Appendix A BALLYNALACKEN WINDFARM VANTAGE POINT SURVEY EFFORT

Table A-1 *Vantage Point Survey hours for the two breeding seasons used for the CRM calculations*

VP	Breeding season 2021							Breeding season 2022							TOTAL (Two Seasons)
	Apr	May	Jun	Jul	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Sep	Total	
5	6	6	6	6		12	36	6	6	6	6	6	6	36	**72**
6	6	6	6	6		12	36	6	6	6	6	6	6	36	**72**
PD VP1	12	12	6		4		34	8	6	6	6	6	6	38	**72**
Total	**24**	**24**	**18**	**12**	**4**	**24**	**106**	**20**	**18**	**12**	**24**	**28**	**28**	**110**	**216**

Table A-2 *Vantage Point Survey hours for the two winter season used for the CRM calculations*

VP	Winter season 2021-22							Winter season 2023-24							TOTAL (Two Seasons)
	Oct	Nov	Dec	Jan	Feb	Mar	Total	Oct	Nov	Dec	Jan	Feb	Mar	Total	
3				12	12	12	36							0	**36**
5				6	18	12[2]	36	6	6	6		12	6	36	**72**
7							0	6	6	6	12		6	36	**36**
PD VP1	6	3				52[3]	61	4	8	3	9	6	6	36	**97**
PD VP2	12[4]	6[5]				18	36							0	**36**
Total	**18**	**9**	**0**	**18**	**30**	**94**	**169**	**20**	**18**	**12**	**24**	**28**	**28**	**108**	**277**

[2] Includes six hours surveyed in April 2022
[3] Includes 36 hours surveyed in April 2022
[4] Includes six hours surveyed in October 2020
[5] Includes six hours surveyed in November 2020

Appendix B PARAMETERS AND CALCULATION STEPS FOR CRM STAGE 1

Survey Area visible from Vantage Points (Acc)

In order to determine the level of flight activity in an area, the total area over which observations are being made needs to be assessed. The area viewed from each VP is not necessarily mutually exclusive form the area viewed from another VP; indeed there needs to be some overlap to maximise coverage of the survey area. As a result, the total survey area visible from each VP is calculated, and these are summed for each VP to give the accumulated total area surveyed. The accumulated survey area from VPs will therefore be greater than the total survey area. This total is calculated in hectares.

Flight Risk Area (A_{FR})

The area where there may be a flight risk must be established and surveyed. Determination of this will largely have taken place in advance of undertaking survey work, but an iterative design approach may result in changes to the area that is required for survey. For CRM, the area should cover the whole wind farm, defined as a polygon encompassing the outer turbines plus the rotor radius. With the layout at Ballynalacken the wind turbine area, plus a 500m buffer around all wind turbines, can be used. However, as the exact locations of flight-lines may be subject to error, an increased buffer is recommended from which to use for the inclusion of flight lines, with 800m often applied. For Ballynalacken, a more conservative buffer of 1km was applied to all turbines to adequately cover the whole of the flight risk area and ensure the robustness of the CRM.

Total Survey time (T)

To assess flight activity in an area, the total survey time undertaken from the VP watches is needed. This is expressed as seconds.

Length of Activity Season (T_{SS})

The period when birds are likely to be active in the area during the season being assessed. This is indicated as 1st April to 30th September for breeding and 1st October to 31st March for winter season; expressed as days.

Daily Duration of Activity (T_{DD})

The number of hours that birds are potentially active during the day, within each season, forms part of the model. This is quantified as 15 hours per day for the period 1st April to 30th September and 12 hours per day for the period 1st October to 31st March. This is likely to be an over-estimate of activity, which would be difficult to quantify in simple term otherwise. Nevertheless, the provision of an over-estimation of activity time increases the likelihood of a collision as birds are considered to be more active (i.e., taking more flights) than if activity hours are reduced. This approach therefore offers a more robust estimation of collision risk within the CRM.

Duration of Activity at Turbine Height (T_{TH})

This metric is based on the observation of flight-lines from the VP surveys. Turbine height is determined by the hub height +/- the length of the blade. This swept area may be subject to change depending upon final design iterations. For a turbine with a hub-height of 84m and a blade length of 58.5m, the swept area (Turbine Height) will be 20m-142.5m.

However, it may be difficult to be certain about individual observations of flight heights, and a precautionary approach needs to be taken about which data to include. A tolerance of +/- 5m at lower flight heights should be considered and these tolerances may need to be greater at higher flight elevations (e.g., +/- 20m at 200m height). In this example, all birds flying in the 10m-20m band would be included, in addition to all birds flying between 20m and up to 200m. For Ballynalacken, with a lowest swept area of 20m, and a turbine diameter of 117, all records between 10m and 200m were retained for analysis within the model.

Flight-lines recorded within the determined flight height bands are therefore selected, and the total numbers of seconds for birds observed within the Survey Area are summed. To ensure a precautionary approach is applied, any flight-lines at the relevant height bands recorded wholly or partially within the survey area are retained for analysis within the CRM.

Proportion of Time at Turbine Height (t)

This metric is obtained by dividing the Duration of Activity at Turbine Height (T_{TH}) by Total Survey Time (T).

Flight Activity in the Visible Area (F)

The level of flight activity within the survey area is determined by dividing the Proportion of Time (birds were recorded) at Turbine Height (t) by the Visible Survey Area (Acc).

Flight Time within the Flight Risk Area (t_{FR})

The amount of time a bird is likely to be within the flight risk area is the product of the Flight Risk Area (A_{FR}) and the Flight Activity in the Visible Area (F).

Occupancy of the Flight Risk Area (n)

The time that a bird is likely to be within the Flight Risk Area is a product of the Length of Activity Season (T_{SS}), the Daily Duration of Activity (T_{DD}) and the Flight Time within the Flight Risk Area (t_{FR}). The output of this provides the number of hours that a bird is within the Flight Risk Area per breeding season.

Flight Risk Volume (Vw)

This is the volume of airspace within the rotor height over the whole wind farm survey area. It is calculated by multiplying the Flight Risk Area (A_{FR}) with the diameter of the rotor (117m for Ballynalacken).

Combined Rotor Volume (Vr)

This is the actual volume of airspace occupied by the rotors within the wind farm. Although the volume of airspace occupied by a single rotor is its depth (*d*) multiplied by its circumference (πr^2, where *r* is the radius of the rotor), the CRM also takes into account the length of the bird (which varies depending upon species) into the rotor depth calculation, as the rotor could collide with the bird anywhere along its length if flying through the swept area. Note the depth of the rotor is taken as the maximum chord of the blade (i.e., the width of the rotor blade at its maximum). Clearly rotors do not operate within this volume (the blade is never at a 90° pitch) nor is the width constant along the length of the blade. Nevertheless, the use of this metric in the calculation ensures that the output of the model follows the precautionary approach to maximise the robustness of the model output. The volume for a single rotor is therefore expressed as $(d+l)*\pi r^2$. The combined rotor volume is this individual rotor volume multiplied by the number of turbines (n=12 for Ballynalacken). See **Table B-1** for the relevant metrics for this calculation for the proposed turbine model for Ballynalacken.

Table B-1 *Turbine and bird metrics inputted to the Ballynalacken CRM*

Parameter	Buzzard	Golden Plover	Kestrel	Sparrowhawk
Rotor diameter	117m	117m	117m	117m
Rotor radius (r)	58.5m	58.5m	58.5m	58.5m
Rotor area (πr^2)	10,751m^2	10,751m^2	10,751m^2	10,751m^2
Rotor depth (d)	4m	4m	4m	4m
Bird Length (bill to tail) (l)	0.57m	0.29m	0.35m	0.38m
Rotor volume ($(d+l)*\pi r^2$)	49,133m^3	46,123m^3	46,768m^3	47,090 m^3
Number of turbines	12	12	12	12
Combined Rotor Volume (Vr)	589,602m^3	553,477m^3	561,218m^3	565,089m^3

Occupancy of the Rotor Volume (b)

This is an estimation of the time that birds will occur within the rotors. It is calculated by dividing the Combined Rotor Volume (Vr) by the Flight Risk Volume (Vw), which gives the proportion of the Flight Risk Volume that is occupied by the rotors. This is then multiplied by the Occupancy of the Flight Risk Area (n).

Transit Time through Rotors (v)

This is calculated by adding length of the bird to the depth of the rotor swept area and then dividing by the flight speed. See **Table B-2** for the relevant metrics for this calculation for the proposed turbine model for Ballynalacken.

Table B-2 *Bird Transit time through the rotors*

Species	Buzzard	Golden Plover	Kestrel	Sparrowhawk
Bird Length (bill to tail) (l)	0.57m	0.29m	0.35m	0.38m
Bird Flight Speed (ms^{-1})	11.6ms^{-1}	17.9ms^{-1}	10.1ms^{-1}	10.0ms^{-1}
Rotor depth (d)	4m	4m	4m	4m
Transit Time (s)	0.39s	0.24s	0.43s	0.44s

Number of Transits through Rotors (b_{FR})

The number of times a bird will pass through the rotors in a season is calculated by dividing the Occupancy of the Rotor Volume (b) by the Transit Time through Rotors (v).

Viewshed Sufficiency (Vs)

Due to local topography, it may not be possible to achieve complete coverage of a whole Flight Risk Area from VPs due to dips or hollows in the landscape. Viewshed Analysis is a topographical model designed to determine the area that can be seen from a VP. It sets the observer height at 1.5m and the "floor" of the viewshed as required for the lowest swept area of the turbine blade (for Ballynalacken, this was set to 25m). The area visible down to 25m is then calculated. For Ballynalacken, Viewshed Sufficiency (Vs) was:

- Breeding Season: 98% of the Flight Risk Area;
- Winter 2021-22: 94% of the Flight Risk Area; and

- Winter 2023-24: 97% of the Flight Risk Area.

Corrected Number of Transits through Rotors (b_C)

This is the Number of Transits through Rotors (b_{FR}) divided by the Vs. This correction assumes that none of the airspace within the area missed by the viewshed analysis is covered. Clearly this is not the case, as the higher the viewshed analysis floor rises, the greater the viewshed coverage will be. However, this correction factor therefore increases the number of transits used in the CRM, offering a more robust estimation of collision risk within the CRM.

This final metric concludes the calculations for Stage 1 of the CRM.

Appendix 13.6: Aquatic Ecology Report

Appendix to Chapter 13: Biodiversity

Appendix 13.6: Aquatic Ecology Survey Results

Ecopower Developments Ltd.

Ballynalacken Windfarm Project

Appendix 13.6
Aquatic Ecology Survey Results

October 2024

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Triturus

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Quality Assurance

The findings outlined within this report and the data we have provided are to our knowledge true and express our bona fide professional opinions. This report has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) good practice guidelines. Where pertinent CIEEM Guidelines used in the preparation of this report include the *Guidelines for Ecological Report Writing* (CIEEM, 2017a), *Guidelines for Preliminary Ecological Appraisals* (CIEEM, 2017b) and *Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine*, (CIEEM, 2019). CIEEM Guidelines include model formats for Preliminary Ecological Appraisal and Ecological Impact Assessment. Also, where pertinent, evaluations presented herein take cognisance of recommended Guidance from the EPA such as *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2022), and in respect of European sites, *Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC* (European Commission, 2018).

Due cognisance has been given at all times to the provisions of the *Wildlife Act, 1976-2023,* the *European Union (Natural Habitats) Regulations*, the *European Communities (Birds and Natural Habitats) Regulations 2011-2021,* EU Regulation on Invasive Alien Species under *EU Regulation 1143/2014*, the EU Birds *Directive 2009/147/EC* and *Habitats Directive 92/43/EEC*.

No method of assessment can completely remove the possibility of obtaining partially imprecise or incomplete information. Any limitation to the methods applied or constraints however are clearly identified within the main body of this document.

Notice

This report was produced by INIS Environmental Consultants Ltd. (INIS) on behalf **of Ecopower Developments Ltd.** (hereafter known as the Developer), for the specific purpose of assessing Aquatics baseline at the EIA Development project, with all reasonable skill, care and due diligence within the terms of the contract with the client, incorporating our terms and conditions and taking account of the resources devoted to it by agreement with the client.

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Table of Contents

List of Tables

List of Figures

1 INTRODUCTION

1.1 Background

The following report provides a baseline assessment of the aquatic ecology and fisheries of watercourses in the vicinity of the proposed Ballynalacken Windfarm, located near Ballyragget, Co. Kilkenny.

Undertaken on a catchment-wide scale, the baseline surveys focused on aquatic habitats in relation to fisheries potential for species of high conservation value (i.e. salmonids, eel and lamprey), white-clawed crayfish *Austropotamobious pallipes* and other macro-invertebrates. It also considered macrophytes, aquatic bryophytes and aquatic invasive species that may be present in the watercourses in the vicinity of the proposed project. Aquatic surveys were undertaken in September 2021, July, August 2023 and April 2024.

The *n*=21 total aquatic survey sites were located within the Nore_SC_060; Nore_SC_080 and Dinin[North]_SC_010 river sub-catchments. Whilst not located within a European site, the proposed wind farm site (via several watercourses) shared downstream hydrological connectivity with the River Barrow and River Nore SAC (002162) and River Nore SPA (004233). Four survey sites on the were located within this European site (Kilcronan (A3), Owveg River (A4), River Nore (A5) & Dinin River (B9)). The survey sites were located within the Nore Upper and Nore Lower *Margaritifera* sensitive areas.

In order to gain an accurate overview of the existing and potential fisheries value of the riverine watercourses within the vicinity of the proposed windfarm, a catchment-wide electro-fishing survey across n=20 sites was undertaken (Table 1.1; Figure 1.3). A pond site (B1) was not surveyed via electro-fishing and was appraised in terms of its fisheries value. Electro-fishing helped to identify the importance of the watercourses as nurseries and habitats for salmonids, lamprey and European eel (*Anguilla anguilla*), as well as other species, and helped to further inform impact assessment and any subsequent mitigation for the project.

Triturus Environmental Ltd. Made an application under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act 1962, to undertake a catchment-wide electrofishing survey in the vicinity of the proposed Ballynalacken Windfarm. Permission was granted on 8th July 2021 and the surveys were undertaken on 21st-22nd September 2021 and 31st July to 3rd August 2023.

1.1.1 Statement of Authority

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).

1.2 Aquatic site surveys

Table 1.1: *Location of n=21 survey sites in the vicinity of Ballynalacken Windfarm, Co. Kilkenny (* indicates Q-sampling, based on the presence of flowing water)*

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
A1	Kilcronan	15K29	Ballyoskill	648256	676284
A2*	Kilcronan	15K29	Loughill	647417	678913
A3*	Owveg [Nore]	15O01	Loughill Bridge	647060	679117
A4*	Owveg [Nore]	15O01	Attanagh Bridge	644102	675905
A5*	Nore	15N01	N77 road bridge	644421	670909
B1	Unnamed pond/wetland	n/a	Ballynalacken	648533	675829
B2*	Castlecomer Stream	15C01	Ballynalacken	648692	675760
B3	Unnamed stream	n/a	Firoda Upper	649278	674520
B4*	Castlecomer Stream	15C01	Skehena	650894	675067
B5*	Castlecomer Stream	15C01	North Bridge, Castlecomer	653206	673228
B6*	Cloghnagh	15C04	R694 road crossing	648359	672799
B7*	Cloghnagh	15C04	Toor More	648826	671111
B8*	Castlecomer Stream	15C01	North Bridge	653221	673215
B9*	Dinin [North]	15D07	Castlecomer Bridge	653593	673055
C1	Castlemarket_East	15C89	Ballyoskill	646420	676578
C2	Nicholastown_15	15N06	Ballynalacken	645938	674583
C3*	Loughill	15L13	Ballyoskill	645883	676790
C4*	Castlemarket_East	15C89	Loughhill River confluence	645306	674872
C5*	Loughill	15L13	Glashagal Bridge, R432	644701	674281
C6	Rathduff_15	15R24	Sraleagh River confluence, Sraleagh	645784	672274
C7	Rathduff_15	15R24	R432 road crossing	644514	672746

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

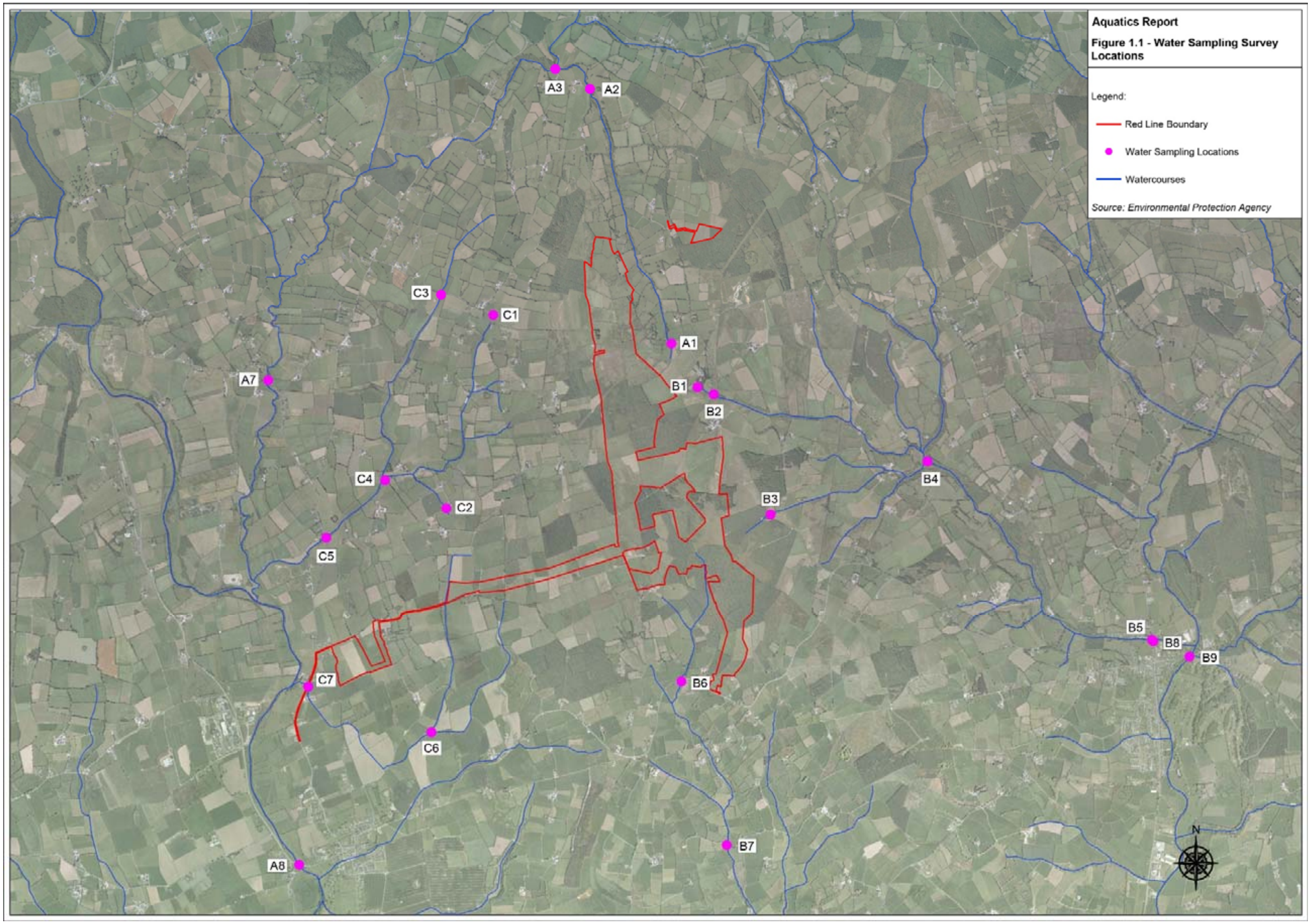

Figure 1.1: *Overview of the n=21 aquatic survey site locations for the proposed Ballynalacken Windfarm Project, Co. Kilkenny*

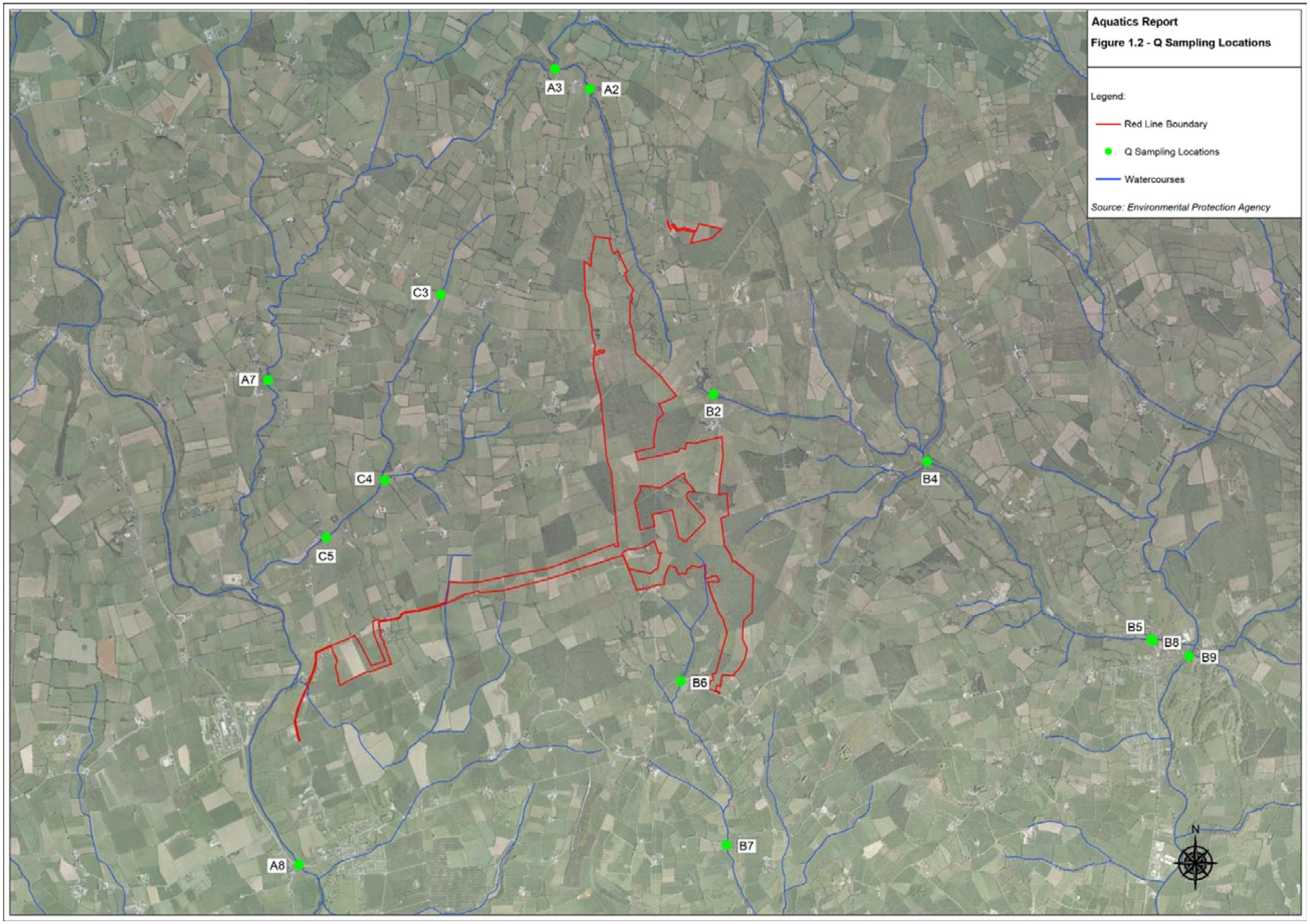

Figure 1.2: *Overview of the n=14 biological water quality sampling locations for the proposed Ballynalacken Windfarm Project, Co. Kilkenny.*

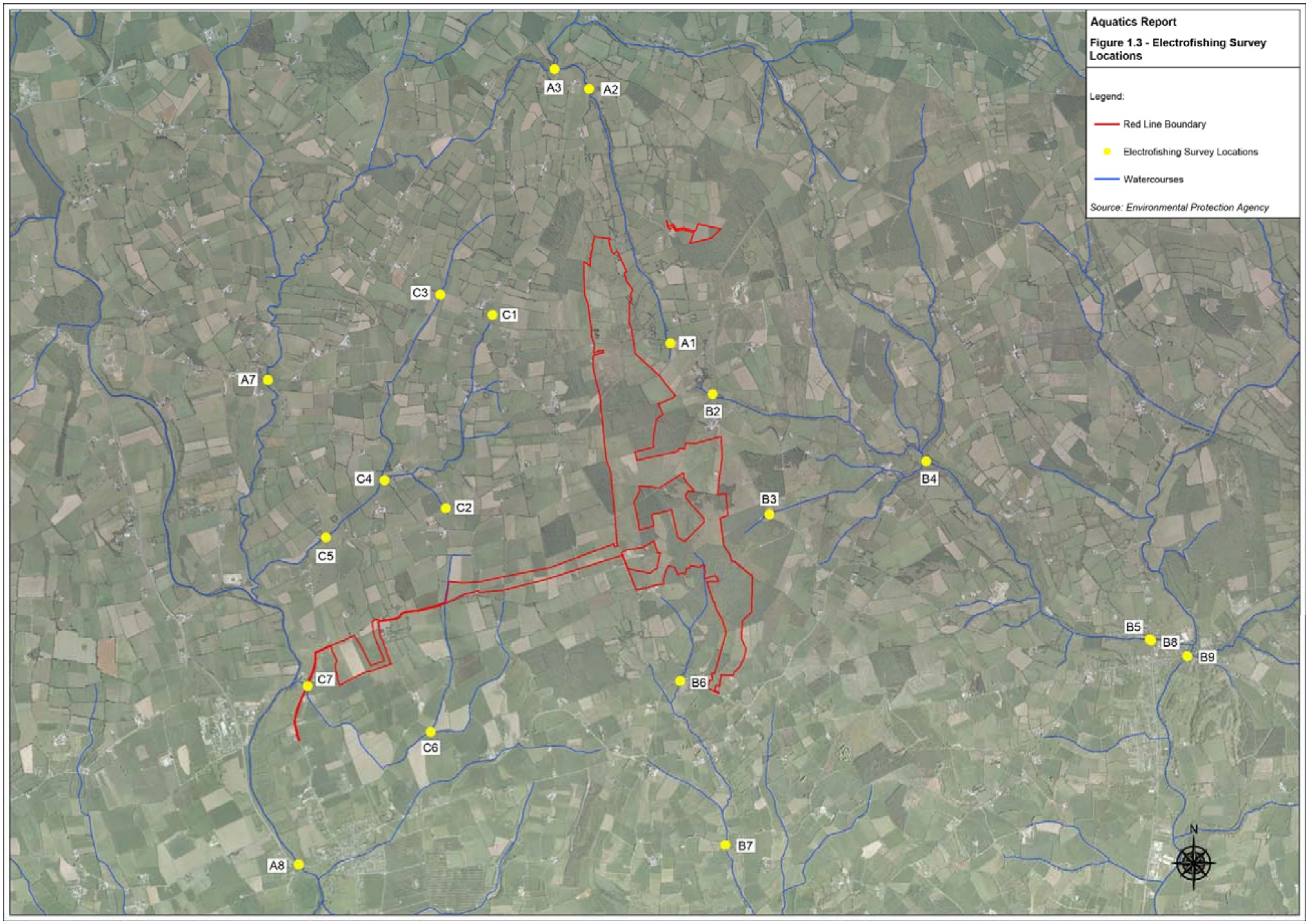

Figure 1.3: *Location overview of the n=20 electro-fishing sites in vicinity of the proposed Ballynalacken Windfarm, Co. Kilkenny.*

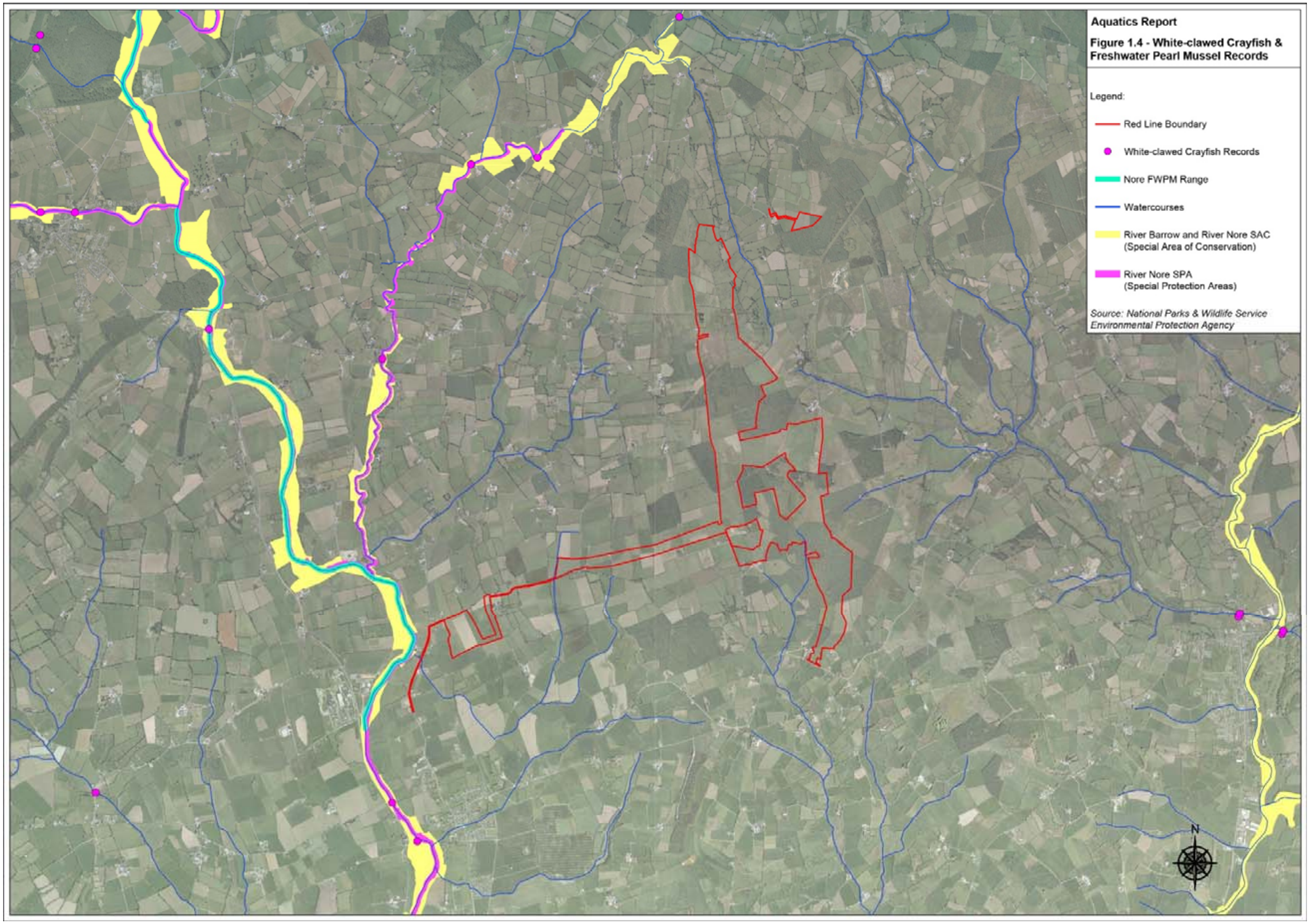

Figure 1.4: *White-clawed crayfish & freshwater pearl mussel records in the vicinity of the proposed Ballynalacken Windfarm Project (source: NPWS data)*

2 RESULTS OF AQUATIC & ELECTRO-FISHING SURVEYS

The following section summarises each of the *n*=21 aquatic survey sites in terms of aquatic habitats, physical characteristics and overall value for fish, white-clawed crayfish and macrophyte/aquatic bryophyte communities. Biological water quality (Q-sample) results are also summarised for *n*=14 riverine sampling sites and in Table 2.4. Habitat codes are according to Fossitt (2000). Scientific names are provided at first mention only. Sites were surveyed in September 2021 and July/August 2023. The results of the electro-fishing survey are also 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, European eel and lamprey species. An evaluation of the aquatic ecological importance of each survey site based on these aquatic surveys is provided and summarised in Table 2.3.

2.1 Aquatic survey site results

2.1.1 Site A1 – Kilcronan, Ballyoskill

Site A1 was located on the uppermost reaches of the Kilcronan stream (15K29) at a farm access track crossing (pipe culvert). The stream was 100% dry at the time of survey with no ponding of water present and a dry base. The stream had been straightened and over-deepened historically, with a very steep V-shaped channel and bankfull heights of 4-5m. The substrata were dominated by cobble with small boulder and mixed gravels. The channel was heavily bound in dense bramble *Rubus fruticosus agg.* scrub with mature treelines of ash *Fraxinus excelsior*, sycamore *Acer psuedoplatanus*, hawthorn *Crataegus monoygna* and blackthorn *Prunus spinosa*. The site was adjoined by intensive agricultural pasture (GA1).

Electro-fishing was not undertaken at site A1 given the stream was 100% dry at this location during the time of survey, and was considered likely to convey water only during wetter/flood periods (i.e., a non-perennial watercourse). The site had no inherent fisheries or aquatic value given its dry nature. However, fisheries value improved downstream (see 2.1.2 below).

Site A1 was not suitable for Q-sampling during the survey period due to its dry nature and lack of flow. Thus, it was not possible to assess biological water quality at this site.

Given the lack of aquatic and fisheries value, the aquatic ecological evaluation of site A1 was of **local importance (lower value)** (Table 2.3).

Plate 2.1 *Representative image of site A1 on the Kilcronan stream, September 2021 (100% dry channel)*

2.1.2 Site A2 – Kilcronan, Loughill

Site A2 was located on the lower reaches of the Kilcronan stream at a local road crossing, approx. 2.8km downstream of site A1 (which was 100% dry). The stream was a largely natural, spate channel, with abundant bank erosion and an often deeply incised V-shaped profile. The stream suffered low flows at the time of survey and averaged 0.1-0.3m deep, with occasional deeper pools to 0.5m max. The profile comprised shallow glide and riffle with frequent small pools over a moderate gradient. Meanders and large woody debris were frequent. Typical of a higher-energy upland watercourse, the substrata were dominated by angular cobble and small boulder, with localised mixed gravels and coarse sands in localised pockets. Siltation was moderate, given low flows. Some soft sediment accumulations were present in association with debris dams and meanders but these were largely flocculent and transient in nature. Deeper silt deposits (resulting from livestock poaching and recent land drainage activities) were present immediately downstream of the cobbled bridge apron. The stream was heavily shaded and tunnelled by mature treelines of holly *Ilex aquifolium* and hazel *Corylus avellana*. As a result of this, and hard mobile substrata, no macrophytes or aquatic bryophytes were recorded. The liverwort *Conocephalum conicum* was present on muddy banks. The site was bordered by improved pasture (GA1).

Brown trout *Salmo trutta* and European eel *Anguilla anguilla* were the only fish species recorded via electro-fishing at site A2 (**Figure 2.1**). Brown trout were present in high densities (*n=66* total), with a very low number of small adults present. Despite their presence in the downstream-connecting Owveg River (see 2.1.3 below), no Atlantic salmon *Salmo salar* were recorded. This was considered a result of poor connectivity due to a ford crossing at the confluence of these watercourses. Site A2 was an excellent-quality salmonid nursery, with frequent boulder/cobble refugia and some localised good-quality holding habitat (better during higher flows). Spawning habitat, whilst present, was more suited to larger Atlantic salmon than brown trout given the predominance of larger substrata. Despite the presence of some localised soft sediment accumulations, no lamprey ammocoetes were recorded via electro-fishing. These accumulations were transient/flocculent in nature and the general upland eroding characteristics were not suitable for lamprey. European eel habitat was moderate overall (better in downstream-connecting habitats). Only a single juvenile eel was captured during electro-fishing at this site. An otter couch (with spraint) was recorded on a meander under a bank overhang (ITM 647381, 678967). Two other regular spraint sites were also recorded (ITM 647403, 678946 &

647413, 678916). This latter site contained crayfish remains. Despite this, no white-clawed crayfish were recorded during the survey. This suggests a low population or a population within the wider catchment in the range of otter (known ranges of male otters are larger than females and extend from c.7 to 21km; O'Néill *et al*. 2008).

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (Table 2.4). However, it should be noted that, given the lack of flow, this is a tentative Q-rating. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of European eel, white-clawed crayfish remains in otter spraint (which may indicate a cryptically-low population) and Q4 (good status) water quality, the aquatic ecological evaluation of site A2 was of **local importance (higher value)** (Table 2.3)**.**

Plate 2.2 *Representative image of site A2 on the Kilcronan stream, September 2021 (facing upstream towards bridge)*

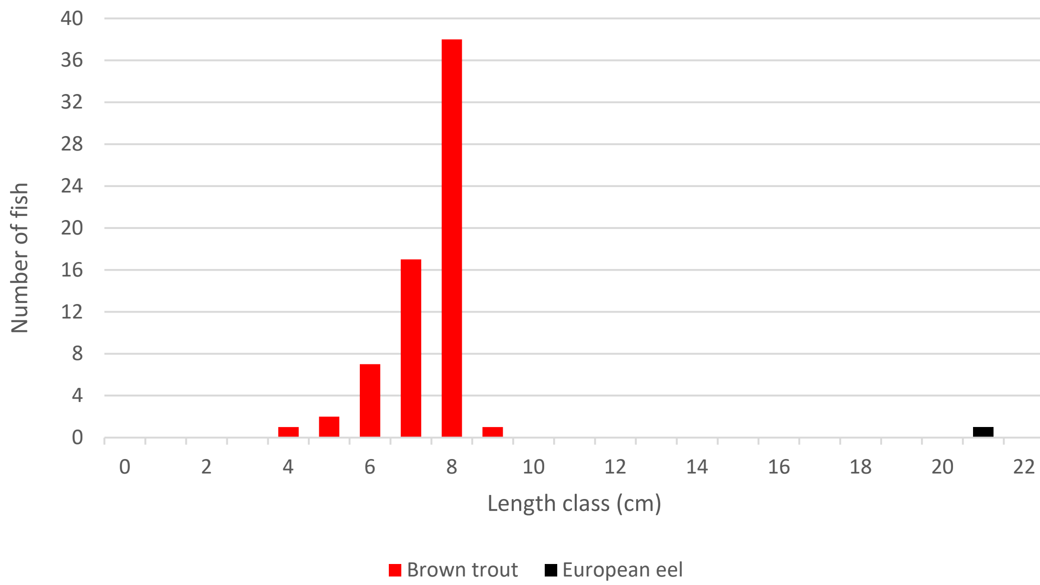

Figure 2.1: *Length frequency distribution recorded via electro-fishing at site A2 on the Kilcronan stream, September 2021.*

Plate 2.3 *Juvenile brown trout recorded from site A2 on the Kilcronan stream, September 2021*

2.1.3 Site A3 – Owveg River, Loughill Bridge

Site A3 was located on the Owveg River at Loughill Bridge. The swift-flowing lowland depositing watercourse (FW2) averaged 6-8m wide and 0.2-0.5m deep, with occasional pool to >1m. Slow-flowing glide predominated, with riffle and scattered pool present downstream of the bridge. The substrata were dominated by cobble and medium to coarse gravels, with localised finer gravels along channel margins. Boulder was occasional. However, downstream of the bridge (and small weir), the faster flows resulted in more boulder and cobble-dominated areas of swift glide and riffle. The bridge apron was cobbled and shallow. Bank erosion was frequent upstream of the bridge indicating significantly higher flows, seasonally. The low flows and water levels at the time of survey resulted in significant coverage of floc and filamentous algae (>75% of bed). *Cladophora* sp. was frequent, indicating enrichment. Submerged macrophytes were absent from the open glide upstream of the bridge, with occasional amphibious bistort *Persicaria amphibia*, watercress *Nasturtium officinale* and lesser water parsnip *Berula erecta*. Reed canary grass *Phalaris arundinacea* was common along channel margins. Aquatic bryophytes were confined to faster-flowing areas near the weir, with the occasional moss species *Platyhipnidium* riparioides. Upstream, the river flowed through improved pasture (GA1) with narrow riparian buffers (GS2). Downstream, the river was heavily shaded by mature treelines of ash, sycamore, alder *Alnus glutinosa* and hazel.

A total of four fish species were recorded via electro-fishing at site A3 (**Figure 2.2**). The site supported very high densities of juvenile Atlantic salmon (*n*=49) and brown trout, in addition to a moderate density of large adult trout (*n*=56 total). Low number of minnow *Phoxinus phoxinus* and a single *Lampetra* sp. transformer was also recorded. The site was evidently an excellent-quality salmonid nursery, with good-quality spawning habitat and some localised but very good quality holding areas associated with bank undercuts and vegetation overhangs. Overall, despite the presence of some localised lamprey spawning habitat, the site was of poor value for lamprey given an absence of soft sediment deposits. Despite some moderate suitability, no European eel or white-clawed crayfish were recorded. A small historical weir downstream of the bridge was considered to present a partial barrier to fish migration at low flows.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (Table 2.4). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Barrow and River Nore SAC (002162), the aquatic ecological evaluation of site A3 was of **international importance** (Table 2.3).

Plate 2.4 *Representative image of site A3 on the Owveg River, September 2021 (facing upstream from bridge)*

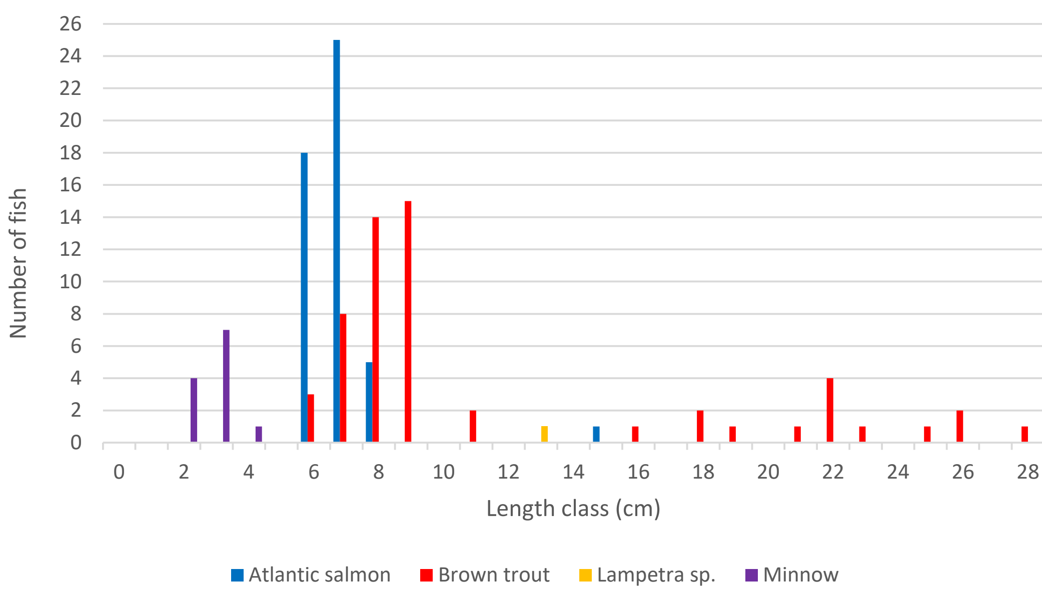

Figure 2.2: *Length frequency distribution recorded via electro-fishing at site A3 on the Owveg, September 2021*

Plate 2.5 *Adult brown trout recorded from site A3 on the Owveg River, September 2021*

2.1.4 Site A4 – Owveg River, Attanagh Bridge

Site A4 was located on the lower reaches of the Owveg River (15O01), a lowland depositing spate river (FW2) at Attanagh Bridge. The channel was 6-7m wide and ranged from 0.1 to 1.3m deep. The river had a sinuous profile with 1.5-2m high banks that were undercut. The profile was dominated by shallow glide with occasional riffle and deep pool. The substrata were dominated by mixed gravels with occasional boulder and cobble. The margins of the river supported locally compacted sand. Siltation was moderate to high and the bed was heavily compacted. The site did not support macrophytes due to the spate nature of the channel, shading and bed compaction. However, larger substrata and the bed supported occasional *Fontinalis antipyretica* and the liverwort *Riccardia chamedryfolia*. The riparian areas supported mature alder, ash, oak (*Quercus robur*), grey willow and hawthorn (*Crataegus monogyna*) with bramble, nettle (*Urtica dioica*), great willowherb and ivy in the understories. The site was bordered by improved grassland (GA1).

Atlantic salmon (*n*=20), brown trout (*n*=4), minnow (*n*=2) and stone loach (*n*=2) were recorded via electro-fishing at site A4 (**Figure 2.3**). The site was a good quality salmonid nursery given broken flow patterns and a stoney bed. However, the compaction of the bed and siltation pressures reduced the quality overall. The quality of salmonid and lamprey spawning habitat was good given the presence of extensive mixed gravels but as with the nursery habitat the quality was reduced by siltation pressures and bed compaction. Deeper glide and pool provided valuable holding habitat for adult salmonids. Localised depositional areas of sand and silt were too compacted to support lamprey ammocoetes. The site was of moderate value for European eel given abundant cobble refugia with deeper pool habitat refugia although none were recorded. Despite some good suitability (ample refugia), no white-clawed crayfish were recorded. However, the species was detected via eDNA sampling which indicates the presence of an upstream population (Table 2.1). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (Table 2.4). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location within the River Barrow and River Nore SAC (002162) and River Nore SPA (004233), the aquatic ecological evaluation of site A4 was of **international importance** (Table 2.3)**.**

Plate 2.6 *Representative image of site A4 on the Owveg River at Attanagh Bridge, August 2023*

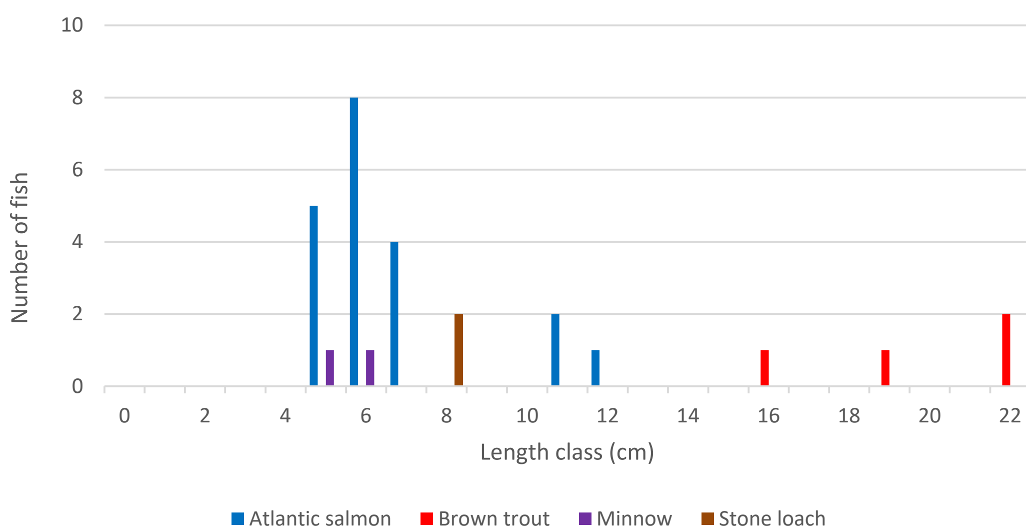

Figure 2.3: *Length frequency distribution recorded via electro-fishing at site A4 on the Owveg River, August 2023*

Plate 2.7 *Mixed cohort Atlantic salmon recorded at site A4 on the Owveg River at Attanagh Bridge, August 2023*

2.1.5 Site A5 – River Nore, N77 road bridge

Site A5 was located on the River Nore (15N01) at the N77 road bridge. The site was located within the River Barrow and River Nore SAC (002162). The lowland depositing watercourse (FW2) was 20-25m wide and 0.7-1.2m deep on average, with localised deeper scour pool. Deep glide dominated in the vicinity of the N77 bridge, with shallower glide, riffle and deeper pool downstream of the adjacent Ballyragget Bridge. The substrata were dominated by coarser gravels and cobble, with occasional boulder and finer interstitial gravels, locally. Sand accumulations were frequent along the margins. Given swift flows, soft sediment was largely absent, with the exception of some localised sand-dominated patches under the semi-dry Ballyragget Bridge arches. In terms of macrophytes, the glide downstream of the N77 bridge supported frequent common clubrush (*Schoenoplectus lacustris*), with both emergent and submerged forms present (i.e., heterophyllous). Water crowfoot (*Ranunculus* sp.) and unbranched bur-reed (*Sparganium emersum*) were present but localised. Water starwort (*Callitriche* sp.) was present along channel margins, with the duckweed species *Lemna minor* and *L. trisulca*. Submerged blue water speedwell was occasional with localised fine-leaved water dropwort (*Oenanthe aquatica*) also present. Cover of bryophytes was relatively high, with abundant *Platyhypnidium riparoides* and more occasional *Fontinalis antipyretica* and *Leptodictyum riparium*. Pocket moss (*Fissidens* sp.) was also present locally (on the waterline of bridge also) with red alga (*Lemanea fluviatilis*) also occasional. Given the presence of indicator *Ranunculus* and *Callitriche* species in addition to *Fontinalis antipyretica* and other aquatic bryophytes (EC, 2018; Devaney *et al*., 2013), the aquatic vegetation community was considered representative of the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] ('floating river vegetation'). Filamentous algae was present (5%) indicating enrichment (*Cladophora* sp.). The margins supported branched bur-reed with reed canary grass, bittersweet (*Solanum dulcamara*) and great willowherb. The low species diversity meant this habitat did not correspond to the Annex I habitat 'Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]'. The river was bordered by improved pasture (GA1) with scattered alder (*Alnus glutinosa*), ash and sycamore.

A total of six fish species were recorded via electro-fishing at site A5 (**Figure 2.4**). The site was dominated by high densities of Atlantic salmon parr (*n*=43), with moderate numbers of brown trout (*n*=10) and low numbers of European eel, minnow (*Phoxinus phoxinus*), stone loach (*Barbatula barbatula*) and a single rudd (*Scardinius erythropthalmus*). A high density of *Lampetra* sp. ammocoetes (34 per m^2) was recorded from a single $1m^2$ patch of habitat under the northernmost arch of Ballyragget Bridge (ITM 644477, 670876). The site was an excellent-quality salmonid nursery and spawning habitat, predominantly for Atlantic salmon. Low numbers of large adult brown trout were present, in addition to lower numbers of juveniles. Salmonid holding habitat, although localised, was present and of good quality (better downstream of Ballyragget Bridge). Whilst highly localised, excellent-quality lamprey ammocoete habitat was present under Ballyragget Bridge, with good-quality spawning present locally. European eel habitat was good overall, although calcification of substrata reduced the accessibility of frequent boulder refugia. Despite some suitability and historical records for the Nore, no white-clawed crayfish were recorded. An otter spraint (and prints) was recorded on a marginal boulder under Ballyragget Bridge with no crayfish remains in the spraint, further supporting crayfish absence (ITM 644477, 670875).

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (Table 2.4). No macro-invertebrate species of conservation value greater than ‘least concern’, according to national red lists, were recorded via Q-sampling.

Given the location within the River Barrow and River Nore SAC (002162), the aquatic ecological evaluation of site A5 was of **international importance** (Table 2.3).

Plate 2.8 *Representative image of site A5 on the River Nore, September 2021 (facing upstream to N77 bridge from Ballyragget Bridge)*

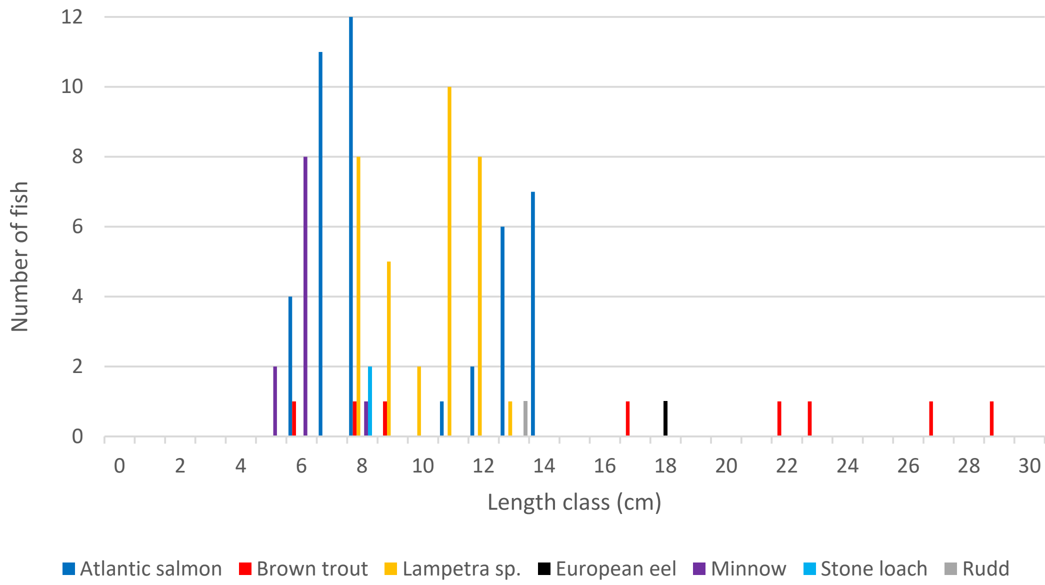

Figure 2.4: *Length frequency distribution recorded via electro-fishing at site A5 on the River Nore at the N77 road bridge, Ballyragget, September 2021*

Plate 2.9 *Adult brown trout recorded from site A5 on the River Nore, September 2021*

2.1.6 Site B1 – unnamed pond, Ballynalacken

Site B1 was a small (0.005ha) artificial pond (FL8) located alongside the headwaters of the Castlecomer Stream. The mature pond averaged 1-1.2m deep with a soft silt base (0.3m depth) underlain by clay and mixed gravels. At the time of survey, the pond featured near-100% surface cover of common duckweed *Lemna minor*, with large beds of broad-leaved pondweed *Potamogeton natans* present in the northern basin. No submerged macrophytes were recorded (given very high shading from duckweed). The wet margins supported frequent water mint *Mentha aquatica* and occasional water plantain *Alisma plantago-aquatica*. Lesser pond sedge *Carex acutiformis* and branched bur-reed *Sparganium erectum* were present but rare. Floating mats of bentgrass *Agrostis* sp. were also frequent around the pond margins. The pond was not fed by the Castlecomer Stream and was positioned approx. 2m above the level of the stream. However, an overflow to the stream was present. The pond was bordered by species-poor wet grassland (GS4), scrub (WS1), treelines (WL2) and improved pasture (GA1).

Site B1 was unsuitable for electro-fishing. However, the pond supported three-spined stickleback *Gasterosteus aculeatus*, which were caught via sweep netting. With the exception of low densities of this species, the heavily-vegetated pond was not of fisheries value and had poor connectivity to the adjacent Castlecomer Stream. Despite some suitability for common frog, none were recorded. The high cover of duckweed reduced suitability for smooth newt and none recorded via sweep netting.

Site B1 was not suitable for Q-sampling (i.e., a pond habitat). Low numbers of the nationally-localised, non-native pygmy backswimmer *Plea minutissima* (*leachi*) were recorded in the sweep samples. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded from the site.

Given the absence of aquatic species or habitats of high conservation value, the aquatic ecological evaluation of site B1 was of **local importance (lower value)** (Table 2.3).

Plate 2.10 *Representative image of site B1 at an unnamed pond, September 2021*

2.1.7 Site B2 – Castlecomer Stream, Ballynalacken

Site B2 was located on the uppermost reaches of the Castlecomer Stream, upstream of a local road crossing and approx. 80m downstream of the pond at site B1. The stream had been straightened and deepened historically but retained some semi-natural characteristics (e.g., meanders). The upland eroding, spate watercourse (FW1) suffered from very low flows at the time of survey (semi-dry) and averaged <1m wide and 0.05-0.1m deep, with limited pool/ponding areas to 0.2m. The stream flowed in a deep V-shaped channel with varying bankfull heights of 1-3m. The substrata were dominated cobble and mixed gravels which were both compacted and silted. Boulder was occasional. Siltation was moderate overall, though no sediment accumulations were present. The stream did not support macrophytes given high riparian shading from mature hedgerows of hawthorn and elder with occasional ash and the invasive rhododendron *Rhododendron ponticum*, plus abundant bramble scrub. Aquatic bryophytes were limited to occasional *Brachythecium* *rivulare* on the tops of larger boulder. Terrestrial encroachment of the channel was high. Livestock poaching was evident.

No fish were recorded via electro-fishing at site B2. The Castlecomer Stream was semi-dry at this location during the time of survey and was considered likely to be a non-perennial watercourse, only conveying significant flows during wetter periods/floods. The upland site had poor fisheries or aquatic value given its semi-dry nature and location in the uppermost reaches of the stream. However, fisheries value improved downstream (see 2.1.9 & 2.1.10 below).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (Table 2.4). However, it should be noted that, given the lack of flow, this is a tentative Q-rating. A single example of the nationally-localised, non-native pygmy backswimmer *Plea minutissima* (*leachi*) was recorded via kick-sampling (Table 2.4). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of high conservation value, and Q3 (poor status) water quality, the aquatic ecological evaluation of site B2 was of **local importance (lower value)** (Table 2.3).

Plate 2.11 *Representative image of site B2 on the Castlecomer Stream, September 2021*

2.1.8 Site B3 – unnamed stream, Firoda Upper

Site B3 was located on the uppermost reaches of an unnamed Castlecomer Stream tributary. The stream was 100% dry at the time of survey and would appear to convey water only during heavy rainfall events. The dry stream channel (<1m wide) was located in a steep, V-shaped channel with bankfull heights of 6-7m (i.e., characteristics of a spate channel). The base featured occasional boulder and cobble but these were bedded in mud. A masonry box culvert was present at the local road crossing, with a 1.5m fall on the downstream side acting as a barrier to any fish. The non-perennial stream drained an area of coniferous forestry (WD4) upstream of the road culvert where it was <0.5m wide. Macrophytes and aquatic bryophytes were absent given the dry channel although localised patches of iris *Iris psuedacorus* were present. The channel was heavily vegetated by willow *Salix* sp. and bramble-dominated scrub. The site was bordered by improved pasture (GA1).

No fish were recorded via electro-fishing at site B3. The upland site had no inherent fisheries or aquatic value given its dry nature, high gradient and location in the uppermost reaches of the stream. However, fisheries value improved in the downstream-connecting Castlecomer Stream (see 2.1.9 & 2.1.10 below).

Site B3 was not suitable for Q-sampling during the survey period due to its dry nature and lack of flow. Thus, it was not possible to assess biological water quality at this site.

Given the lack of aquatic and fisheries value, the aquatic ecological evaluation of site B3 was of **local importance (lower value)** (Table 2.3).

Plate 2.12 *Representative image of site B3 on an unnamed stream, September 2021*

2.1.9 Site B4 – Castlecomer Stream, Skehana

Site B4 was located on the middle reaches of the Castlecomer Stream at a local ford crossing. The upland eroding stream (FW1) averaged 2.5-3m wide and 0.1-0.3m deep, with only localised deeper pool to 0.5m. At the confluence of an unnamed stream, approx. 80m downstream of the ford, a large 1.5m deep plunge pool was present. The Castlecomer Stream flowed in a shallow, wide U-shaped channel in a glide-pool sequence, with 1-2m bank heights. Typically for an upland stream, the substrata were dominated by compacted cobble and boulder with only very localised interstitial finer gravels and coarse sands. Siltation was low and no accumulations were present. Filamentous algae (and floc) was present (5% cover), indicating some enrichment. The stream flowed through an area of mature oak-hazel woodland (WN2). The high shading and high-energy nature precluded the presence of macrophytes. However, *Platyhypnidium riparoides* was frequent on instream boulder, with *Thamnobryum* sp. on larger boulder.

Atlantic salmon and brown trout were the only fish species recorded via electro-fishing at site B4 (**Figure 2.5**). The site supported a relatively high density of mixed-cohort brown trout (*n*=47) and a moderate density of Atlantic salmon parr (*n*=14). The site was evidently a valuable salmonid nursery. Low densities of adult trout were recorded, which were largely restricted to occasional deeper pools. Salmonid spawning habitat, whilst present and of good quality, was localised. There was no suitability for lamprey given the upland nature of the site and absence of soft sediment areas. Despite some suitability, no European eel were recorded. The site was unsuitable for white-clawed crayfish and none were recorded.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (Table 2.4). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of Atlantic salmon and Q4 (good status) water quality, the aquatic ecological evaluation of site B4 was of **local importance (higher value)** (Table 2.3).

Plate 2.13 *Representative image of site B4 on the Castlecomer Stream, September 2021*

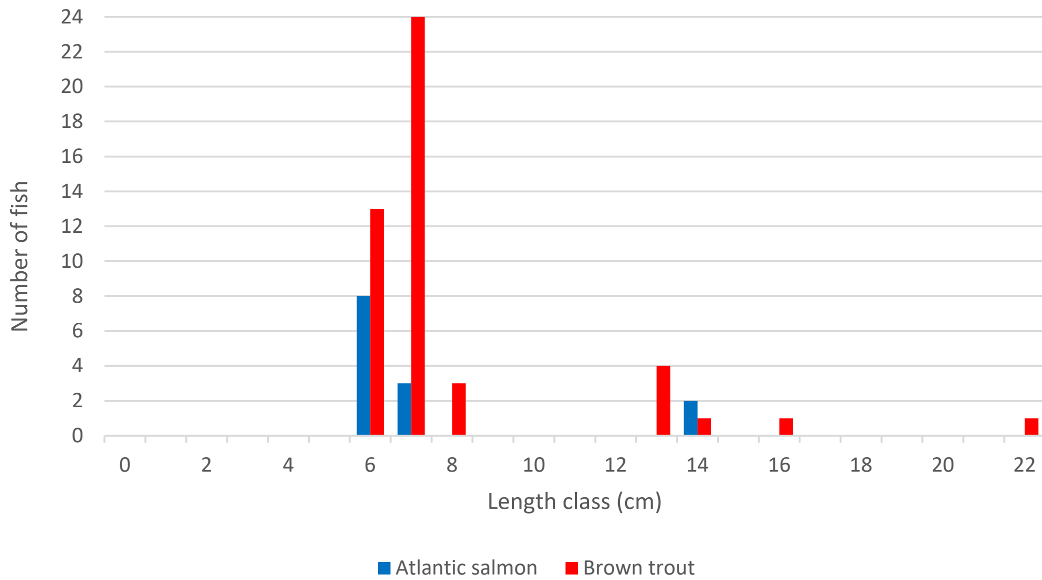

Figure 2.5: *Length frequency distribution recorded via electro-fishing at site B4 on the Castlecomer Stream, September 2021*

Plate 2.14 *Atlantic salmon parr and adult brown trout recorded from site B4 on the Castlecomer Stream, September 2021*

2.1.10 Site B5 – Castlecomer Stream, North Bridge, Castlecomer

Site B5 was located on the lower reaches of the Castlecomer Stream at North Bridge, approx. 0.4km upstream of the Dinin River confluence. The stream averaged 6-8m wide and 0.1-0.2m deep. Flows and water levels were low at the time of survey. Shallow, slow-flowing glide dominated the site with occasional riffle and very limited shallow pool habitat to a maximum of 0.3m depth. The substrata were dominated by cobble and boulder with frequent interstitial mixed gravels. These were moderately compacted and, given low seasonal flows, moderately silted with a high coverage of leaf litter and filamentous algae/floc covering >75% of the bed. Soft sediment accumulations were very localised and shallow where present (<5cm), e.g., downstream of bridge apron. The cobbled bridge apron was evidently a barrier to fish migration at low flows (<0.1m deep). The site was shaded by mature treelines of mostly sycamore. As a result, macrophyte growth was limited to occasional small stands of watercress and iris on channel margins. In terms of aquatic bryophytes, the moss species *Platyhypnidium riparoides* was common, with occasional *Fontinalis antipyretica* on larger boulder. *Hygrohypnum* sp. moss was present on marginal boulders. The site was bordered by residential areas and gardens, with scrubby riparian zones.

A total of four fish species were recorded via electro-fishing at site B5 (**Figure 2.6**). The site was dominated by brown trout (*n*=33) and Atlantic salmon (*n*=20), with a low density of *Lampetra* sp. ammocoetes and low numbers of three-spined stickleback. The site was evidently a valuable salmonid nursery habitat, supporting relatively high densities of both juvenile Atlantic salmon and brown trout. Adults were not recorded, with no deeper holding habitat present in vicinity of the bridge. Salmonid and lamprey spawning habitat was present but the quality was reduced given siltation and cover of floc. A low density of *Lampetra* sp. was recorded from superficial silt accumulations downstream of the bridge (mean of 6 per m^2). Suitability for European eel was low given the shallow nature of the site and poorly accessible cobble/boulder refugia and no eel were recorded via electro-fishing.

An old otter spraint was recorded on sand under the bridge (ITM 653221, 673227).

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (Table 2.4). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of Atlantic salmon and Q4 (good status) water quality, the aquatic ecological evaluation of site B5 was of **Local importance (Higher Value)** (Table 2.3).

Plate 2.15 *Representative image of site B5 on the Castlecomer Stream, September 2021 (facing upstream from bridge)*

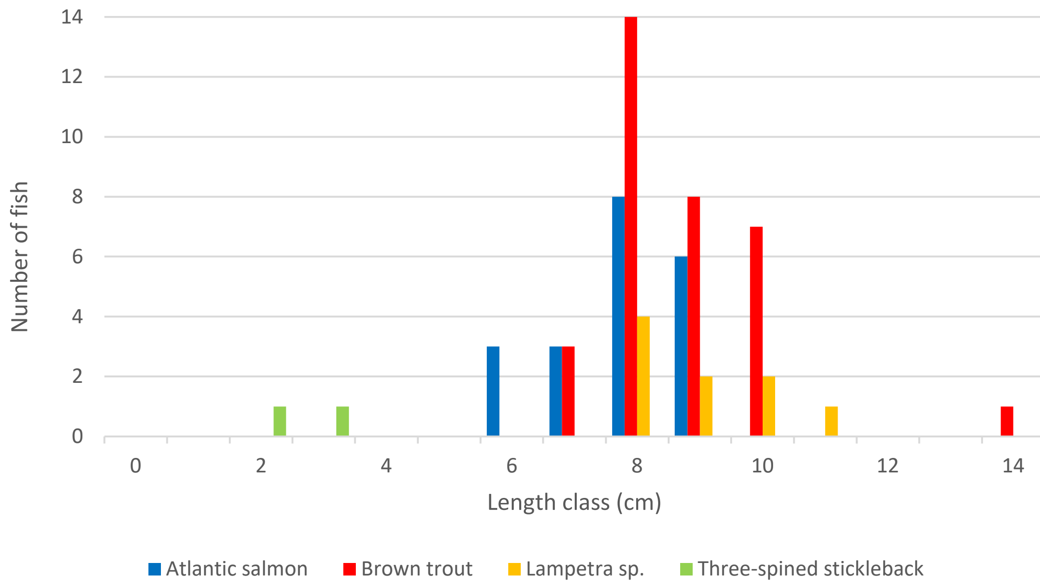

Figure 2.6: *Length frequency distribution recorded via electro-fishing at site B5 on the Castlecomer Stream, September 2021*

Plate 2.16 Lampetra *sp. ammocoetes recorded from site B5 on the Castlecomer Stream, September 2021*

2.1.11 Site B6 – Cloghnagh, R694 road crossing

Site B6 was located on the Cloghnagh river (15C03), upstream of the R694 road crossing. The semi-natural stream (FW1) had not been straightened or deepened historically, though was modified by way of a small ford crossing. The river suffered from very low flows at the time of survey, with the channel semi-dry, but showed spate characteristics. The river averaged 1-1.5m wide in a 2-3m wide, steep V-shaped incised channel. The depth averaged 0.05-0.15m at the time of survey, with isolated pools to 0.25m (more so downstream of the bridge). The profile comprised very shallow glide and riffle with frequent small pool. The substrata were dominated by angular cobble and boulder (indicative of spate-type channel) which were moderately-heavily silted, given the low flows. Transient, flocculent silt accumulations were present. With the exception of a short section at the livestock ford crossing, the channel was very heavily tunnelled. As a result of tunnelling, macrophytes were absent with the exception of some localised brooklime and water mint in open areas. Aquatic bryophytes were not recorded. The site was flanked by mature treelines of sycamore, ash, hawthorn and hazel with dense bramble-dominated scrub. The river flowed through improved pasture (GA1) with mixed broad-leaved woodland (WD1) downstream.

Stone loach and European eel were the only fish species recorded via electro-fishing at site B6 (**Figure 2.7**). Both species were present in low densities (*n*=6 & *n*=2 respectively) and mostly confined to small pools. The low flows likely precluded salmonids during the survey period, although the river would have considerably higher value as a nursery and, less so, as a spawning habitat during higher flows. Downstream barriers were known on the river, which may have impacted salmonid migration. Sediment deposits were largely unsuitable for lamprey ammocoetes and the site was not considered of value as a lamprey spawning habitat. No white-clawed crayfish were recorded.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (Table 2.4). However, it should be noted that, given the lack of flow, this is a tentative Q-rating. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of European eel, the aquatic ecological evaluation of site B6 was of **local importance (higher value)** (Table 2.3).

Plate 2.17 *Representative image of site B6 on the Cloghnagh river, September 2021*

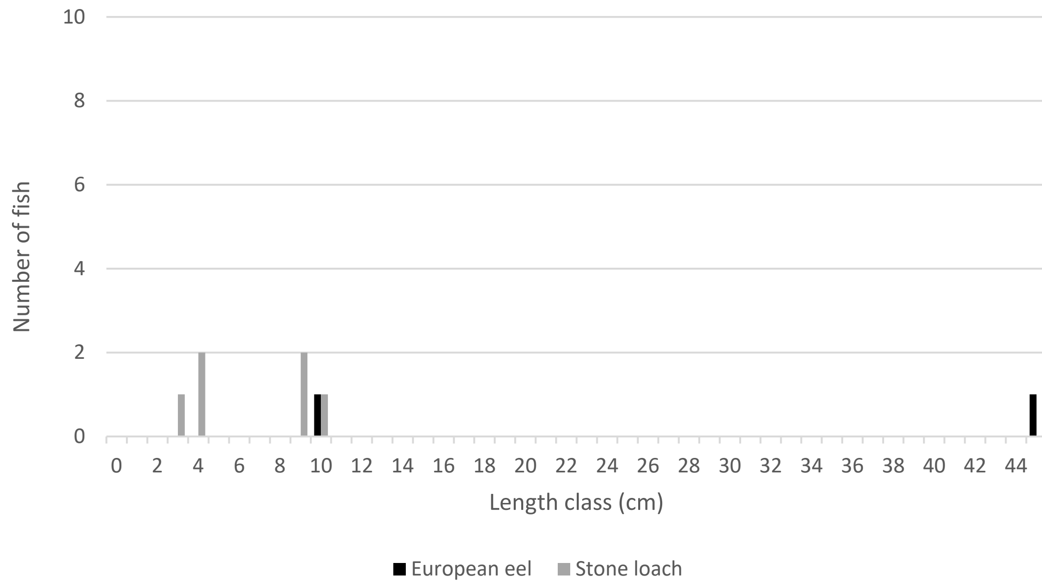

Figure 2.7: *Length frequency distribution recorded via electro-fishing at site B6 on the Cloghnagh river, September 2021*

Plate 2.18 *Mixed-cohort stone loach and juvenile European eel recorded from site B6 on the Cloghnagh river, September 2021*

2.1.12 Site B7 – Cloghnagh, Toor More

Site B7 was located on the middle reaches of the Cloghnagh river at a ford crossing, approx. 2km downstream of site B6. The river averaged 2-3m wide (but up to 5m) in a largely natural, sinuous channel. As per upstream, the river suffered from very low flows at the time of survey, with the average depth 0.1-0.15m. The profile comprised slow-flowing glide with frequent riffles and small pools (to 0.5m), over a moderate gradient with bankfull heights of 1-2m. The river showed characteristics of a spate channel, with frequent bank erosion and scours. The substrata were dominated by relatively mobile cobble and boulder. Interstitial gravels were present but rare overall. Siltation, given low flows, was moderate at the time of survey. Macrophytes were limited to abundant watercress and frequent brooklime in more open areas. Blue water speedwell (*Veronica anagallis-aquatica*) and water mint were also present. Filamentous algae and floc coverage was very high, covering >90% of the bed (Indicating enrichment). Aquatic bryophytes were limited to *Brachythecium rivulare* on the tops of boulders. The liverwort *Conocephalum conicum* was present on muddy banks. With the exception of the ford crossing, the site was heavily shaded by mature treelines of ash, sycamore, hazel, crab apple (*Malus sylvestris*) and hawthorn. The site was bordered by improved pasture (GA1) and scrub vegetation (WS1).

Stone loach were the only fish species recorded via electro-fishing at site B7 (**Figure 2.8**). Juveniles were abundant, with lower numbers of adults (*n*=89 total). No salmonids were recorded which likely reflected known barriers downstream (AMBER Consortium, 2020) and others such as the ford crossing present immediately downstream of the site (0.5m fall on downstream side). Salmonid nursery and spawning habitat were considered moderate overall (improved at higher flows, given seasonal sediment deposits). Some good-quality holding habitat was present by way of bank undercuts and small scour pools. The site was largely unsuitable for lamprey given the eroding nature and paucity of suitable spawning or nursery areas. Despite some good suitability, no European eel or white-clawed crayfish were recorded.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (Table 2.4). However, it should be noted that, given the lack of flow, this is a tentative Q-rating. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of high conservation value, the aquatic ecological evaluation of site B7 was of **local importance (lower value)** (Table 2.3).

Plate 2.19 *Representative image of site B7 on the Cloghnagh river, September 2021*

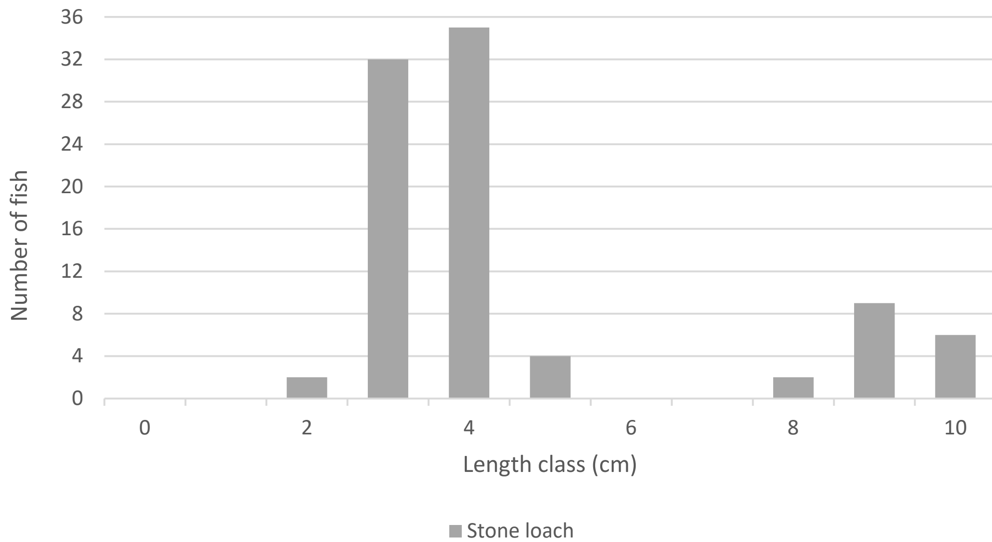

Figure 2.8: *Length frequency distribution recorded via electro-fishing at site B7 on the Cloghnagh river, September 2021*

Plate 2.20 *Mixed-cohort stone loach recorded from site B7 on the Cloghnagh river, September 2021.*

2.1.13 Site B8 – Castlecomer Stream, North Bridge

Site B8 was located on the Castlecomer Stream (15C01) at North Bridge in Castlecomer, approximately 400m upstream of the Dinin River confluence. The semi-natural upland eroding spate river (FW1) was 7-8m wide and between 0.1-0.3m deep. The river had variable bank height between 1-4m given historical urbanisation along the riparian areas but nonetheless retained good hydromorphological variation instream. The profile was dominated by shallow glide and riffle with localised shallower pools in bank undercuts under tree root systems. The substrata comprised abundant boulder and cobble with frequent mixed coarse gravels between coarser substrata. Siltation was moderate and the bed was lightly compacted. The spate site did not support macrophytes. Hower the aquatic moss *Cinclidotus fontinaloides* was present locally instream with the moss *Sciuro hypnum-plumosum* on boulder tops. Submerged boulders supported *Fontinalis antipyretica* locally. The riparian areas supported scattered treelines of mature alder, sycamore and hawthorn with localised cherry laurel. The understories supported abundant bramble and butterbur (*Petasites hybridus*) scrub. The site as bordered by buildings and artificial surfaces (BL3) and residential gardens (GA2). This site was visited in August 2023 where the nearby B5 was visited in September 2021.

Atlantic salmon (*n*=10), brown trout (*n*=39), lamprey (*Lampetra* sp.) (*n*=4), stone loach (*n*=1) and minnow (*n*=1) were recorded via electro-fishing at site B8 (**Figure 2.9**). The site was a good quality salmonid nursery supporting a medium density of juveniles. However, the value was reduced somewhat by historical bank works and siltation pressures. Mixed gravels between cobbles with more extensive gravels in deeper glide provided good quality salmonid spawning habitat. The holding value of the site for adult salmonids was low due to the generally shallow nature and paucity of pool areas. The high energy site was largely unsuitable for lamprey although a low density (0.5 per m^2) of *Lampetra* sp. ammocoetes was recorded from superficial silt accumulations downstream of the bridge. Despite some low suitability for white-clawed crayfish, none were recorded via hand searching of instream refugia or eDNA sampling (Table 2.1). Freshwater pearl mussel (*Margaritifera margaritifera*) were detected via eDNA sampling indicating an upstream population (Table 2.1). This positive eDNA result was determined to be a false positive as a result of salmonids carrying traces of pearl mussel from other locations within the River Nore. An old otter spraint was recorded on sand under the bridge (ITM 653221, 673227).

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (Table 2.4). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon), *Lampetra* sp. and Q4 (good status) water quality, in addition to the detection of white-clawed crayfish via eDNA, the aquatic ecological evaluation of site B8 was of **Local importance (Higher Value)** (Table 2.3).

Plate 2.21 *Representative image of site B8 on the Castlecomer Stream at North Bridge, August 2023*

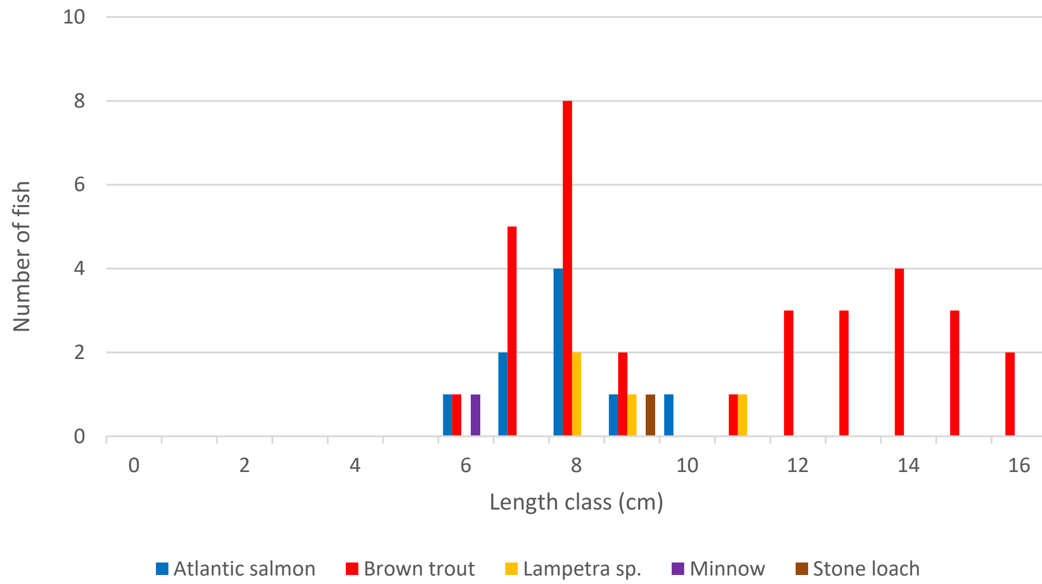

Figure 2.9: *Length frequency distribution recorded via electro-fishing at site B8 on the Castlecomer Stream, August 2023*

Plate 2.22 *Salmonids and stone loach recorded at site B8 on the Castlecomer Stream, August 2023*

2.1.14 Site B9 – Dinin River, Castlecomer Bridge

Site B9 was located on the Dinin River (15D07) at Castlecomer Bridge. The large upland eroding spate river (FW1) had been modified historically with cobble retaining walls (2m high) and a weir. The river was 10-16m wide and ranged between 0.2m to 1.2m deep. The profile was dominated by shallow glide and riffle with occasional deeper pool and localised bank scours. The substrata were dominated by boulder and cobble with abundant mixed rounded interstitial gravels. Siltation was moderate although soft sediment accumulations were not present given the high energy conditions downstream of the weir. Given high riparian shading and high flow rates, macrophytes were not present. However, the weir face supported the aquatic moss species *Cinclidotus fontinaloides*, *Fontinalis antipyretica* and *Rhynchostegium riparioides*. The riparian areas supported mature mixed broadleaved woodland (WD1) with mature horse chestnut (*Aesculus hippocastanum*), beech, oak, alder, ash and juniper (*Juniperus communis*) with scattered cherry laurel in the understories.

Atlantic salmon (*n*=49), brown trout (*n*=20) and stone loach (*n*=1) were the only fish recorded via electro-fishing at site B9 (**Figure 2.10**). The site was considered an excellent quality salmonid nursery, supporting a relatively high density of Atlantic salmon parr and juvenile brown trout. While siltation was moderate, the fast flows maintained relatively clean bed substrata which were mobile and uncompacted. The quality of salmonoid spawning habitat was good given the presence of extensive mixed gravels between coarse substrata and also large depositions in pool habitat. Deep pools and bank scours provided good quality holding areas for adult salmonids in addition to spawning substrata. However, the weir was considered a major barrier to fish during summer flows with no functioning fish pass (c. 2m vertical fall). Despite some good suitability (ample refugia), no European eel were recorded. Whilst the site was of too high energy so support lamprey ammocoetes, the deep impounded glide upstream of the weir was more suitable as a lamprey nursery. Despite some low suitability for white-clawed crayfish, none were recorded via hand searching of instream refugia. However, the species was detected via eDNA sampling (Table 2.1). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (Table 2.4). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location within the River Barrow and River Nore SAC (002162), the aquatic ecological evaluation of site B9 was of **international importance** (Table 2.3)**.**

Plate 2.23 *Representative image of site B9 on the Dinin River at Castlecomer Bridge, August 2023*

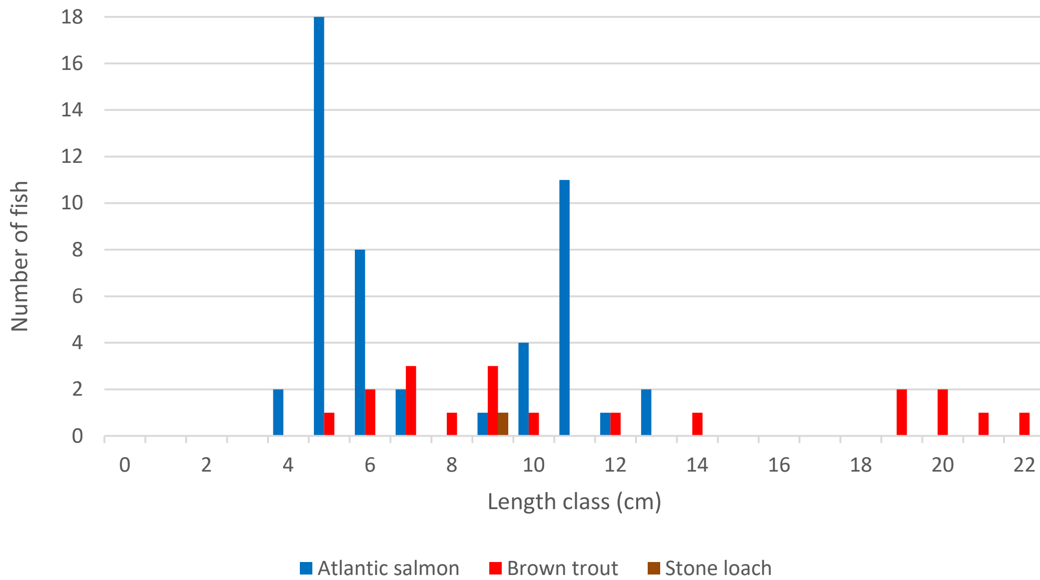

Figure 2.10: *Length frequency distribution recorded via electro-fishing at site B9 on the Dinin River, August 2023*

Plate 2.24 *Atlantic salmon parr (top) and brown trout (with spinal deformity) recorded at site B9 on the Dinin River at Castlecomer Bridge, August 2023*

2.1.15 Site C1 – Castlemarket_East, Ballyoskill

Site C1 was located on the uppermost reaches of the Castlemarket_East stream (15C89), which drained an area to the west of the proposed wind farm boundary. The stream had been extensively straightened and deepened historically in the vicinity of a local road crossing (pipe culvert). The stream was semi-dry at the time of survey and resembled a drainage ditch habitat (FW4), with no flows present and localised standing water only (i.e., non-perennial). The channel averaged 2-2.5m wide in a deep U-shaped profile, with a maximum depth of 0.05m. The bed comprised 100% deep silt, with some localised cobble and gravels underneath. Occasional watercress was present in small pools of standing water. No aquatic bryophytes were recorded. Terrestrial encroachment was very high, with the channel heavily vegetated by willow, bramble, nettle, great willowherb *Epilobium hirsutum* and rank grasses. The site was bordered by improved pasture (GA1) and open banks.

No fish were recorded from stagnant pools via electro-fishing at site C1. The heavily-vegetated watercourse was evidently non-perennial at this location and likely only conveyed significant flows during wetter periods/floods. The site had no inherent fisheries and poor aquatic value given its semi-dry nature, and location in the uppermost reaches of the stream. However, fisheries value improved downstream (see 2.1.18 below).

Site C1 was not suitable for Q-sampling during the survey period due to its semi-dry nature and lack of flow. Thus, it was not possible to assess biological water quality at this site.

Given the absence of aquatic species or habitats of high conservation value, the aquatic ecological evaluation of site C1 was of **local importance (lower value)** (Table 2.3).

Plate 2.25 *Representative image of site C1 on the Castlemarket_East stream, September 2021 (semi-dry channel)*

2.1.16 Site C2 – Nicholastown_15, Ballynalacken

Site C2 was located on the Nicholastown_15 stream at a local road. However, the site survey revealed the stream had been historically realigned as part of land drainage activities. Despite being indicated by EPA mapping, the stream did not cross under the local road, although a dry channel was located approx. 40m downstream of the indicated crossing point. Here, the non-perennial channel averaged a homogenous 1.5-2m wide with a deep U-shaped profile. The base comprised of dry mud with occasional cobble and boulder, indicative of occasional water flows. No macrophytes or aquatic bryophytes were present. The channel was heavily bound by mature ash-dominated treelines and scrub vegetation. The site was located in improved pasture (GA1).

Electro-fishing was not undertaken at site C2 given the stream was 100% dry at this location during the time of survey. The non-perennial stream at this location likely only conveyed significant flows during wetter periods/floods. The channel had no inherent fisheries or aquatic value given its dry nature, and location in the uppermost reaches of the stream. Fisheries value improved downstream (see 2.1.18 below).

Site C2 was not suitable for Q-sampling during the survey period due to its dry nature and lack of flow. Thus, it was not possible to assess biological water quality at this site.

Given the lack of aquatic and fisheries value, the aquatic ecological evaluation of site C2 was of **local importance (lower value)** (Table 2.3).

Plate 2.26 *Representative image of site C2 on the Nicholastown_15 stream, September 2021 (no watercourse crossed by road despite EPA mapping)*

2.1.17 Site C3 – Loughill, Ballyoskill

Site C3 was located on the uppermost reaches of the Loughill river (15L13) at a local road crossing. The stream had been straightened and deepened historically and suffered from very low flows at the time of survey. Upstream of the road pipe culvert, the river represented a very heavily vegetated semi-dry drainage channel (FW4). However, downstream, the river was more representative of an upland eroding watercourse (FW1). The river averaged 1.5-2m wide in a 2.5-3m wide channel. Bankfull heights were 2-3m in a trapezoidal channel. Flows were very slow at the time of survey with the average depth being 0.05-0.1m. The profile comprised very shallow glide and riffle with localised pool to 0.2m. A plunge pool associated with the road culvert/farm track crossing was 0.5m deep. The substrata were dominated by medium and coarse gravels with frequent cobble and small boulder. These were compacted. Sand was also frequent. Siltation was moderate, given the low flows. However, any deposits were flocculent only (with the exception of the plunge pool). The small channel was very heavily tunnelled, with only a short section of more open channel near the culvert. Here, lesser water parsnip was occasional with common duckweed and filamentous algae *Cladophora sp.* present, indicating enrichment. Encroachment from nitrophilous species such as nettle and great willowherb was high. Aquatic bryophytes were not recorded given very high shading. A mature and dense hedgerow of hawthorn, elder and bramble lined the channel downstream. The river flowed through intensive pasture (GA1).

Three-spined stickleback were the only fish species recorded via electro-fishing at site C3 (**Figure 2.11**). With the exception of low densities of this species (*n*=10; most in the plunge pool associated with the road culvert), the site was of very poor fisheries value given observed low seasonal flows (near semi-dry), siltation and historical modification. There was no suitability for salmonids, lamprey, European eel or other fish species at the time of survey. No white-clawed crayfish were recorded.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (Table 2.4). However, it should be noted that, given the lack of flow, this is a tentative Q-rating. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of high conservation value, and Q3 (poor status) water quality, the aquatic ecological evaluation of site C3 was of **local importance (lower value)** (Table 2.3).

Plate 2.27 *Representative image of site C3 on the Loughill stream, September 2021*

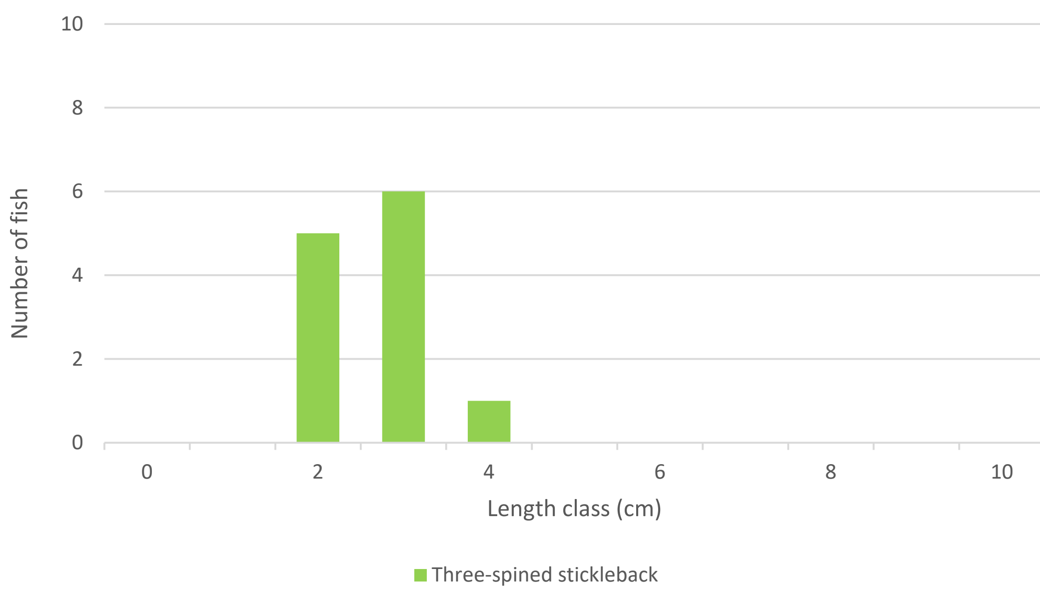

Figure 2.11: *Length frequency distribution recorded via electro-fishing at site C3 on the Loughill, September 2021*

Plate 2.28 *Three-spined stickleback recorded from site C3 on the Loughill stream, September 2021*

2.1.18 Site C4 – Castlemarket_East, Loughill stream confluence

Site C4 was located on the Castlemarket_East stream (15C89) at the confluence with the upper reaches of the Loughill river, approx. 2.4km downstream of site C1. The small stream (FW2) had been straightened and deepened historically and averaged 2-2.5m wide and 0.05-0.1m deep. The stream suffered from very low flows at the time of survey and clearly conveyed substantially higher flows during wetter periods. The profile comprised riffle and very shallow homogenous glide with limited small pool to a maximum depth of 0.2m. The stream flowed in a deep trapezoidal channel with bankfull heights of 1.5m. The substrata comprised cobble and boulder with occasional small patches of mixed gravels. However, these were very heavily compacted (due to excavation to bedrock), in addition to some calcification and siltation. Siltation was moderate overall due to the low flows. Sediment deposits, whilst present, were superficial/transient only and <3cm deep. Macrophytes included frequent fool's watercress *Apium nodiflorum* and occasional water mint. Filamentous algae *Cladophora sp.* was present (<2% cover), indicating enrichment. The calcicolous liverwort *Pellia endiviifolia* was common as both a submerged and emergent form. The stream was moderately shaded by a mature treeline of ash, hazel, beech and willow on the south bank, with narrow riparian zone along the north. Downstream, where the stream adjoined the Loughill River (semi-dry, 0.5m-wide stream), the channel was heavily tunnelled by scrub and hedgerows. The site was bordered by intensive pasture (GA1).

Brown trout and three-spined stickleback were the only fish species recorded via electro-fishing at site C4 (**Figure 2.12**). Both were present in very low densities. This was unsurprising given the very shallow and modified nature of the stream. The site provided some moderate salmonid nursery value and poor spawning given the very compacted substrata. Holding habitat was poor given the paucity of deeper pool areas. However, the salmonid value was likely improved during high flows/wetter periods. Sediment deposits were flocculent only and were not suitable for lamprey ammocoetes. Suitability for European eel and white-clawed crayfish was low and neither species were recorded.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (Table 2.4). However, it should be noted that, given the lack of flow, this is a tentative Q-rating. The IUCN near-threatened water beetle *Gyrinus urinator* (Foster *et al*. 2009) was recorded. No other macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of the near-threatened water beetle *Gyrinus urinator*, the aquatic ecological evaluation of site C4 was of **local importance (higher value)** (Table 2.3).

Plate 2.29 *Representative image of site C4 on the Castlemarket_East stream, September 2021*

Figure 2.12: *Length frequency distribution recorded via electro-fishing at site C4 on the Castlemarket_East stream, September 2021*

Plate 2.30 *Three-spined stickleback and juvenile brown trout recorded from site C4 on the Castlemarket_East stream, September 2021*

2.1.19 Site C5 – Loughill, Glashagall Bridge

Site C5 was located on the Loughill river at Glashagal Bridge (R432), approx. 0.9km upstream of the River Nore confluence. The small lowland depositing river (FW2) had been straightened but not deepened historically and retained some semi-natural features, particularly downstream of the twin-arch bridge. The river suffered from very low flows at the time of survey and averaged <2m wide and 0.05-0.1m deep. The site was typified by shallow slow-flowing glide and occasional riffle with very limited shallow, small pool to 0.2m max. The substrata were dominated by cobble and mixed gravels which were heavily compacted and bedded, with some calcification. Siltation was moderate overall (exacerbated by low seasonal flows), with plumes underfoot. However, some interstitial patches of more mobile gravels were present in between cobble and boulder. Flocculent soft sediment accumulations were frequent but limited in extent. Riparian shading was high and macrophytes were limited to occasional watercress (albeit, abundant at bridge) and least duckweed (*Lemna minor*) in more open areas of channel. The moss *Leptodictyum riparium* was frequent on boulder with present on the tops of boulders. The liverwort *Pellia endiviifolia* was common instream and on the banks. Mature riparian treelines of ash, sycamore and hazel lined the channel on south bank, with narrow riparian buffer adjoining intensive pasture (GA1) on the north. Downstream, mature treelines bordered both banks.

Three fish species were recorded via electro-fishing at site C5 (**Figure 2.13**). A low density of three-spined stickleback were present (*n*=6) in addition to a moderate density of *Lampetra* sp. Ammocoetes (15 per $1m^2$ fished total). A single juvenile brown trout was also recorded. The shallow site was of some moderate value as a salmonid nursery, although the low seasonal flows significantly reduced the value overall. Spawning habitat was poor given siltation and compaction of substrata (more suited to small trout). Lamprey spawning habitat was present in small finer gravel pockets. Although mostly flocculent in nature, some good quality ammocoete habitat was present, typically adjoining pool areas and macrophyte beds. A moderate density of 15 per m^2 was present. Suitability for European eel was low given the shallow nature of the site and none were recorded. White-clawed crayfish were not recorded.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (Table 2.4). However, it should be noted that, given the lack of flow, this is a tentative Q-rating. No other macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of *Lampetra* sp., the aquatic ecological evaluation of site C5 was of **local importance (higher value)** (Table 2.3).

Plate 2.31 *Representative image of site C5 on the Loughill river, September 2021 (upstream of bridge)*

Figure 2.13: *Length frequency distribution recorded via electro-fishing at site C5 on the Loughill river, September 2021*

Plate 2.32 Lampetra *sp. ammocoetes and three-spined stickleback recorded from site C5 on the Loughill river, September 2021*

2.1.20 Site C6 – Rathduff_15, Sraleagh

Site C6 was located on the Rathduff_15 river (15R24) at the confluence of the Sraleagh river. The river had been extensively straightened and deepened historically through intensive pasture (GA1), with a deep U-shaped channel and bankfull heights of 2-3m. The river was 100% dry at the time of survey, with no standing water present. The substrata were dominated by cobble and coarse gravels with frequent boulder. However, the dry mud on the base would indicate the river rarely conveys water. The channel was heavily tunnelled by bramble-dominated scrub and mature treelines of ash, sycamore and hazel, with privet *Ligustrum vulgare* and hawthorn.

Electro-fishing was not undertaken at site C6 given the river was 100% dry at this location during the time of survey. The non-perennial watercourse likely only conveyed flows of water during wetter periods/floods. The site had no inherent fisheries or aquatic value given its dry nature, and location in the uppermost reaches of the stream. However, the downstream-connecting River Nore is of high fisheries value.

Site C6 was not suitable for Q-sampling during the survey period due to its dry nature and lack of flow. Thus, it was not possible to assess biological water quality at this site.

Given the lack of aquatic and fisheries value, the aquatic ecological evaluation of site C6 was of **local importance (lower value)** (Table 2.3).

Plate 2.33 *Representative image of site C6 on the Rathduff_15, September 2021 (100% dry channel)*

2.1.21 Site C7 – Rathduff_15, R432 road crossing

Site C7 was located on the Rathduff_15 river (15R24) at the R432 road and proposed Ballynalacken Grid Connection crossing (W3), approx. 0.2km upstream of the River Nore confluence. The river had been extensively straightened and deepened historically through intensive pasture (GA1), with a deep U-shaped channel and bankfull heights of 1.5-3m. The river was 100% dry at the time of survey, with no standing water present. The substrata were dominated by cobble and coarse gravels with frequent boulder. However, the dry mud on the base would indicate the river rarely conveys water. With the exception of localised watercress in damp muddy patches, macrophytes were absent. No aquatic bryophytes were recorded. The channel was lined by mature treelines of ash, crab apple and hawthorn and bordered by improved pasture (GA1) and a residential garden (GA2).

Electro-fishing was not undertaken at site C7 given the river was 100% dry at this location during the time of survey. The non-perennial watercourse likely only conveyed flows of water during wetter periods/floods. The site had no inherent fisheries or aquatic value given its dry nature, and location in the uppermost reaches of the stream. However, the downstream-connecting River Nore (0.2km downstream) is known to be of high fisheries value.

Site C7 was not suitable for Q-sampling during the survey period due to its dry nature and lack of flow. Thus, it was not possible to assess biological water quality at this site.

Given the lack of aquatic and fisheries value, the aquatic ecological evaluation of site C7 was of **local importance (lower value)** (Table 2.3).

Plate 2.34 *Representative image of site C7 on the Rathduff_15, September 2021 (100% dry channel)*

2.2 eDNA analysis

Table 2.1: eDNA results in the vicinity of the proposed Ballynalacken Windfarm (positive qPCR replicates out of 12 in parentheses)

Site	Watercourse	Freshwater pearl mussel	White-clawed crayfish	Crayfish plague
A4	Owveg River	Negative (0/12)	**Positive (4/12)**	Negative (0/12)
B8	Castlecomer Stream	**Positive (9/12)**	Negative (0/12)	**Positive (12/12)**
B9	Dinin River	Negative (0/12)	**Positive (1/12)**	Negative (0/12)

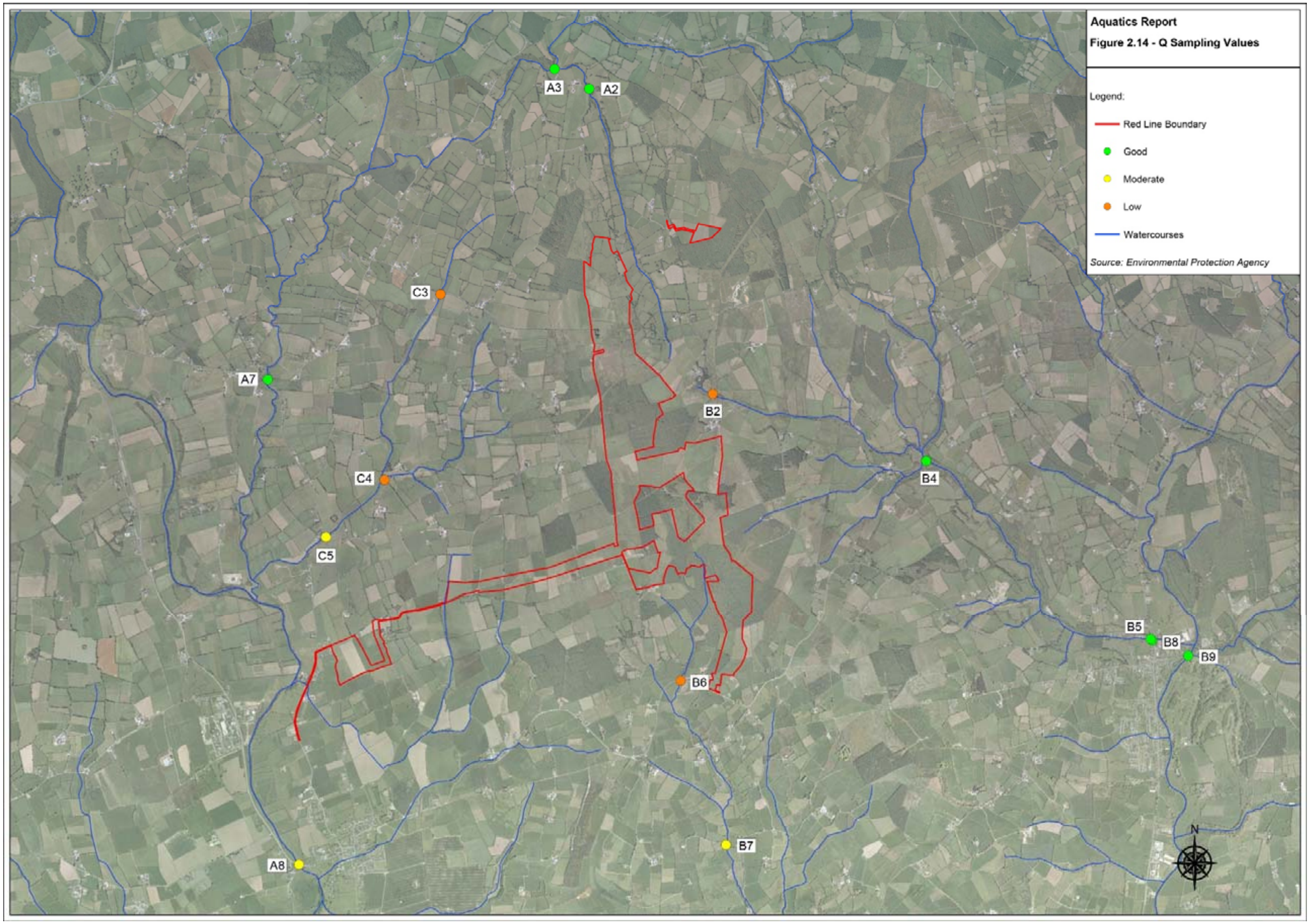

Figure 2.14: *Overview of the biological water quality status in the vicinity of the proposed Ballynalacken Windfarm Project.*

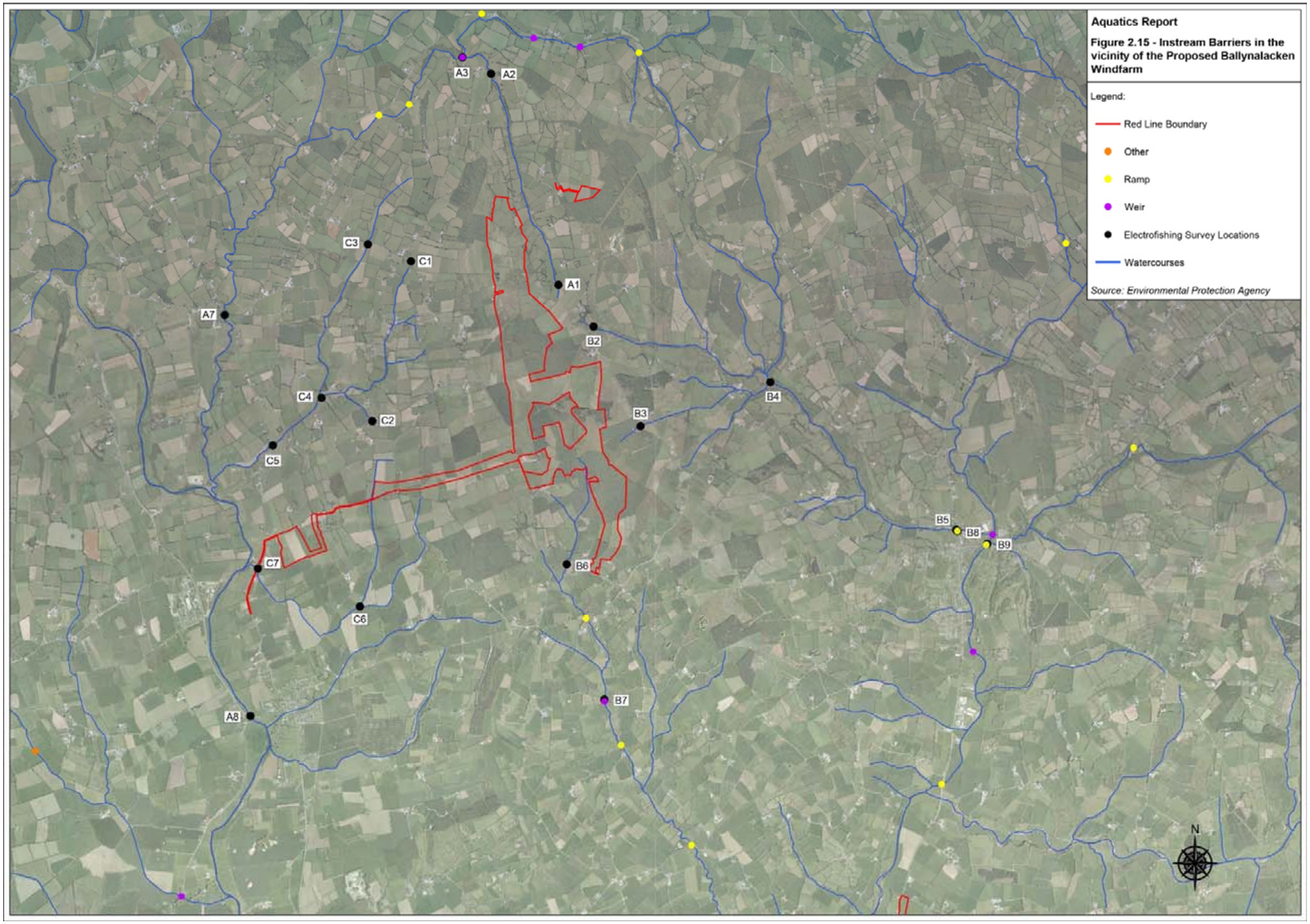

Figure 2.15: *Instream barriers in the vicinity of the proposed Ballynalacken Windfarm, Co. Kilkenny (source: AMBER Atlas + this survey)*

Table 2.2: *Fish species densities per m² recorded at sites in the vicinity of Ballynalacken Windfarm via electro-fishing in September 2021 and July, August 2023. Values in bold represent the highest densities recorded for each species, respectively.*

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m²)	Fish density (number fish per m²)						
				Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	Three-spined stickleback	Minnow	Stone loach
A1	Kilcronan	n/a	Dry channel	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A2	Kilcronan	10	187.5	0.000	**0.352**	0.000	0.005	0.000	0.000	0.000
A3	Owveg [Nore]	10	270	**0.181**	0.207	0.004	0.000	0.000	**0.044**	0.000
A4	Owveg [Nore]	10	300	0.067	0.013	0.000	0.000	0.000	0.007	0.007
A5	Nore	10	250	0.172	0.032	**34.0***	0.004	0.000	0.044	0.008
B2	Castlecomer Stream	n/a	Dry channel	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B3	Unnamed stream	n/a	Dry channel	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B4	Castlecomer Stream	10	175	0.074	0.269	0.000	0.000	0.000	0.000	0.000
B5	Castlecomer Stream	10	280	0.071	0.118	6*	0.000	0.007	0.000	0.000
B6	Cloghnagh	5	100	0.000	0.000	0.000	**0.020**	0.000	0.000	0.060
B7	Cloghnagh	10	162.5	0.000	0.000	0.000	0.000	0.000	0.000	**0.548**
B8	Castlecomer Stream	10	280	0.036	0.139	0.5*	0.000	0.000	0.004	0.004
B9	Dinin [North]	10	350	0.14	0.057	0.000	0.000	0.000	0.000	0.003
C1	Castlemarket_East	n/a	Dry channel	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	Nicholastown_15	n/a	Dry channel	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	Loughill	5	60	0.000	0.000	0.000	0.000	**0.200**	0.000	0.000
C4	Castlemarket_East	5	100	0.000	0.020	0.000	0.000	0.070	0.000	0.000

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m^2)	Fish density (number fish per m^2)						
				Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	Three-spined stickleback	Minnow	Stone loach
C5	Loughill	10	150	0.000	0.007	15*	0.000	0.047	0.000	0.000
C6	Rathduff_15	n/a	Dry channel	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C7	Rathduff_15	n/a	Dry channel	0.000	0.000	0.000	0.000	0.000	0.000	0.000

* = no. ammocoetes per m^2 of targeted habitat fished. Greyed out values indicate no fish recorded during the survey.

Table 2.3: *Aquatic ecological evaluation summary of the aquatic survey sites according to NRA (2009) criteria*

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
A1	Kilcronan	15K29	Local importance (lower value)	No fisheries or aquatic value due to non-perennial nature of stream (site 100% dry at time of survey); not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value
A2	Kilcronan	15K29	**Local importance (higher value)**	Excellent-quality salmonid nursery with good-quality spawning and holding; site unsuitable for lamprey; brown trout & European eel recorded via electro-fishing; Q4 (good status) water quality (tentative rating due to poor flows); white-clawed crayfish remains recorded in otter spraint; no other aquatic species or habitats of high conservation value
A3	Owveg [Nore]	15O01	**International importance**	Located within the River Barrow and River Nore SAC (002162); excellent-quality salmonid nursery habitat with good-quality spawning and holding habitat; poor-quality *Lampetra* sp. habitat; Atlantic salmon, brown trout, minnow & *Lampetra* sp. recorded via electro-fishing; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
A4	Owveg [Nore]	15O01	**International importance**	Located within the River Barrow and River Nore SAC (002162) & River Nore SPA (004233)
A5	Nore	15N01	**International importance**	Located within the River Barrow and River Nore SAC (002162); excellent-quality salmonid spawning & nursery habitat with good-quality holding habitat; localised but excellent-quality *Lampetra* sp. spawning & nursery habitat; brown trout, minnow, stone loach, rudd, Annex II Atlantic salmon, Annex II *Lampetra* sp. & Red-listed European eel, recorded via electro-fishing; otter prints recorded; Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]' present; Q3-4 (moderate status) water quality; no other aquatic species or habitats of high conservation value
B1	Unnamed pond/wetland	n/a	Local importance (lower value)	Poor-quality fisheries habitat; three-spined stickleback recorded via sweep netting; high suitability for common frog but low value for smooth newt[1] (neither species recorded present); no other aquatic species or habitats of high conservation value
B2	Castlecomer Stream	15C01	Local importance (lower value)	Poor-quality salmonid habitat present, no suitability for lamprey; no fish recorded via electro-fishing; Q3 (poor status) water quality; no aquatic species or habitats of high conservation value
B3	Unnamed stream	n/a	Local importance (lower value)	No fisheries or aquatic value due to non-perennial nature of stream (site 100% dry at time of survey); not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value
B4	Castlecomer Stream	15C01	**Local importance (higher value)**	Excellent-quality salmonid nursery with good-quality spawning and holding; site unsuitable for lamprey; Atlantic salmon & brown trout recorded via electro-fishing;

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
				Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
B5	Castlecomer Stream	15C01	**Local importance (higher value)**	Excellent-quality salmonid nursery with good-quality spawning but poor holding; moderate-quality lamprey habitat; Atlantic salmon, brown trout, three-spined stickleback & *Lampetra* sp. recorded via electro-fishing; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
B6	Cloghnagh	15C04	**Local importance (higher value)**	Moderate-quality salmonid habitat present (reduced by low flows); no suitability for lamprey; European eel & stone loach recorded via electro-fishing; Q3 (poor status) water quality; no other aquatic species or habitats of high conservation value
B7	Cloghnagh	15C04	Local importance (lower value)	Moderate-quality salmonid habitat present (reduced by low flows); no suitability for lamprey; stone loach only species recorded via electro-fishing; Q3-4 (moderate status) water quality; no other aquatic species or habitats of high conservation value
B8	Castlecomer Stream	15C01	**Local importance (higher value)**	Salmonids (including Atlantic salmon), *Lampetra* sp., freshwater pearl mussel recorded (eDNA), Stone Loach and Minnow; Q4 (good status water quality)
B9	Dinin [North]	15D07	**International importance**	Located within the River Barrow and River Nore SAC (002162)
C1	Castlemarket_East	15C89	Local importance (lower value)	Very low fisheries or aquatic value due to non-perennial nature of stream (site semi-dry at time of survey); not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value
C2	Nicholastown_15	15N06	Local importance (lower value)	No fisheries or aquatic value due to non-perennial nature of stream (site 100% dry at time of survey); no fish recorded via electro-fishing; not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value
C3	Loughill	15L13	Local importance (lower value)	Poor fisheries or aquatic value due to non-perennial nature of stream (site semi-dry at time of survey); three-spined stickleback recorded via electro-fishing; Q3 (poor status) water quality (tentative rating due to poor flows); no other aquatic species or habitats of high conservation value
C4	Castlemarket_East	15C89	**Local importance (higher value)**	Moderate-quality salmonid nursery & spawning with poor-quality holding; site unsuitable for lamprey; brown trout and three-spined stickleback recorded via electro-fishing; Q3 (poor status) water quality (tentative rating due to poor flows); IUCN near-threatened water beetle *Gyrinus urinator* (Foster *et al*. 2009) recorded; no other aquatic species or habitats of high conservation value
C5	Loughill	15L13	**Local importance (higher value)**	Moderate-quality salmonid nursery poor-quality spawning & holding; moderate-quality lamprey habitat; brown trout, three-spined stickleback & *Lampetra* sp. recorded via electro-fishing; Q3-4 (moderate status) water quality (tentative rating due to poor flows); no other aquatic species or habitats of high conservation value

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
C6	Rathduff_15	15R24	Local importance (lower value)	No fisheries or aquatic value due to non-perennial nature of stream (site 100% dry at time of survey); not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value
C7	Rathduff_15	15R24	Local importance (lower value)	No fisheries or aquatic value due to non-perennial nature of stream (site 100% dry at time of survey); not possible to collect biological water quality sample; no other aquatic species or habitats of high conservation value

[1]Both smooth newt (*Lissotriton vulgaris*) and common frog (*Rana temporaria*) are protected under the Wildlife Act (1976-2021). Furthermore, common frogs are protected under Annex V of the Habitats Directive [92/42/EEC].

*** Conservation value:** Atlantic salmon (*Salmo salar*), sea lamprey (*Petromyzon marinus*), brook lamprey (La*mpetra planeri*), river lamprey (*Lampetra fluviatilis*), white-clawed crayfish (*Austropotamobius pallipes*) and otter (*Lutra lutra*) are listed under Annex II of the Habitats Directive [92/42/EEC]. Atlantic salmon, river lamprey, white-clawed crayfish and otter are also listed under Annex V of the Habitats Directive [92/42/EEC]. Otters, along with their breeding and resting places, are also protected under provisions of the Irish Wildlife Acts 1976 to 2021. European eel are 'critically endangered' according to most recent ICUN red list (Pike *et al*. 2020) and listed as 'critically engendered' in Ireland (King *et al*. 2011). With the exception of the Fisheries Acts 1959 to 2019, brown trout and coarse fish species have no legal protection in Ireland.

Table 2.4: *Macro-invertebrate Q-sampling results for aquatic survey sites A2, A3, A4, A5, B2, B4, B5, B6, B7, B8, B9, C3, C4 & C5*

Group	Family	Species	A2	A3	A4	A5	B1	B2	B4	B5	B6	B7	B8	B9	C3	C4	C5	EPA Group
Ephemeroptera	Heptageniidae	*Ecdyonurus dispar*	2	1	13					5		2	33	9				A
Ephemeroptera	Heptageniidae	*Rhithrogena semicolorata*				4			2									A
Ephemeroptera	Baetidae	*Baetis muticus*				3												
Ephemeroptera	Baetidae	*Alainites muticus*											3	4				
Plecoptera	Leuctridae	*Leuctra hippopus*			7	17							4	30				
Plecoptera	Nemouridae	*Protonemura meyeri*	3	5					1	1								A
Ephemeroptera	Baetidae	*Alainites (Baetis) muticus*	2							1						1	2	B
Ephemeroptera	Baetidae	*Cloeon dipterum*					2											B
Ephemeroptera	Ephemerellidae	*Serratella ignita*			45								39	3				
Plecoptera	Leuctridae	*Leuctra hippopus*	19	34					13	9	16	4				1	9	B
Trichoptera	Cased caddis pupa	*sp. indet.*												1				
Trichoptera	Glossosomatidae	*Agapetus fuscipes*			1													
Trichoptera	Leptoceridae	*Leptoceridae (early instar)*		1														B
Trichoptera	Limnephilidae	*Halesus radiatus*											1					
Trichoptera	Limnephilidae	*Potamophylax cingulatus*						1					5		1	2		B
Trichoptera	Limnephilidae	*Drusus annulatus*															1	B
Trichoptera	Limnephilidae	*Limnephilidae species*															1	B
Trichoptera	Sericostomatidae	*Sericostoma personatum*	1	1				7			6		2			6	1	B
Ephemeroptera	Baetidae	*Baetis rhodani*	3	7	3	45			6	7		12	38	3		4	5	C

Group	Family	Species	A2	A3	A4	A5	B1	B2	B4	B5	B6	B7	B8	B9	C3	C4	C5	EPA Group
Trichoptera	Hydropsychidae	*Hydropsyche instabilis*	13	43	6	21			3	3		11				17	4	C
Trichoptera	Hydropsychidae	*Hydropsyche siltalai*		10	3	1					1	3				3	3	C
Trichoptera	Hydropsychidae	*Cheumatopsyche lepida*				1												
Trichoptera	Philopotamidae	*Chimarra marginata*	1															C
Trichoptera	Polycentropodidae	*Plectrocnemia conspersa*							1									C
Trichoptera	Polycentropodidae	*Polycentropus flavomaculatus*		1					12	6		11		5				C
Trichoptera	Rhyacophilidae	*Rhyacophila dorsalis*	3	3	10	1			4	3		5	2				1	C
Trichoptera	Trichoptera	*Trichoptera pupa*		1								2					2	C
Mollusca	Tateidae	*Potamopyrgus antipodarum*	3							4		2				9	1	C
Crustacea	Gammaridae	*Gammarus duebeni*	5	8	13	4		3	2	8	3	7	9	9		6	8	C
Coleoptera	Dytiscidae	*Oreodytes sanmarkii*								1								C
Coleoptera	Dytiscidae	*Agabus paludosus*															1	C
Coleoptera	Dytiscidae	*Hygrotus inaequalis*					1											C
Coleoptera	Dytiscidae	*Ilybius ater*																C
Coleoptera	Dytiscidae	*Ilybius fuliginosus*										1			1			C
Coleoptera	Dytiscidae	*Dytiscidae larva*													1		2	C
Coleoptera	Elmidae	*Elmis aenea*	3	27	6	2			2	6	1	7	3	2	1	5	9	C
Coleoptera	Elmidae	*Esolus parallelpipedus*				1												
Coleoptera	Elmidae	*Limnius volckmari*		3	8						1		2	1			2	C
Coleoptera	Gyrinidae	*Gyrinidae larva*										2						C
Coleoptera	Gyrinidae	*Gyrinus urinator*[1]														1		C

Group	Family	Species	A2	A3	A4	A5	B1	B2	B4	B5	B6	B7	B8	B9	C3	C4	C5	EPA Group
Coleoptera	Halipliidae	*sp. indet.*												1				
Coleoptera	Hydraenidae	*Hydraena gracilis*					1		1		1							C
Coleoptera	Hydrophilidae	*Helophorus grandis*										1						C
Coleoptera	Hydrophilidae	*Helophorus brevipalpis*													1		1	C
Coleoptera	Scirtidae	*Scirtidae (larva)*	2					2										C
Diptera	Ceratopogonidae	*Ceratopogonidae larva*										1			1			C
Diptera	Chaoboridae	*Chaoboridae larva*					5											C
Diptera	Chironomidae	*Chironomidae larva*	25	7		3		10	4	3	19	6	3	9	16	4	6	C
Diptera	Culicidae	*Culicidae larva*	1		3	1					3				3			C
Diptera	Dixidae	*Dixidae larva*										2			1			C
Diptera	Limoniidae	*Antocha sp.*											1					
Diptera	Pediciidae	*Dicranota sp.*	2	4					2	3				7		3	3	C
Diptera	Pediciidae	*Pedicia sp.*																C
Diptera	Simuliidae	*Simuliidae larva*	8		42	30			1				7	8			13	C
Diptera	Thaumaleidea	*Thaumaleidea larva*	1															C
Diptera	Tipuliidae	*Tipula sp.*		3				1							4		6	C
Hemiptera	Corixidae	*Hesperocorixa sahlbergi*									2	2						C
Hemiptera	Notonectidae	*Notonecta sp.*									1							C
Hemiptera	Pleidae	*Plea minutissima (leachi)*					3	1										C
Arachnida	Hydrachnidiae	*Hydrachnidiae species*		1					1								1	C
Crustacea	Asellidae	*Asellus aquaticus*			1							1		1		3	4	D
Crustacea	Gammaridae	*Gammarus duebeni*				4												
Gastropoda	Tateidae	*Potamopyrgus antipodarum*												1				

Group	Family	Species	A2	A3	A4	A5	B1	B2	B4	B5	B6	B7	B8	B9	C3	C4	C5	EPA Group
Hirudinidae	Erpobdellidae	*sp. indet.*			1													
Mollusca	Lymnaeidae	*Ampullacaeana (Radix) balthica*					8								5			D
Arachnida	Hydrachnidiae	*Unidentified species*				1												
Hirudinidae	Erpobdellidae	*Erpobdella sp.*				1												D
Hirudinidae	Glossiphoniidae	*Glossiphonia complanata*										1				1	1	D
Oligochaeta	Lumbricidae	*Lumbricidae species*	1				2					1			2		3	n/a
Abundance			98	160	**163**	147	22	25	55	60	54	84	153	95	37	66	90	
Q-rating			*4	4	Q4	*3-4	n/a	*3	4	4	*3	*3-4	Q4	Q4	*3	*3	*3-4	
WFD status			Good	Good	Good	Mod	n/a	Poor	Good	Good	Poor	Mod	Good	Good	Poor	Poor	Mod	

[1] *Gyrinus urinator* is listed as 'near-threatened' according to Foster *et al*. (2009)

* tentative rating due to poor flows/low water levels

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Appendix 13.7: Freshwater Pearl Mussel Report – River Nore and Castlecomer Stream

Appendix to Chapter 13: Biodiversity

Appendix 13.7: Freshwater Pearl Mussel Report

Ecopower Developments Ltd.

Ballynalacken Windfarm Project

Appendix 13.7 - Freshwater Pearl Mussel Report - River Nore and Castlecomer stream

October 2024

This report considers the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Quality Assurance

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The findings outlined within this report and the data we have provided are to our knowledge true and express our bona fide professional opinions. This report has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) good practice guidelines. Where pertinent CIEEM Guidelines used in the preparation of this report include the *Guidelines for Ecological Report Writing* (CIEEM, 2017a), *Guidelines for Preliminary Ecological Appraisals* (CIEEM, 2017b) and *Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine*, (CIEEM, 2019). CIEEM Guidelines include model formats for Preliminary Ecological Appraisal and Ecological Impact Assessment. Also, where pertinent, evaluations presented herein take cognisance of recommended Guidance from the EPA such as *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2022), and in respect of European sites, *Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC* (European Commission, 2018).

Due cognisance has been given at all times to the provisions of the *Wildlife Act, 1976-2023,* the *European Union (Natural Habitats) Regulations*, the *European Communities (Birds and Natural Habitats) Regulations 2011-2021,* EU Regulation on Invasive Alien Species under *EU Regulation 1143/2014*, the EU Birds *Directive 2009/147/EC* and *Habitats Directive 92/43/EEC*.

No method of assessment can completely remove the possibility of obtaining partially imprecise or incomplete information. Any limitation to the methods applied or constraints however are clearly identified within the main body of this document.

Notice

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Table of Contents

List of Tables

List of Figures

1 INTRODUCTION

1.1 Background

Triturus Environmental Ltd. were contracted by Inis Environmental Consultants Ltd. to undertake a baseline Stage 1 & 2 freshwater pearl mussel *Margaritifera margaritifera* survey of the River Nore within the downstream catchment of the proposed Ballynalacken Windfarm approximately 5km west of Castlecomer, Co. Kilkenny (**Figure 2.1**). This would attempt to identify the nearest downstream extant mussel population from the proposed project. Despite an absence of historical records, the survey also included environmental DNA (eDNA) sampling of the Cloghnagh river and Dinin River to ascertain the presence/absence of pearl mussel in these watercourses downstream of the proposed project.

The River Nore supports an endemic population of the Nore freshwater pearl mussel *Margaritifera durrovensis* and is listed as a qualifying interest for the River Barrow and River Nore SAC (002162). Whilst long considered a separate species, recent molecular studies have now placed this hard-water (alkaline) form of mussel within the *Margaritifera margaritifera* taxon due to genetic similarity[1] (Geist *et al*. 2018). Most pearl mussel records within the River Nore are located upstream of potential hydrological pathways associated with the project, with no live mussels recorded during a full-coverage survey of the Nore between Archer's Island and Ballyragget Bridge by Triturus in 2023 (3.8km of channel). However, a low number of historical records are known between the Dinin River confluence and Ballyragget from 1998 and 2007 (i.e. downstream of the proposed project; **Figure 1.1**).

Considering the above, an initial survey effort was conducted in August 2023 followed by a precautionary Stage 1 and 2 pearl mussel survey that was undertaken in April 2024 to establish population status and contemporary mussel distribution downstream of the proposed wind farm, thus informing impact assessment and mitigation. Additionally, Castlecomer was surveyed in April 2024. The survey area encompassed contiguous sections of the River Nore from Old Bridge, Ballyragget to the Dinin River confluence covering a c.11.8km total linear length of river channel (**Figure 2.1**).

1.1.1 Statement of Authority

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

[1] *Thus, whilst not a separate species, the Nore population is still considered a unique conservation unit based on high genetic diversity, different habitats & morphological characteristics (Geist et al. 2018)*

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).

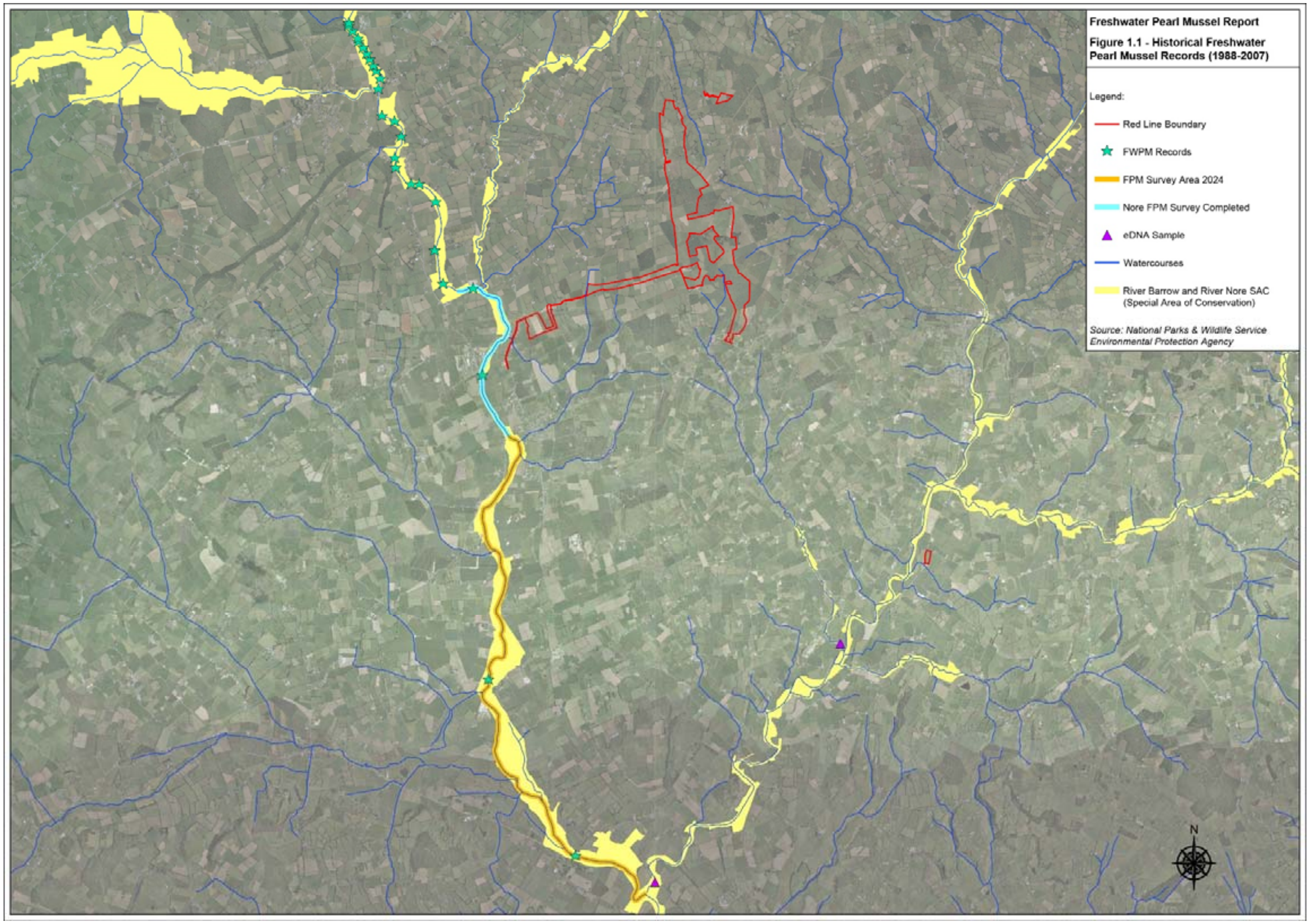

Figure 1.1: *Historical freshwater pearl mussel records in the wider survey area (source: NPWS data, 1988-2007)*

2 Survey Effort

2.1 Stage 1 & 2 surveys

Table 2.1: *Summary of the freshwater pearl mussel Stage 1 and 2 survey areas in the River Nore, Co. Kilkenny in August 2023*

Watercourse	Approx. survey length (km)	No. ≤500m survey sections	Upstream extent (ITM)	Downstream extent (ITM)
River Nore	3.8	8	643539, 673687	644460, 670866

Table 2.2: *Summary of the freshwater pearl mussel Stage 1 and 2 survey areas in the River Nore, Co. Kilkenny in April 2024*

Watercourse	Approx. survey length (km)	No. ≤500m survey sections	Upstream extent (ITM)	Downstream extent (ITM)
River Nore	11.8	24	644460, 670866	647083, 662018

Table 2.3: *Summary of the freshwater pearl mussel Stage 1 and 2 survey areas in the Castlecomer Stream, Co. Kilkenny in April 2024*

Watercourse	Approx. survey length (km)	No. ≤500m survey sections	Upstream extent (ITM)	Downstream extent (ITM)
Castlecomer Stream	4.5	9	651042, 675732	653631, 673168

2.2 Survey Section Characteristics

Table 2.4: *Summary characteristics of contiguous River Nore freshwater pearl mussel survey sections in the vicinity of the proposed Ballynalacken Windfarm, 2023 & 2024*

Section	Pearl mussel habitat	Substrata	Bed condition & siltation	Macrophytes & bryophytes	Pearl mussel recorded	Threats & pressures	Start (ITM)	Stop (ITM)
1	Very poor suitability (often none due to high flow rates & calcification). Very fast flowing glide with cascades & localised riffle near Archer's Island with deeper depositional glide present downstream. Bordered by mature but degraded (poached) native woodland& improved pasture downstream	Very compacted, heavily calcified cobble & boulder with locally abundant sand & silt accumulations, with very limited mixed gravels	Moderate siltation overall (locally high) with locally high coverage of filamentous algae & floc in less shaded areas	Occasional *Ranunculus* sp. with localised *Rhynchostegium riparioides, Pellia endiviifolia* & *Fontinalis antipyretica* with *Schoenoplectus lacustris* & *Sparganium erectum* in open glide	**No (1 no. dead shells)**	Siltation, eutrophication, livestock poaching	643539, 673687	643980, 673630
2	Poor suitability (but some localised footing opportunities under trees). High energy glide & riffle with localised pool. Bordered by improved pasture with localised degraded (grazed) wet grassland & intermittent mature treelines	Compacted, heavily calcified cobble & boulder with occasional pockets of sands & mobile mixed gravels	High siltation with high filamentous algal cover in all but the fastest flowing areas	As above	No	As above	643980, 673630	644284, 673328
3	Poor suitability (but some localised footing opportunities under trees). High energy glide habitat. Bordered by improved pasture with intermittent mature treelines (locally high shading)	Compacted, calcified cobble with frequent boulder & greater proportion of mixed gravels (mobile)	Moderate siltation overall (locally high) with locally high coverage of filamentous algae & floc in less shaded areas	Occasional *Sparganium erectum* & *Schoenoplectus lacustris* with locally frequent *Rhynchostegium riparioides* & occasional *Fontinalis antipyretica*	No	As above	644284, 673328	644416, 672871
4	Very poor suitability (often none due to high flow rates, mobile substrata & siltation). Very high energy glide habitat with occasional deep pool. Bordered by improved pasture with mature treelines (locally high shading)	Heavily compacted & calcified cobble and boulder with mobile gravels & sands in lower flow areas	High siltation & high cover of filamentous algae in less shaded areas	As above	No	Siltation, eutrophication	644416, 672871	644110, 672499
5	Very poor suitability (often none due to high flow rates, mobile substrata & siltation but some suitability near island, ITM 643934, 672066; Plate 3.5). Very high energy riffle & glide habitat with very limited flow refugia.	Heavily compacted & calcified cobble and boulder with very localised gravels & sands	As above	Very occasional *Ranunculus* sp. with frequent *Rhynchostegium riparioides*	No	Siltation, eutrophication (including WW discharge), livestock poaching	644110, 672499	643920, 672052

Section	Pearl mussel habitat	Substrata	Bed condition & siltation	Macrophytes & bryophytes	Pearl mussel recorded	Threats & pressures	Start (ITM)	Stop (ITM)
	Bordered by native woodland & improved pasture							
6	Very poor suitability. Deep homogenous glide habitat. Bordered by improved pasture & tillage with limited shading (cleared riparian zones)	Compacted cobble with occasional boulder & mixed gravels with and locally abundant shifting sands & silt accumulations	Very high siltation & high cover of filamentous algae	Frequent linear stands of *Schoenoplectus lacustris* & *Sparganium erectum* along margins with rare *Fontinalis antipyretica* & *Rhynchostegium riparioides*	No	Siltation, eutrophication, livestock poaching, riparian clearance, historical bank modifications	643920, 672052	644006, 671569
7	Very poor suitability. Deep homogenous glide habitat. Bordered by improved pasture & tillage with limited shading (cleared riparian zones)	As above	As above	As above	No	Siltation, eutrophication, riparian clearance, historical bank modifications	644006, 671569	644257, 671139
8	Poor suitability (but some localised footing opportunities downstream of old weir; 1 dead shell recorded along east bank). Higher energy glide and riffle habitat grading to deep glide & pool downstream. Bordered by improved pasture with intermittent treelines	As above	Moderate to high siltation with a high cover of filamentous algae	As above	**No (1 no. dead shells)**	Siltation, eutrophication, livestock poaching, riparian clearance	644257, 671139	644460, 670866
9	Some good bed stability but pressures too significant to support mussels. Sinuous lowland section, 10-12m wide & 0.4-1.8m deep with mixed riffle, glide & pool sequences. Bordered by mature native treelines/ woodland	Compacted small boulder, cobble & localised mixed gravels. Sand & silt depositions in pool.	Moderate siltation overall (locally high) with locally high filamentous algal cover	Abundant *Schoenoplectus lacustris* with occasional *Fontinalis antipyretica*	No	Local road drainage, land drainage, sedimentation & enrichment (pastures)	644460, 670866	644645 , 670481
10	No suitability given very significant siltation & limited shading. More homogenous lowland depositing section of deep glide & pool, 10-12m wide & 0.7-1.5m deep with largely open, poached banks. Bordered by improved pasture	Dominated by beds of sand & silt with compacted small boulder, cobble & localised mixed gravels	Moderate siltation overall (locally high) with limited filamentous algae due to depths	Occasional *Schoenoplectus lacustris* with *Rhynchostegium riparioides* & *Fontinalis antipyretica*	No	Riparian tree removal, sedimentation & enrichment (pastures incl. cattle poaching)	644645, 670481	644420 , 670038
11	No suitability given very significant siltation & limited shading. More homogenous lowland depositing section	Compacted cobbles, gravels & sand with	High siltation overall with limited	Abundant *Schoenoplectus lacustris* & riparian Phalaris arundinacea	No	As above	644420, 670038	644155 , 669616

Section	Pearl mussel habitat	Substrata	Bed condition & siltation	Macrophytes & bryophytes	Pearl mussel recorded	Threats & pressures	Start (ITM)	Stop (ITM)
	of deep glide & pool, 12m wide & 1.2-2m deep with open & locally poached banks. Bordered by improved pasture	extensive beds of sand/silt locally	filamentous algae due to depths					
12	No suitability given very significant siltation. Lowland depositing section of deep glide & pool with localised riffle, 12m wide & 0.3-2m deep with heavily shaded banks. Bordered by improved pasture & scrub	Compacted small boulder, cobbles, coarse gravels & sand with extensive beds of sand/silt locally	As above	As above	No	Riparian tree removal, sedimentation & enrichment (pastures)	644155, 669616	643947, 669221
13	No suitability given very significant siltation & limited shading. Depositing section of deep glide & pool, 12m wide & 1.5-2m deep with open & locally poached banks. Bordered by improved pasture	Extensive sand/silt beds with localised compacted coarse substrata	As above	As above	No	As above	643947, 669221	644080, 668745
14	Improved suitability over upstream areas but very significant siltation precluded mussels. Heterogenous, meandering section with mixed riffle, glide & pool. 10m wide & 0.3-1.8m deep. Some channel braiding & abundant large woody debris (LWD). Bordered by mature native treelines/ woodland & improved pasture	Compacted mixed boulder, cobbles & coarse gravels with sand & silt beds in depositional areas	High siltation (despite locally high flow rates)	Locally abundant *Schoenoplectus lacustris* & riparian Phalaris arundinacea	No	Sedimentation & enrichment (pastures)	644080, 668745	644306, 668350
15	As above	As above	As above	As above	No	As above	644306, 668350	644346, 667872
16	No suitability given very significant siltation & bed compaction. Depositional section of deep glide & pool, 10m wide & 1.5-2.2m deep. Bordered by narrow mature riparian treelines (mostly willow) & pasture	Compacted cobble, coarse gravels and sand/silt	High siltation	None present due to depths	No	As above	644346, 667872	644232, 667408

Section	Pearl mussel habitat	Substrata	Bed condition & siltation	Macrophytes & bryophytes	Pearl mussel recorded	Threats & pressures	Start (ITM)	Stop (ITM)
17	Some suitability given fast flows & stable areas of bed but significant siltation & enrichment pressures. Sinuous, fast flowing section, 9-10m wide & 0.3-2.2m deep. Shallow riffle & glide with deep glide & pool locally. Bordered by narrow mature riparian treelines	As above	High siltation (despite locally high flow rates)	*Rhynchostegium riparioides*, *Fontinalis antipyretica*	No	As above	644232, 667408	644335, 666952
18	No suitability given very significant siltation, bed compaction & limited footing opportunities. Sinuous deep glide section, 9-10m wide, 0.8-2m deep. Adjoined by heavily-enriched wetland on east bank. Bordered by narrow mature riparian treelines & pasture	Compacted small boulder, cobble, & coarse gravels with beds of sand & silt	High siltation with locally high filamentous algal cover	Occasional *Sparganium erectum, Schoenoplectus lacustris, Fontinalis antipyretica*	No	Land drainage, sedimentation & enrichment (pastures)	644335, 666952	644222, 666585
19	Improved suitability with some bed stability, good shading & flow heterogeneity. Sinuous, fast flowing section with mixed riffle & glide. 10m wide, 0.3-1.2m deep. Frequent LWD & bank scours. Bordered by narrow mature riparian treelines & pasture	Compacted cobble & mixed gravels with sand/silt beds	Moderate siltation	*Fontinalis antipyretica*, *Rhynchostegium riparioides*,	No	As above	644222, 666585	644058, 666170
20	As above section but deeper, 10-18m wide & 0.5-2m deep.	As above	High siltation (despite locally high flow rates)	As above	**No (1 no. dead shells)**	As above	644058, 666170	643985, 665741
21	No suitability given significant siltation, bed compaction & limited footing opportunities. Deep glide & pool, 10-12m wide & 1.5-2.2m deep. Steep sandy banks grading into heavily improved pasture	Compacted mixed gravels with sand & silt	Moderate siltation (locally high)	Occasional *Ranunculus* sp. & *Fontinalis antipyretica*	No	Riparian tree clearance, land drainage, sedimentation & enrichment (pastures)	643985, 665741	644240, 665359
22	Improved suitability with some bed stability, & good flow heterogeneity but poor shading. Sinuous, fast flowing	Compacted boulder, cobble & mixed gravels	Moderate siltation	Frequent *Ranunculus* sp. & *Fontinalis antipyretica*	**No (1 no. dead shells)**	As above	644240, 665359	644197, 664865

Section	Pearl mussel habitat	Substrata	Bed condition & siltation	Macrophytes & bryophytes	Pearl mussel recorded	Threats & pressures	Start (ITM)	Stop (ITM)
	section with mixed riffle & glide, 10-14m wide & 0.3-1.5m deep. Typically open banks with poaching, bordered by improved pasture	with good stability, localised sand/silt deposits						
23	No suitability given significant siltation, bed compaction & limited footing opportunities. Deep glide & pool, 10m wide & 1.5-2m deep. Largely open banks grading into heavily improved pasture	Compacted cobbles, mixed gravels, sand & silt	Heavy siltation	Rare *Ranunculus* sp. & *Fontinalis antipyretica*	No	As above	644197, 664865	644346, 664409
24	Improved suitability with some bed stability, & good flow heterogeneity but poor shading. Sinuous, fast flowing section with mixed riffle & glide & localised pool, 10-12m wide & 0.3-1.8m deep. Typically open banks with poaching, bordered by improved pasture	Compacted boulder, cobble & mixed gravels with localised sand & silt deposits	Moderate siltation	Occasional *Ranunculus* sp. & *Fontinalis antipyretica*	No	As above	644346, 664409	644630, 664073
25	Low suitability given significant siltation & bed compaction. Fast-flowing glide section, 10m wide & 1-1.8m deep with good bed stability. Typically open banks with poaching, bordered by improved pasture	As above	As above	Occasional *Ranunculus* sp.	No	As above	644630, 664073	645062, 663861
26	Low suitability given significant siltation & bed compaction. Fast-flowing glide section with localised pool, 10m wide & 1-1.8m deep with good bed stability. Typically open banks with intermittent treelines. Bordered by improved pasture	Compacted small boulder, cobble & mixed gravels with localised sand & silt deposits	As above	Occasional *Ranunculus* sp. & *Fontinalis antipyretica*	No	As above	645062, 663861	645261, 663410
27	No suitability given significant siltation, bed compaction & enrichment pressures. Deep glide & pool, 10m wide & 1.5-2m deep. Largely open high banks grading into heavily improved pasture	Compacted mixed gravels with sand & silt	Heavy siltation	Rare *Sparganium erectum, Ranunculus* sp., *Fontinalis antipyretica*	No	Land drainage, sedimentation & enrichment (pastures)	645261, 663410	645482, 662981

Section	Pearl mussel habitat	Substrata	Bed condition & siltation	Macrophytes & bryophytes	Pearl mussel recorded	Threats & pressures	Start (ITM)	Stop (ITM)
28	No suitability given significant siltation, bed compaction & enrichment pressures. Deep glide & pool, 10m wide & 1.5-2m deep. High riparian shading (willow). Bordered by heavily improved pasture	As above	As above	None recorded	No	As above	645482, 662981	645870, 662716
29	No suitability given significant siltation, bed compaction & enrichment pressures. Deep, slow-flowing depositional section of glide & pool, 12-14m wide & 1.5->2m deep. Intermittent treelines only. Bordered by heavily improved pasture	Compacted mixed cobbles & gravels with localised marginal sand & silt deposits	Heavy siltation	Localised *Sparganium erectum* & *Phalaris arundinacea*	No	As above	645870, 662716	646360, 662635
30	As above, with further reduced flow rates	As above	As above	As above	No	Riparian tree clearance, land drainage, sedimentation & enrichment (pastures)	646360, 662635	646795, 662414
31	As above, with increased poaching & open banks	As above	As above	As above	No	As above	646795, 662414	646864, 661983
32	Improved suitability with some bed stability (in pools), good flow heterogeneity & good shading. Sinuous, fast flowing section with mixed riffle, glide & localised pool, 10-15m wide & 0.3-1.8m deep. Bordered by mature native woodland.	Moderate compaction of small boulder, cobble & mixed gravels	Moderate siltation (despite flow rates)	*Fontinalis antipyretica*, *Rhynchostegium riparioides*	No	Nutrient enrichment and sedimentation from upstream (pastures)	646864, 661983	647083, 662018

Table 2.5: Summary characteristics of contiguous Castlecomer Stream freshwater pearl mussel survey sections in the vicinity of the proposed Ballynalacken Windfarm, April 2024

Section	Pearl mussel habitat	Substrata	Bed condition & siltation	Pearl mussel recorded	Threats & pressures	Start (ITM)	Stop (ITM)
1	No suitability for pearl mussel. Natural and sinuous high gradient, 2-3m wide shallow spate/cascading channel in V-shaped valley with high flow rates, compacted substrata and siltation pressures. Bordered by native woodland.	Bedrock with compacted angular cobble & pockets of mixed gravels	Moderate siltation overall (excessive for high energy channel)	No	Siltation, local road drainage	651042, 675732	650942, 675280
2	No suitability for pearl mussel. Natural and sinuous high gradient, 2.5-3m wide shallow spate/cascading channel in V-shaped valley with high flow rates, compacted substrata and siltation pressures. Bordered by native woodland.	Rounded boulder & cobble with localised bedrock & coarse gravels	Moderate siltation overall (excessive for high energy channel)	No	Siltation, local road drainage	650942, 675280	651123, 674969
3	Some locally stable areas of bed with low suitability for pearl mussel but none recorded. Natural, 3m wide sinuous channel with local braiding. High energy but with more frequent pool & lower gradient reaches than upstream. Bordered by native woodland, pasture & afforestation (north bank).	Mixed boulder, cobble & gravels	Moderate siltation overall (excessive for high energy channel)	No	Siltation, livestock poaching, riparian clearance, coniferous woodland	651123, 674969	651404, 674570
4	Some locally stable areas of bed with low suitability for pearl mussel in deeper glide & pool but none recorded. Natural high energy, high gradient section with cascades & local braiding. Bordered by native woodland & pasture.	More mobile mixed boulder, cobble & gravels	Moderate siltation overall (excessive for high energy channel)	No	Siltation, riparian clearance	651404, 674570	651737, 674227
5	Some locally stable areas of bed with low suitability for pearl mussel in deeper glide & pool but none recorded. Natural, 2m wide high energy section with meanders, braiding & frequent cascades. Bordered by native woodland & pasture.	Mostly mobile mixed boulder, cobble & gravels with localised areas of more stable cobble, gravels & sands in pools	Moderate to high siltation overall (excessive for high energy channel)	No	Siltation, riparian clearance	651737, 674227	651994, 673854
6	Poor suitability for pearl mussel. Natural, 4m wide high energy section with riffle,	Mostly mobile mixed boulder, cobble & gravels	Moderate to high siltation overall (excessive for high energy channel)	No	Siltation, riparian clearance,	651994, 673854	652202, 673448

	glide & localised pool on meanders. Bordered by native woodland & pasture.				eutrophication (point sources)		
7	Some locally stable areas of bed with low suitability for pearl mussel in deeper glide & pool but none recorded. Natural, 3-4m wide high energy section with riffle, glide & localised pool on meanders. Bordered by native woodland (wide buffers)	More compacted boulder & cobble with localised mixed gravels	Moderate to high siltation overall (excessive for high energy channel)	No	Siltation, bank erosion, eutrophication (pastures)	652202, 673448	652641, 673250
8	Some locally stable areas of bed with low suitability for pearl mussel in deeper glide & pool but none recorded. 5m wide high energy, peri-urban section with steep banks, riffle, glide & limited pool.	Boulder, cobble and compacted coarse gravels with localised sand behind debris dams	Moderate siltation overall (excessive for high energy channel)	**No**	Siltation, bank erosion, eutrophication (pastures)	652641, 673250	653138, 673231
9	Some locally stable areas of bed with low suitability for pearl mussel but none recorded. Heavily modified, 5m wide, shallow high energy section with historical retaining walls & compacted substrata.	Compacted boulder and cobble with localised bedrock and bedded mixed gravels	Moderate siltation overall (excessive for high energy channel)	**No**	Siltation, hydromorphology, eutrophication (urban run-off)	653138, 673231	653631, 673168

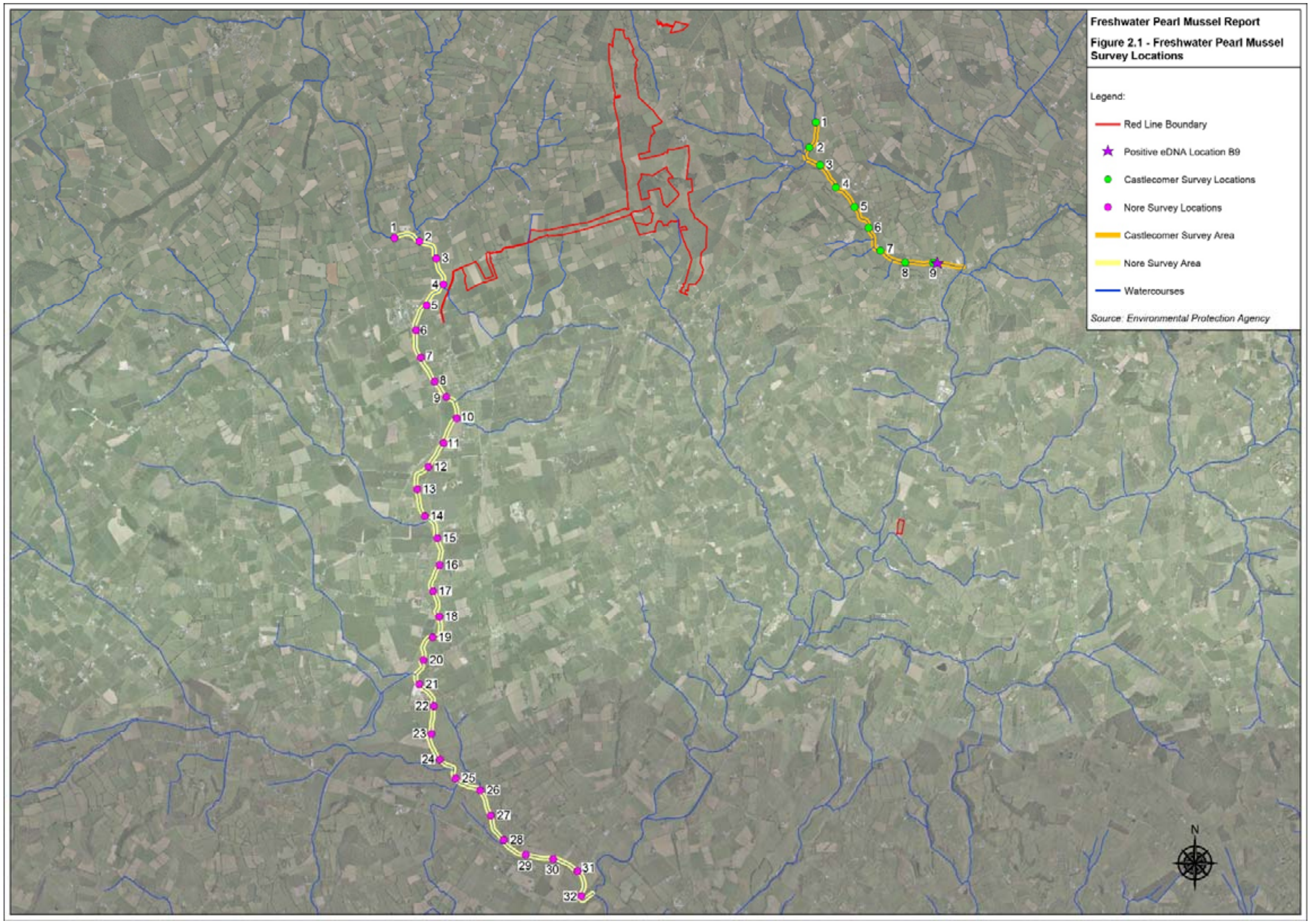

Figure 2.1: *Overview of the freshwater pearl mussel survey areas.*

3 RESULTS

3.1 Absence of freshwater pearl mussel

No live freshwater pearl mussels were recorded during the stage 1 & 2 survey undertaken along 15.6km of the River Nore between Ballyragget Old Bridge and the Dinin River confluence in August 2023 and April 2024 (**Figure 3.1, Table 3.1**). Habitat suitability was very poor overall with significant siltation and enrichment pressures observed. A summary of the physical habitats and suitability for freshwater pearl mussel for each ≤500m survey section is provided in **Table 2.4 & Table 2.5**.

Four dead *Margaritifera* shells were identified during the survey. These were located downstream of Archer's Island (500m upstream of the Owveg River confluence) (section 1), North of N77 Bridge (Section 8), Lismaine Bridge (section 20) and in the vicinity of Inchmore Castle (section 22) (**Figure 3.1**).

Table 3.1: *Counts of freshwater pearl mussel per ≤500m survey section within the River Nore.*

Watercourse	Survey section	No. live mussels	Relative abundance category	No. dead shells
River Nore	1	0	Absent	1
River Nore	2	0	Absent	None recorded
River Nore	3	0	Absent	None recorded
River Nore	4	0	Absent	None recorded
River Nore	5	0	Absent	None recorded
River Nore	6	0	Absent	None recorded
River Nore	7	0	Absent	None recorded
River Nore	8	0	Absent	1
River Nore	9	0	Absent	None recorded
River Nore	10	0	Absent	None recorded
River Nore	11	0	Absent	None recorded
River Nore	12	0	Absent	None recorded
River Nore	13	0	Absent	None recorded
River Nore	14	0	Absent	None recorded
River Nore	15	0	Absent	None recorded
River Nore	16	0	Absent	None recorded
River Nore	17	0	Absent	None recorded
River Nore	18	0	Absent	None recorded
River Nore	19	0	Absent	None recorded

Watercourse	Survey section	No. live mussels	Relative abundance category	No. dead shells
River Nore	20	0	Absent	1
River Nore	21	0	Absent	None recorded
River Nore	22	0	Absent	1
River Nore	23	0	Absent	None recorded
River Nore	24	0	Absent	None recorded
River Nore	25	0	Absent	None recorded
River Nore	26	0	Absent	None recorded
River Nore	27	0	Absent	None recorded
River Nore	28	0	Absent	None recorded
River Nore	29	0	Absent	None recorded
River Nore	30	0	Absent	None recorded
River Nore	31	0	Absent	None recorded
River Nore	32	0	Absent	None recorded
	Total	**0**		**4**

Table 3.2: *Counts of freshwater pearl mussel per ≤500m survey section within the Castlecomer Stream.*

Watercourse	Survey section	No. live mussels	Relative abundance category	No. dead shells
Castlecomer Stream	1	0	Absent	None recorded
Castlecomer Stream	2	0	Absent	None recorded
Castlecomer Stream	3	0	Absent	None recorded
Castlecomer Stream	4	0	Absent	None recorded
Castlecomer Stream	5	0	Absent	None recorded
Castlecomer Stream	6	0	Absent	None recorded
Castlecomer Stream	7	0	Absent	None recorded
Castlecomer Stream	8	0	Absent	None recorded
Castlecomer Stream	9	0	Absent	None recorded
	Total	**0**		**0**

3.2 eDNA sampling

In keeping with the known historical distribution of the species in the wider Nore catchment (**Figure 1.1**), no freshwater pearl mussel eDNA was detected in the lowermost reaches of the Cloghnagh river or Dinin River (**Table 3.3**). These eDNA efforts focus solely on Freshwater Pearl Mussel targets. eDNA or other aquatic receptors and the general sampling for Freshwater Pearl Mussel are provided in the main Aquatics Appendix (Appendix 13.6).

Table 3.3: *eDNA results in the vicinity of the proposed Ballynalacken Windfarm, Co. Kilkenny (positive qPCR replicates out of 12 in parentheses)*

Watercourse	Location	Freshwater pearl mussel
Cloghnagh	150m upstream of Dinin River confluence	Negative (0/12)
Dinin River	150m upstream of River Nore confluence	Negative (0/12)

Plate 3.1 Bank erosion from cattle poaching on the River Nore downstream of Ballyragget Bridge, April 2024 (section 2)

Plate 3.2 Utilising a bathyscope from a kayak for deep water glide area (section 6)

Plate 3.3 Fast glide habitat with riparian tree cover, April 2024 (section 9)

Plate 3.4 Heavily enriched wetland area adjoining the River Nore, April 2024 (section 10)

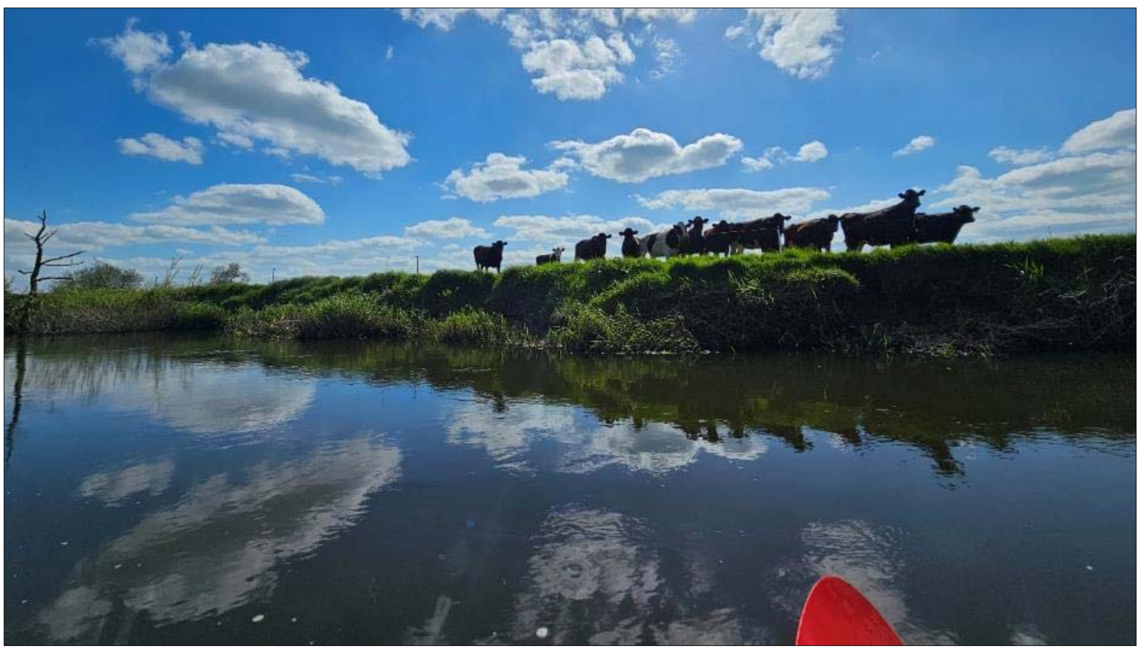

Plate 3.5 Evident adjoining land use pressures and historically cleared banks (section 13)

Plate 3.6 Deep depositional glide habitat with compacted bed unsuitable for pearl mussels (section 15)

Plate 3.7 The River Nore-Dinin confluence, April 2024 (section 24)

Plate 3.8 Mobile substrata in the adjoining Dinin River, with no suitability for pearl mussel

Plate 3.9 Representative image of the upper reaches of the Castlecomer Stream in section 1, April 2024

Plate 3.10 Representative image of the upper reaches of the Castlecomer Stream in section 2, April 2024

Plate 3.11 Annex I petrifying spring habitat (tufa formation) on the upper reaches of the highly natural Castlecomer Stream in section 2, April 2024 (ITM 650866, 675062)

Plate 3.12 Representative image of the upper reaches of the Castlecomer Stream in section 3, April 2024

Plate 3.13 Representative image of the Castlecomer Stream in section 4, April 2024

Plate 3.14 Representative image of the Castlecomer Stream in section 5, April 2024

Plate 3.15 Example of riparian woodland clearance along the Castlecomer Stream in section 5, April 2024

Plate 3.16 Representative image of the Castlecomer Stream in section 6, April 2024

Plate 3.17 Castlecomer Stream tributary contributing sediment to the watercourse in section 6, April 2024

Plate 3.18 Representative image of the Castlecomer Stream in section 7, April 2024

Plate 3.19 Representative image of the Castlecomer Stream in section 8, April 2024

Plate 3.20 Representative image of the Castlecomer Stream in section 9, April 2024, showing evidence of historical modification (hydromorphological pressures)

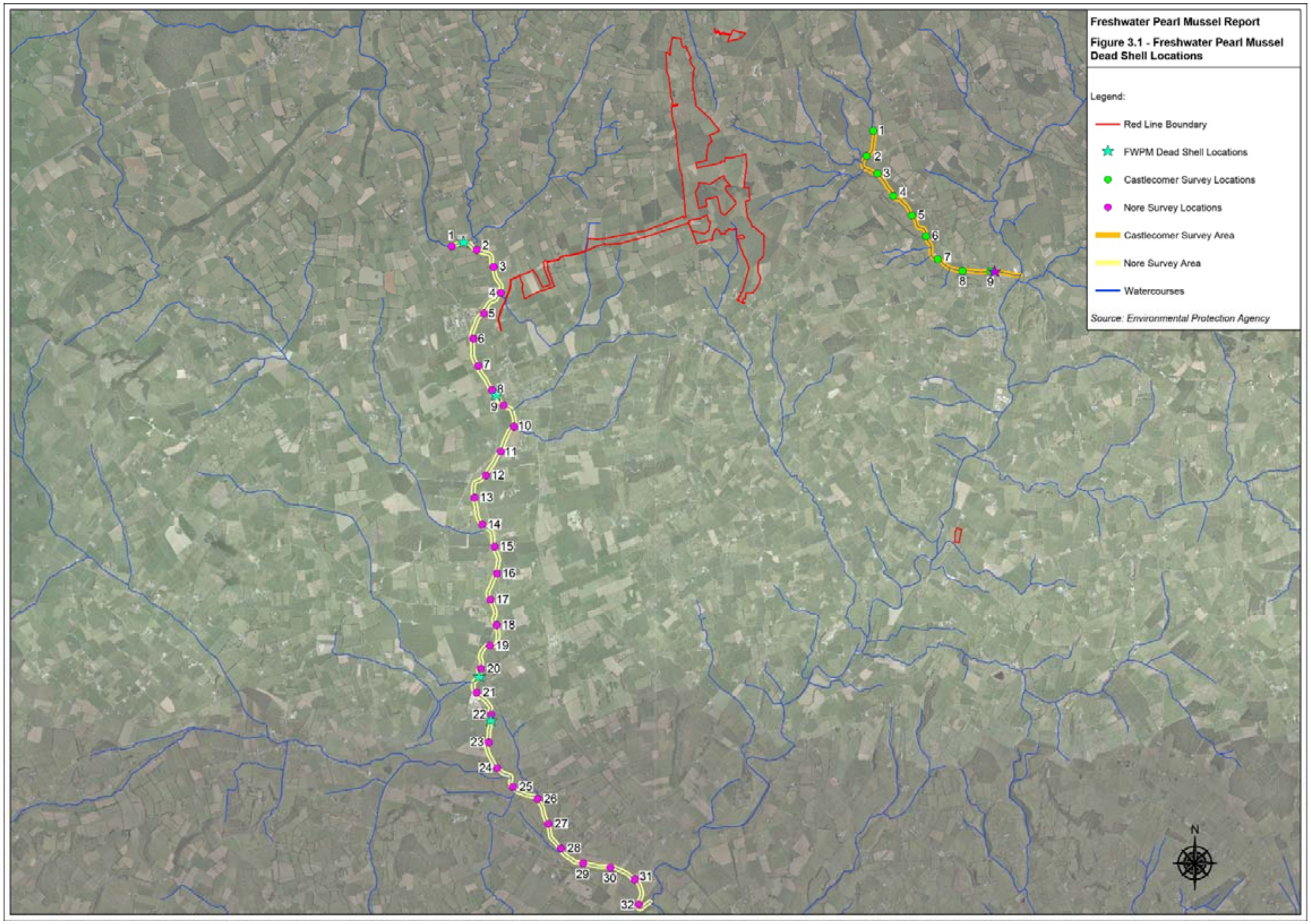

Figure 3.1: *Freshwater pearl mussel abundance per ≤500m survey section in the River Nore and Castlecomer Stream survey area.*

4 DISCUSSION

4.1.1 River Nore

No live freshwater pearl mussels were recorded during the current survey, which encompassed a contiguous 15.6km length of the River Nore both upstream and downstream of the Ballynalacken Windfarm project. Habitat suitability and footing opportunities were typically poor throughout the survey area, with deeper depositional glide and compacted substrata predominating. A low number (4 no.) of dead shells were recorded in the vicinity of Archer's Island (500m upstream of the Owveg River confluence), North of N77 Bridge, Lismaine Bridge and Inchmore Castle, respectively (**Figure 3.1**). No live mussels have been recorded on the River Nore downstream of the River Erkina confluence (Durrow) since 2007 (NPWS data). Furthermore, no pearl mussel eDNA was detected in either the Cloghnagh or Dinin River (**Appendix A**), supporting the absence of records for the species in these watercourses.

Siltation is an ongoing issue on the River Nore and is not only preventing successful recruitment of the population but also leading to the death of adult mussels due to varying levels of severity (Moorkens, 2014; NS2, 2010). Significant levels of siltation were observed throughout much of the survey area, inclusive of stable riverbed substrata which otherwise would have provide footing opportunities for mussels (e.g. section 1). Livestock poaching and both adjoining and upstream agricultural land use practices contributed to sediment loads and colmation (clogging) of riverbed substrata. Both juvenile and adult life stages of freshwater pearl mussel are highly sensitive to siltation and eutrophication (Boon *et al*. 2019; Moorkens, 2000). Siltation of interstitial spaces in the substrata reduces oxygen exchange required by juvenile mussels buried in substrata and is the critical factor determining successful *Margaritifera* recruitment (Tamario *et al*. 2022; Hyvärinen *et al*. 2021; Moorkens & Killeen, 2014; Denic & Geist, 2015; Geist & Auerswald, 2007). Siltation also impacts the filter feeding ability of adult mussels and can lead to mortality (Goldsmith *et al*. 2021; Österling *et al*. 2010; Moorkens, 1999).

Enrichment (eutrophication) pressures were also present throughout the survey area, with coverage of filamentous algae present in less shaded areas of channel. Eutrophication, resulting in higher rates of algal growth and decay, increases biological oxygen demand and thus limits oxygen supply, particularly in juvenile mussels buried in substrata (Geist & Auerswald, 2007). The upper Nore catchment drains heavily improved pasture and coniferous afforestation, with much of the middle and lower river bordered by increasingly intensive pasture and tillage with frequent adjoining land drainage channels (i.e. nutrient pathways). Such land use practices significantly increase the escapement of nutrients to surface waters.

In addition to livestock poaching (often unfenced banks), historical riverbank clearance (for agriculture) was widespread in the survey area, thus leading to a lack of or absence of riparian and littoral shading. Removal of such vegetation (e.g. treelines) alters sediment dynamics, river hydromorphology, thermal regimes and host salmonid populations, impacting the growth and survival of pearl mussels (Wagner *et al*. 2024). Allochthonous inputs from intact riparian zones contribute particulate organic matter and provide surprisingly important food resources for pearl mussels (Brauns *et al*. 2021). Mussel densities are strongly correlated with riparian shading (Reid *et al*. 2013; Gittings *et al*. 1998; Triturus pers. obs.) although in an Irish context this is thought to only apply to damaged habitats, such as the River Nore. Mussels in open, unshaded and undamaged habitats filter more efficiently, grow larger, and reproduce more frequently and successfully (Moorkens, 2018).

In summary, despite the presence of localised suitable habitat and host fish species, no live freshwater pearl mussels were recorded in the current survey. Indeed, it has been concluded that pearl mussel in the River Nore no longer occur downstream of the River Erkina confluence (Sweeney, 2022) and our results further validate this assumption. The population of pearl mussel in the River Nore has long been considered at high risk of extinction (Moorkens & Costello, 1994). The extant wild population of Nore freshwater pearl mussel was estimated as 300 adult individuals in the late 2000s, representing a >75% decline from the total of 2,000 individuals found in 1991 (NS2, 2010). Dwindling numbers are now confined to a c.10km stretch of the main channel of the River Nore from Poorman's Bridge to upstream of the Erkina River confluence (i.e. upstream of the proposed project).

4.1.2 Castlecomer Stream

Habitat suitability for pearl mussels was typically poor throughout the Castlecomer Stream given naturally high gradients, high flow rates and mobile substrata in the spate channel with exception of local improved habitat (stable substrata). These localised areas offered low-moderate quality footing opportunities (as per Hastie *et al*. 2000) in lower gradient deeper glide and pool in the middle and lower reaches of the watercourse. Despite high energy conditions and a natural to semi-natural channel form, significant siltation pressures and colmation (clogging) of riverbed substrata were evident during the survey. These primarily originated from adjoining agricultural land use practices (including livestock poaching) as well as riparian clearance, coniferous afforestation and point sources (**Table 5.2**). The lower reaches, in Castlecomer village, demonstrated some historical bank and bed modifications resulting in impacts to hydromorphology, therefore further reducing the quality of mussel habitat.

Both juvenile and adult life stages of freshwater pearl mussel are highly sensitive to siltation and eutrophication (Boon *et al*. 2019; Moorkens, 2000). Siltation of interstitial spaces in the substrata reduces oxygen exchange required by juvenile mussels buried in substrata and is the critical factor determining successful *Margaritifera* recruitment (Tamario *et al*. 2022; Hyvärinen *et al*. 2021; Moorkens & Killeen, 2014; Denic & Geist, 2015; Geist & Auerswald, 2007). Siltation also impacts the filter feeding ability of adult mussels and can lead to mortality (Goldsmith *et al*. 2021; Österling *et al*. 2010; Moorkens, 1999). Salmonid populations, utilised as hosts by *Margaritifera* glochidia (larvae), are also negatively impacted by siltation and this can result in fewer opportunities for glochidia transport in a given watercourse or catchment.

4.1.2.1 Freshwater pearl mussel eDNA detection in absence of live mussels

The detection of freshwater pearl mussel environmental DNA (eDNA) in the lower reaches of the Castlecomer Stream in August 2023 as part of general aquatic survey sampling (9 out of 12 qPCR replicates; Appendix 13.6) suggested the possible presence of a previously unknown mussel population within the River Dinin tributary. However, this follow-up Stage 1 and 2 survey along 4.5km contiguous length of channel did not identify any evidence of the species, inclusive of dead shells (as outlined above).

False positives are an accepted occurrence in environmental DNA sampling (Sepulveda *et al*. 2020; Ficetola *et al*. 2016; Goldberg *et al*. 2016). The possibility of a methodological false positive (detection of target species when DNA is in fact absent from the sample) was unlikely given the strong genetic signature (9 out of 12 positive qPCR replicates), assay optimisation (by the laboratory) and strict adherence to best practice by a highly experienced laboratory (SureScreen Scientifics, UK). Contamination by surveyors during sampling was deemed implausible given adherence to biosecurity protocols and best practice sampling precautions (e.g. sterilised equipment, sampling upstream of contact with water, wearing PPE not used at a site supporting live mussels etc.). The shells of *Margaritifera* contain viable posthumous genetic material (for several months; Geist *et al*. 2008) and it has been postulated that shells may contribute DNA to the environment long after the extinction of mussels (Stoeckle *et al*. 2016), thus producing false positive results. However, shell material from long dead mussels (20-30 years) does not secrete DNA in quantities measurable by current eDNA techniques and, in any case, no dead shells were recorded in the current survey. Positive eDNA signals for *M. margaritifera* can reflect the presence of living individuals or recently dead ones with actively degrading soft tissues (Rasmussen *et al*. 2021). The detection of resuspended historic mussel eDNA from riverine sediments of the Castlecomer Stream (where degradation may be slowed) cannot be ruled out although detection probability naturally decreases with time.

The alternative explanation for the detection of pearl mussel eDNA in the Castlecomer Stream is contamination from the downstream-connecting River Nore, where a scattered and rapidly declining mussel population exists (albeit mostly confined to upstream of Durrow; **Figure 1.1**). The transport and distribution of target species' DNA by other organisms (vectors) within and between watercourses is also known to occur (Roussel *et al*., 2015). For example, otters utilise the River Nore, Dinin River and Castlecomer Stream and movement of individual animals between these rivers is considered likely given the close proximity. The same is probable for piscivorous birds. The release of pearl mussel larvae (glochidia) in Irish rivers peaks in August-September period (Moorkens, 1999). Not only does this period coincide with the highest seasonal eDNA concentrations (Wacker *et al*., 2019) but also our eDNA sampling of the Castlecomer Stream in August 2023 (when a relatively strong signal was detected). Given fluvial connectivity and the presence of both Atlantic salmon and brown trout in the Castlecomer Stream, it seems plausible that some glochidia may have been transported upstream on migratory salmonids from the River Nore (c.17km) and then been detected by highly sensitive eDNA sampling (as known for other unionid mussels; Preece *et al*. 2021). The presence of juvenile *Margaritifera* life stages buried within the river bed (not detectable during Stage 1 & 2 survey) and subsequent detection of live organisms via eDNA sampling is also possible although considered unlikely in light of the continuing failed recruitment throughout the Nore catchment (DEHLG, 2010) and unsuitable conditions within the Castlecomer Stream (e.g. high energy, poor bed conditions, siltation & enrichment pressures).

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APPENDIX A – EDNA ANALYSIS LAB REPORT

Folio No: 790-2024
Purchase Order: eDNA_Clognagh_24
Contact: Triturus Environmental Ltd
Issue Date: 07.05.2024

eDNA Report

Technical Report

SureScreen Scientifics

Folio No: 790-2024
Purchase Order: eDNA_Clognagh_24
Contact: Triturus Environmental Ltd
Issue Date: 07.05.2024

SureScreen Scientifics

eDNA Analysis

Summary

When aquatic organisms inhabit a waterbody such as a pond, lake or river they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm the presence or absence of the target species within the waterbody.

Results

Lab ID	Site Name	OS Reference	Target Species	Sample Integrity Check	Result	Positive Replicates
FK1766	Clognagh		Freshwater pearl mussel	Pass	Negative	0

Matters affecting result: none

Reported by:Lauryn Jewkes

Approved by: Jennifer Higginbottom

Folio No:	790-2024
Purchase Order:	eDNA_Clognagh_24
Contact:	Triturus Environmental Ltd
Issue Date:	07.05.2024

SureScreen Scientifics

Methodology

Samples have been analyzed for the presence of target species eDNA following readily available and scientifically published eDNA assays and protocols.

The analysis is conducted in two phases. The sample first goes through an extraction process where the filter is incubated in order to obtain any DNA within the sample. The extracted sample is then tested via real-time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species, ensuring no DNA from any other species present in the water is amplified. If target species DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If target DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent the risk of false positive and false negative results. True positive controls, negative controls, and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared. Stages of the analysis are also conducted in different buildings at our premises for added security. SureScreen Scientifics Ltd is ISO9001 accredited and participates in Natural England's proficiency testing scheme for GCN eDNA testing.

Interpretation of Results

Sample Integrity Check:

Laboratory Arrival:

When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results. Any samples which fail this test are rejected and eliminated before analysis.

Degradation and Inhibition check:

Analysis of the spiked DNA marker to see if there has been degradation or inhibition of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results. If inhibition is detected, samples are purified and re-analyzed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result:

Presence of eDNA (Positive/Negative/Inconclusive)

Positive: DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past.

Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. Even a score as low as 1/12 is declared positive. 0/12 indicates negative species presence.

Negative: eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.

Inconclusive: Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.

Folio No: 791-2024
Purchase Order: eDNA_Dinan
Contact: Triturus Environmental Ltd
Issue Date: 07.05.2024

eDNA Report

Technical Report

SureScreen Scientifics

Folio No: 791-2024
Purchase Order: eDNA_Dinan
Contact: Triturus Environmental Ltd
Issue Date: 07.05.2024

SureScreen Scientifics

eDNA Analysis

Summary

When aquatic organisms inhabit a waterbody such as a pond, lake or river they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm the presence or absence of the target species within the waterbody.

Results

Lab ID	Site Name	OS Reference	Target Species	Sample Integrity Check	Result	Positive Replicates
FK1759	Dinan		Freshwater pearl mussel	Pass	Negative	0

Matters affecting result: none

Reported by:Lauryn Jewkes Approved by: Jennifer Higginbottom

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Folio No:	791-2024
Purchase Order:	eDNA_Dinan
Contact:	Triturus Environmental Ltd
Issue Date:	07.05.2024

SureScreen Scientifics

Methodology

Samples have been analyzed for the presence of target species eDNA following readily available and scientifically published eDNA assays and protocols.

The analysis is conducted in two phases. The sample first goes through an extraction process where the filter is incubated in order to obtain any DNA within the sample. The extracted sample is then tested via real-time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species, ensuring no DNA from any other species present in the water is amplified. If target species DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If target DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent the risk of false positive and false negative results. True positive controls, negative controls, and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared. Stages of the analysis are also conducted in different buildings at our premises for added security. SureScreen Scientifics Ltd is ISO9001 accredited and participates in Natural England's proficiency testing scheme for GCN eDNA testing.

Interpretation of Results

Sample Integrity Check:

Laboratory Arrival:

When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results. Any samples which fail this test are rejected and eliminated before analysis.

Degradation and Inhibition check:

Analysis of the spiked DNA marker to see if there has been degradation or inhibition of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results. If inhibition is detected, samples are purified and re-analyzed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result:

Presence of eDNA (Positive/Negative/Inconclusive)

Positive: DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past.

Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. Even a score as low as 1/12 is declared positive. 0/12 indicates negative species presence.

Negative: eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.

Inconclusive: Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.

Appendix 13.8: Methodology for the evaluation of Biodiversity

Appendix to Chapter 13: Biodiversity

Appendix 13.8: Methodology for the evaluation of Biodiversity

A13.8 Methodology Applied

The criteria used for the scoping and subsequent impact evaluation in this report is based on *Environmental Impact Assessment of Projects: Guidance on the preparation of Environmental Impact Assessment Report* (EU, 2017)

A13.8.1 Methodology used to Describe the Baseline Environment and to Evaluate Effects

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 Ballynalacken Windfarm Project.

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.

A13.8.1.1 Determining the Importance of the Biodiversity resources (NRA, 2009)

The importance of biodiversity resources within the study areas for the Proposed Ballynalacken Windfarm Project has been derived from NRA Guidance (2009), as outlined in the table below.

Table 1: NRA Evaluation Guidance (NRA, 2009)

Resource Evaluation	**NRA Criteria**
International Importance	● 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. ● Proposed Special Protection Area (SPA) or Important Bird Area (IBA). Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). Features essential to maintaining the coherence of the Natura 2000 Network. ● 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 Berne 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	● Site designated or proposed as a Natural Heritage Area (NHA). ● 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);

Resource Evaluation	NRA Criteria
	• 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	• 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.
Local Importance (Higher Value)	• 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 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. • 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)	• 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.

A13.8.1.2 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. This rating system has also been used as a general guide for other biodiversity receptors throughout this report.

Table 2: Bird Sensitivity Rating Equivalency (Percival 2007 and NRA 2009 combined)

Sensitivity of Bird receptor	Percival 2007 criteria	NRA Resource Evaluation	NRA Criteria	Combined Criteria
Very High	Species is cited interest of SPA.	International Importance.	Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species of	• Species is cited interest of SPA. • Species present in Internationally important numbers.

Sensitivity of Bird receptor	Percival 2007 criteria	NRA Resource Evaluation	NRA Criteria	Combined Criteria
	Species present in Internationally important numbers.		bird, listed in Annex I and/or referred to in Article 4(2) of the Birds 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.
High	Other non-cited species which contribute to integrity of SPA. Ecologically sensitive species (<300 breeding pairs in UK) and less common birds of prey. Species listed on Annex 1 of the EU bird's directive. Regularly occurring relevant migratory species which are rare or vulnerable.	National Importance.	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.	• Other non-cited species which contribute to integrity of SPA • Ecologically sensitive species (<100 breeding pairs nationally nationally to align with "Birds of Conservation 2020-2026" (Gilbert et al., 2021) and less common birds of prey. • Species listed on Annex 1 of the EU Bird's Directive. • Regularly occurring relevant migratory species which are rare or vulnerable. • Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species protected under the Wildlife Acts; and/or Includes species listed on the relevant Red Data list that have experienced recent population declines or range contraction (BoCCI Red List).
Medium	Species present in regionally important numbers (>1% of regional population). Species occurring within SPA's but not crucial to the integrity of the site. Species listed as priority species in the UK BAP subject to special conservation measures.	County Importance.	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; County important populations of species. Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.	• Species present in regionally important numbers (>1% of regional population). • Species occurring within SPA's but not crucial to the integrity of the site. • 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; • County important populations of species. • Species that are rare or are undergoing a decline in quality or extent at a national level. This includes all other BoCCI Red-listed species not included under "High" sensitivity and Amber-listed species that have

Sensitivity of Bird receptor	Percival 2007 criteria	NRA Resource Evaluation	NRA Criteria	Combined Criteria
				experienced recent population declines or range contraction.
Low	Species covered above which are present very infrequently or in very low numbers. Any other species of conservation interest not covered above, e.g. species listed on the red or amber lists of the BoCCI.	Local Importance (High Value).	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 bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list.	• Locally important populations of priority species 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 bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. • Amber listed species (BoCCI) excluding those under "Medium" sensitivity which have experiences population decline/range contraction.
Negligible	Species that remain common and widespread.	Local Importance (Low Value).	N/A.	• Species that remain common and widespread. • Green Listed Species.

A13.8.1.3 Determining Magnitude of Impacts to Biodiversity Receptors (Percival, 2007)

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

Table 3: 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.

A13.8.1.4 Determining Risk of Effect to Biodiversity Receptors (Percival, 2007)

The guidance probability rating definitions used to inform bird species evaluations in conjunction with the probability definitions as outlined in Table 5 are outlined in Table 4 below. In some instances, consideration of a species sensitivity and or separation distance has merited an evaluation of less than LOW in respect of the probability of impacts, this is referenced in the text where applicable.

This rating system has also been used as a general guide for determining risk in relation to other biodiversity receptors throughout this report.

Table 4: Birds – Risk classifications or likelihood that an impact will occur (Percival, 2007)

Probability	Description	Comments
High	Impact is likely to occur (>50% likelihood).	Species known to be vulnerable to specific impact.
Medium	Impact may occur (5-50% likelihood).	Species may be affected by specific impact.
Low	Impact is very unlikely (<5% likelihood).	Species known to be tolerant to specific impact.

The EPA also define the probability of effects, in the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022), as outlined in the table below.

Table 5: Probability of Effects (EPA, 2022)

Likely Effects	Unlikely Effects
The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

A13.8.1.5 Determining Significance of Effect to Birds (Percival 2007 & EPA 2022 combined)

The Percival significance matrix used for bird species evaluations is provided in the table below. This matrix has also been used as a guide for determining the significance of impacts in relation to other biodiversity receptors throughout this report. The Equivalent EPA significance ratings have been applied to the table by the authors.

Table 6: Determining the Significance of Impacts (Percival 2007 with equivalent EPA Significance Ratings)

Significance		Sensitivity			
		Very High	**High**	**Medium**	**Low**
Magnitude	**Very High**	Very high/ Very significant	Very high/ Very significant	High/ Significant effects	Medium/ Moderate effects
	High	Very high/ Very significant	Very high/ Very significant	Medium/ Moderate effects	Low/ Slight effects

	Medium	Very high/ Very significant	High/ Significant effects	Low/ Slight effects	Very low/ Not Significant
	Low	Medium/ Moderate effects	Low/Slight effects	Low/Slight effects	Very low/ Not Significant
	Negligible	Low/ Slight effects	Very low/ Not Significant	Very low/ Not Significant	Very low/ Not Significant

Note: 'Very Low' significance (as per Percival 2007) is considered equivalent to the EPA definitions for 'Not Significant', or 'Imperceptible' or 'Neutral' depending on the context of the magnitude of the impact or the sensitivity of the receptor, determined by the authors based on their professional ecological judgement and experience. Similarly, the significance of impacts where the magnitude is Negligible is determined by the authors based on the context of the impact and their professional ecological judgement and experience.

A13.8.1.6 EPA EIAR Guidance Definitions of Effects

Tables 7 to 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: 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 the improving 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 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 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.

A13.8.2 Methodology – Desktop Review

A desktop review of secondary data was carried out to formulate the baseline and background of the proposed Ballynalacken Windfarm Project. As mentioned in Section EIAR 13.1.3 of the Biodiversity Chapter, sources reviewed include ABP pre-app consultation meeting minutes, consultation responses from the DAU, IFI, and NPWS and Kilkenny Council County Development Plan.

A13.8.2.1 Designated Sites – Desktop review

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 Ballynalacken Windfarm Project. Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs) within 15km of the proposed Ballynalacken Windfarm Project, and records of protected species in the vicinity of the proposed Ballynalacken Windfarm Project were identified. This information was obtained by accessing the website of the National Parks and Wildlife Service (NPWS) of the Department of the Environment, Heritage and Local Government.

Other potential sites of conservation interest were identified by an examination of NPWS and EPA maps browser and detailed aerial photography (Bing maps).

A data request was also sent to NPWS GIS division on 31 May 2022 for a full inventory of all protected and rare species recorded within the 10km grid squares overlapping the Ballynalacken Windfarm site, Internal Cable Link to the Tinnalintan Substation, and the Ballynalacken Grid Connection route. An updated data request was sent to NPWS on 05/06/2024 and received on the 11/06/2024 for the grid squares associated with the finalised project layout. This data is presented in Appendix 13.1: Species Records held by NBDC.

The database of the National Biodiversity Data Centre was also consulted to assess the presence of rare plant and faunal species and records of protected species reported within the primary 10km squares in which the proposed Ballynalacken Windfarm Project is located (S47, S46, S55, S56 and S57). This data is presented in Appendix 13.1: Species Records held by NBDC.

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 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".

A13.8.2.2 Birds – Desktop review

Recommended bird survey methods to inform impact assessment of onshore wind farms (SNH, 2017) were reviewed. The methodology detailed in the document for the basic requirements to undertake Vantage Point counts were adhered to when undertaking Vantage Point (VP) counts.

The Project is predominantly located in the National 10km grid square S47, which includes the entire Ballynalacken Windfarm, Internal Cable Link, Tinnalintan Substation and the Ballynalacken Grid Connection. The haul route from port via Kilkenny and Castlecomer includes minor works and activities along national routes in the grid squares S46, S55, S56 and S57.

NBDC records pertaining to the region in which the proposed Ballynalacken Windfarm Project is located were consulted for observations of protected birds. A data request was also sent to NPWS GIS division in June 2022, with an update request sent in June 2024, for a full inventory of all protected and rare bird species recorded within the S47 10km square overlapping the Ballynalacken Windfarm site, Internal Cable Link to the Tinnalintan Substation, the Ballynalacken Grid Connection route. S55, S56, S57 and S46 are only relevant to the haul route works and activities associated with the turbine component delivery route, with works located along or immediately adjacent to the public road network. The updated request sent in June 2024 also included S46, S55, S56 & S57 in which the haul route works and activities are located.

The Bird Sensitivity to Wind Energy by Birdwatch Ireland was consulted via the NBDC records. No sensitive bird species were recorded in the area of the proposed Ballynalacken Windfarm Project.

Best Practice survey methodologies for all bird species likely to occur within the proposed project area were reviewed, and these methodologies are detailed in Section A13.8.3 of this appendix.

A13.8.2.3 Bats – Desktop review

National landscape suitability maps for Irish bat species (Lundy *et al*. 2011) were reviewed using the Map Viewer of the National Biodiversity Data Centre (Figure 13.4). Records of known bat roosts within 10km of the proposed Ballynalacken Windfarm Project were obtained from the NBDC maps at the outset of the project (Lundy *et al*. 2011).

A13.8.2.4 Aquatic Ecology – Desktop review

A comprehensive desktop review was carried out to identify watercourses that drain the Ballynalacken Windfarm site including Internal Cable Link to the Tinnalintan Substation, and the Ballynalacken Grid Connection. Information on water quality of the relevant watercourses was obtained from the EPA website and Chapter 8: Water.

Fisheries survey sites were present on the Kilcronan stream (EPA code: 15K29), Owveg [Nore] (also known as the Owveg River) (15O01), Nore (also known as the River Nore) (15N01), Castlecomer Stream (15C01), Cloghnagh river (15C04), Castlemarket_East stream (15C89), Nicholastown_15 stream (15N06), Loughill river (15L13), Rathduff_15 river (15R24) and Dinin [North] (also known as the Dinin River) (15D07) (Figure 13.6).

A13.8.2.5 Habitat Ecology – Desktop review

Satellite maps, available at https://www.google.com/maps/, were reviewed 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 Ballynalacken Windfarm Project. Information on plant species present within the Ballynalacken Windfarm site including Internal Cable Link to the Tinnalintan Substation, and the Ballynalacken Grid Connection locations was obtained from the NPWS data request sent in June 2022. An updated list was received in June 2024 for the updated grid squares overlapping with the proposed Ballynalacken Windfarm Project. A list of protected plant species recorded within the 10km grid squares in which the proposed Ballynalacken Windfarm Project is located was procured from the NBDC maps.

A13.8.2.6 Mammal Ecology – Desktop review

Utilising satellite maps available at https://www.google.com/maps/, a desktop review was undertaken to identify suitable habitat for mammals within the Proposed Ballynalacken Windfarm Project site. A data request was also sent to NPWS GIS division in June 2022 and June 2024 for a full inventory of all protected and rare species recorded within the 10km square overlapping the Ballynalacken Windfarm site including Internal Cable Link to the Tinnalintan Substation, and the Ballynalacken Grid Connection. The database of the National Biodiversity Data Centre was also consulted to assess the presence of rare mammal species reported within the 10km grid squares overlapping the proposed Ballynalacken Windfarm Project site. The NPWS 'Ireland Red List No. 12: Terrestrial Mammals' (Marnell *et al*. 2019) was consulted in addition to the 'Irish Wildlife Manuals No. 76, National Otter Survey of Ireland 2010/12 (Reid *et al*. 2013), 'Atlas of Mammals in Ireland 2010-2015' (Lysaght and Marnell, 2016), and 'Irish Wildlife Manual 121, All-Ireland Squirrel and Pine Marten Survey 2019' (Lawton *et al*. 2020).

A13.8.2.7 Amphibian and Reptile Ecology – Desktop review

A comprehensive desktop review was carried out to identify waterbodies located within or adjacent to the proposed Ballynalacken Windfarm Project. The database of the National Biodiversity Data Centre was consulted to assess the presence of amphibian and reptile species reported within the grid squares overlapping the proposed Ballynalacken Windfarm Project. Satellite mapping was also consulted to assess suitable habitat for reptiles and amphibians within or adjacent to the Proposed Ballynalacken Windfarm Project.

A13.8.2.8 Terrestrial Invertebrate Ecology – Desktop review

Utilising satellite maps available at https://www.google.com/maps/, a desktop review was undertaken to identify suitable habitat for rare and protected invertebrates within the proposed Ballynalacken Windfarm Project site. A data request was also sent to NPWS GIS division in June 2022 and June 2024 for a full inventory of all protected and rare species recorded within the 10km squares overlapping the Ballynalacken Windfarm site including Internal Cable Link to the Tinnalintan Substation, and the Ballynalacken Grid Connection. 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 10km grid squares overlapping the proposed Ballynalacken Windfarm Project.

A13.8.3 Methodology – Fieldwork

The following surveys were carried out at the Ballynalacken Windfarm site, at haul route works locations in the vicinity of the windfarm, along the route of the Internal Cable Link, at the Tinnalintan Substation site and along the route of the Ballynalacken Grid Connection with the exception of habitat and mammal surveys, which were undertaken at all locations (i.e. including haul route works locations remote from the proposed Ballynalacken Windfarm).

A13.8.3.1 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 50m buffer of the proposed Ballynalacken Windfarm Project were surveyed and classified to level 3. All surveys were carried out in good weather. Habitat surveys were undertaken in July 2021, July, November, December 2022, May, August 2023 and January, May 2024. Nomenclature for vascular plants follows Parnell and Curtis (2012).

Detailed Survey Results:

For Habitats (non-linear and linear respectively) surveyed within 50m of the proposed Ballynalacken Windfarm Project works locations.

A13.8.3.2 Birds – Fieldwork

A13.8.3.2.1 Breeding Season Bird Surveys

Countryside Bird Surveys

A total of four transects were surveyed in the breeding season 2021 and three in 2022 in the Ballynalacken Windfarm Turbines. The Internal Cable Link, Haul Route, Grid Connection, Substation and Ballyragget Substation were not included in the transect surveys based on the main disturbance areas being within 500m of the turbine and the other areas only likely to be short term and isolated in nature with regards to passerine impact. Four transects were conducted in April and May 2021 and three transects were conducted in April and May 2022.

The methodology followed the standardised line transect methodology for surveying birds (CBS, 2012). All birds were recorded on standardised recording sheets in four distance categories from the transect route (0-25m; 25-100m; 100+m and in flight).

The conservation status of each species recorded during the field surveys was assessed using the Birds of Conservation Concern in Ireland (BoCCI) list (Gilbert *et al.* 2021) in addition to relevant national or international legal designations.

For General Birds Survey Results see Appendix 13.4: General Bird Fieldwork and Survey Results.

Vantage Point Surveys

In the breeding season 2021, INIS carried out three VPs per month (VP5, VP6, PDVP1). VP5 and VP6 provide coverage of the current Ballynalacken Windfarm Turbines, while the southern half of the site was covered by PDVP1 and their hour count can be seen in **Table 10** below. The VPs provide the necessary viewshed coverage of the lands under consideration for turbines (T1 to T12) plus a minimum 500m buffer around the Ballynalacken Windfarm Turbines (see Figure 13.5).

In the Breeding Season 2022, INIS carried out three VPs per month, VP5, VP6 and PDVP1. These VPs provide a viewshed coverage of all the lands under consideration plus a minimum 500m buffer around the

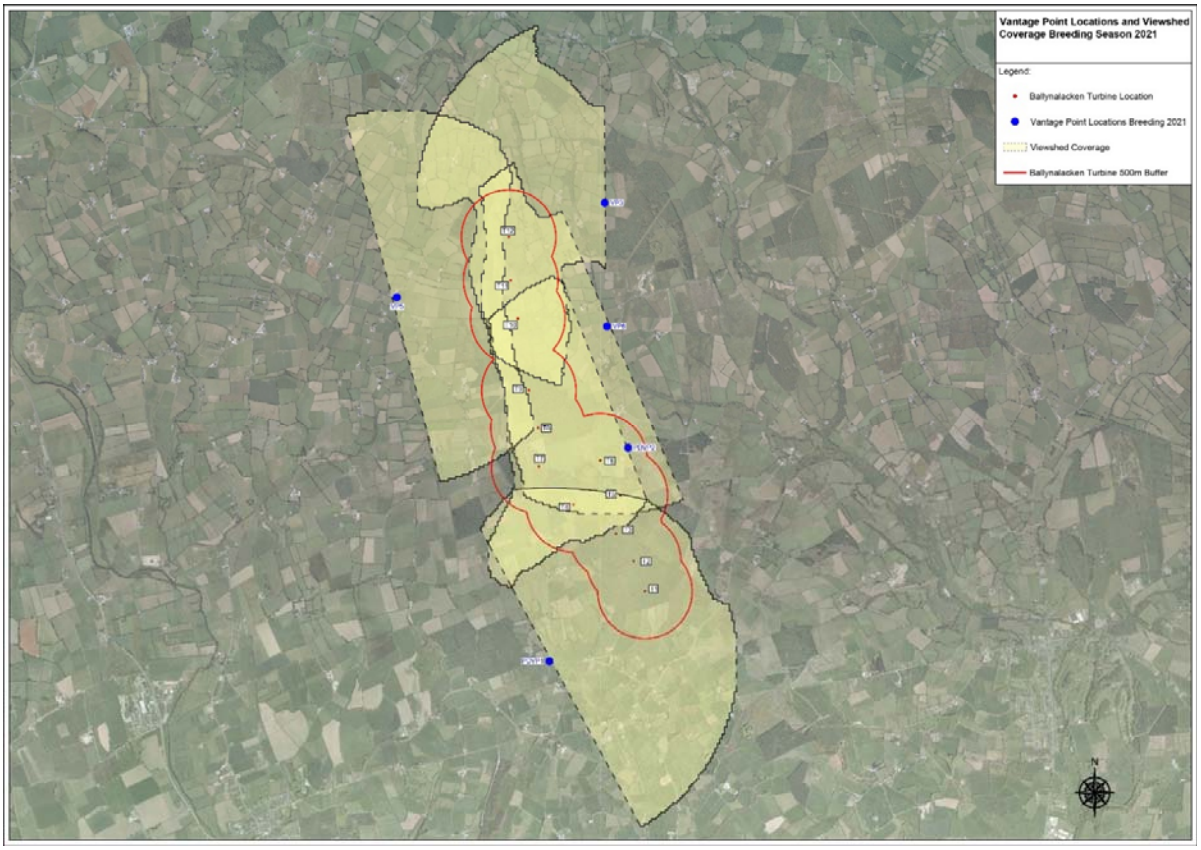
Ballynalacken Windfarm Turbines (see Figure 13.5). PDVP1 was conducted for 38 hours in summer 2022 and in 2021.

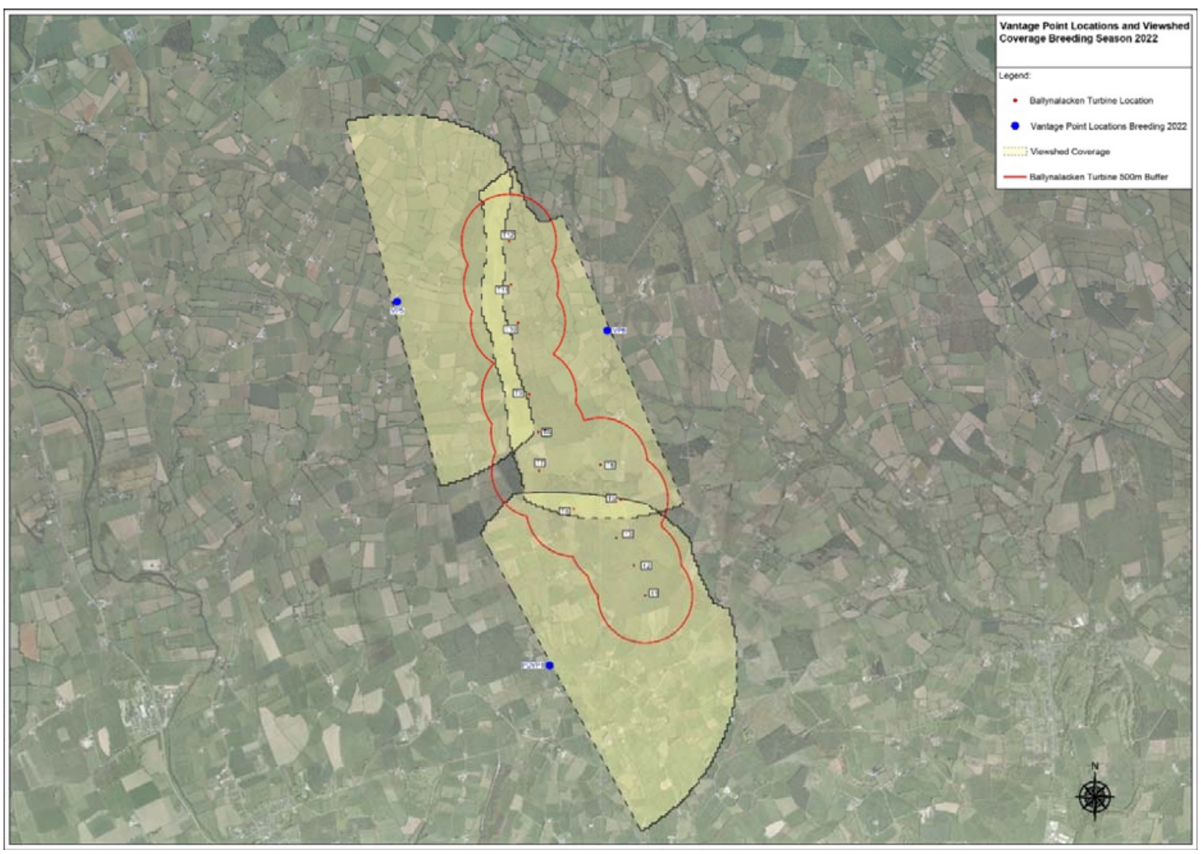
The SNH (2017) recommend a minimum of 72 hours per VP location divided between seasons (36 hours breeding and 36 hours non-breeding) per year. A minimum of 36 hours per VP were carried out during the 2021 Breeding Season and during the 2022 Breading season. PDVP1 was monitored 34 hours in 2021 and 38 hours in 2022 to ensure the total hours of survey effort achieved the minimum 72 hours as per best practice guidance (SNH, 2017). In total, 216 hours of VP surveys were completed in the Breeding Seasons 2021 and 2022 at the Ballynalacken Windfarm site.

All target species (Annex I listed, red and amber species of conservation concern) were recorded in addition to commoner species potentially sensitive to the development. Details recorded included flightlines mapped, flight duration, direction and heights. This information was suitable to inform collision risk analysis with the proposed turbine layout.

Table 10: Ballynalacken Summer 2021 and 2022 VP Hours

VP	Summer 2021						
	Apr	May	Jun	Jul	Aug	Sep	Total
5	6	6	6	6		12	36
6	6	6	6	6		12	36
PDVP1	12	12	6		4		34
Total	24	24	18	12	4	24	106
VP	Summer 2022						
	Apr	May	Jun	Jul	Aug	Sep	Total
5	6	6	6	6	6	6	36
6	6	6	6	6	6	6	36
PDVP1	8	6	6	6	6	6	38
Total	20	18	12	24	18	18	110





For Vantage Point Survey results see Section A13.4.2 in Appendix 13.4.

Breeding Woodcock Surveys

Breeding Woodcock surveys were carried out in May 2021 and June 2021 and May and June 2022. These surveys were informed by Hoodless *et al*. 2009 & Heward *et al*. 2015 guidelines. The survey took place within a study area composed of the Ballynalacken Windfarm Turbines and a 500m buffer. The survey recorded the number of Woodcock seen/heard.

For Breeding Woodcock Survey results see Section A13.4.3.4 in Appendix 13.4.

Water Crossing Surveys

With regard to water crossing surveys, the suitability of watercourses 500m upstream and downstream of watercourse crossing locations was appraised in April and May 2022. These surveyed watercourses include the River Nore and its tributaries. These watercourses were selected due to their possible potential to support suitable Kingfisher, Grey Wagtail and Dipper foraging and nesting habitats, and the potential for greater prey item availability.

Watercourse crossing surveys followed the Best Practice methodology presented in National Roads Authority (2008). Suitable watercourses were evaluated for any evidence of nest holes within 300m of the crossing locations. In each case banks were inspected for evidence of Kingfisher, Grey Wagtail and Dipper, and general suitability of banks in proximity to crossing locations for nesting Kingfisher. Target notes were made on suitable nesting banks, and any observed nest holes.

For Water Crossing Surveys Results see Section A13.4.3.5 in Appendix 13.4.

Breeding Wader Surveys

To assess the presence of breeding wader species and Snipe at the proposed Ballynalacken Windfarm site, along the route of the Internal Cable Link and at the Tinnalintan Substation site, areas of suitable peatland or wetland habitat were surveyed. The survey involved visits in April, May, June and July 2021 and April, May and June 2022. Survey methods followed relevant guidance (Brown & Shepherd, 1993). The observer walked within 100m of all the suitable areas. Wader species and any wetland birds (e.g. wildfowl, rails, gulls and terns) present on site were recorded. Other species of conservation interest were also noted, along with their flight paths, during the walkover surveys.

For Breeding Wader results see Section A13.4.3.3 in Appendix 13.4.

Breeding Raptor Surveys

Raptor Hinterland Surveys were conducted once in April, May and June 2021 covering the area within a 2km buffer from the Ballynalacken Windfarm Turbines. The surveys were conducted in accordance with Hardey *et al*. 2013 guidelines. Raptor species were recorded (if present) as a viable target species during flight line surveys. These surveys informed the Breeding Raptor Surveys conducted in Summer 2022 which focused on breeding Kestrel and Peregrine. The 2022 surveys were undertaken in April, May, June and July in 2022 and were conducted in accordance with Hardey *et al*. 2013 guidelines.

For Raptor Survey Results see Section A13.4.3.1 in Appendix 13.4.

Barn Owl Surveys

In April 2022 buildings were noted for potential suitability for Breeding Barn Owls. A site walkover was conducted in the proposed Ballynalacken Windfarm Project, and the buildings identified as having high suitability for Barn Owls were then surveyed. The walkover involved checking for signs of building occupation (such as pellets, feathers, etc.). The buildings with high potential were surveyed nocturnally to observe potential Barn Owl activity in July 2021 and June, July and August 2022. All Barn Owl surveys were carried out in accordance with *Barn Owl Surveying Standards for National Road Projects,* (TII, 2017).

For Barn Owl Survey Results see Section A13.4.3.2 in Appendix 13.4.

A13.8.3.2.2 Winter Season Bird Surveys

Countryside Bird Surveys

A total of four transects were surveyed in the winter season 2021/22 and three were surveyed 2023/24 along the Ballynalacken Windfarm site. Surveys were conducted in December 2021 and January, February and March 2022. The 2023/24 season transects were conducted in November, December 2023, and January, February 2024. The methodology followed the standardised line transect methodology for surveying birds (CBS, 2012). However, as CBS is designed to record breeding (and therefore territorial) birds, the winter equivalent is modified following recommendation in Bibby *et al*. (2000) and Atkinson *et al*. (2006) for wintering bird surveys. The main modification is that four monthly counts (November to February) are recommended throughout the winter period, as opposed to the 2-visit (early and late) approach adopted by the CBS, and that all birds are recorded (CBS excludes recognisable juveniles). Due to a lack of capacity to undertake surveys in November, extra compensatory surveys were conducted from December 2021 to March 2022. This does not undermine the sufficiency of the bird survey data as wintering transect surveys provide baseline information for the region and are not a legal requirement.

All birds were recorded on standardised recording sheets in four distance categories from the proposed Ballynalacken Windfarm (0-25m; 25-100n; 100+m and in flight).

The conservation status of each species recorded during the field surveys was assessed using the Birds of Conservation Concern in Ireland (BoCCI) list (Gilbert *et al.* 2021) in addition to relevant national or international legal designations.

For General Birds Survey Results see Appendix 13.4.

Vantage Point Surveys

The SNH (2017) recommend a minimum of 72 hours per VP location divided between seasons (36 hours breeding and 36 hours non-breeding) per year.

Due to weather constraints and layout changes between 2020 and 2024, the VP names and seasonal efforts were not uniformly conducted in each month of a season. Due to this, the CRM analysis of the flightlines were grouped to ensure flightlines were considered for two winter season and two summer seasons totalling a minimum of 72 hours for winter and summer respectively (Appendix 13.5). This is an accepted measure where weather and other factors impact survey efforts over the accepted 2 year minimum survey period for windfarm development (SNH, 2017).

In the Winter Season 2020-21, Pat Doherty Ltd. carried out two VPs for the proposed Ballynalacken windfarm from October to March (PDVP1 & PDVP2; see Figure 13.5). These VPs provided viewshed coverage of the Southern half of the lands under consideration at the Ballynalacken Windfarm Turbines plus a 500m buffer. Six hours of the VP PDVP2 October and November were respectively used for the CRM analysis to ensure the minimum 36-hour coverage per season was available for the Winter 2021-22 season.

In the Winter Season 2021-22, INIS carried out four VPs per month (VP3, VP5, PDVP1 & PDVP2). These VPs provided a partial viewshed coverage of the lands under consideration at the Ballynalacken Windfarm Turbines plus a minimum 500m buffer.

A total of 186 hours of VP surveys were completed in the winter season 2021-22 and 108 hours of VP surveys were completed in the winter season 2023-24. All target species (Annex I listed, red and amber species of conservation concern) were recorded in addition to commoner species potentially sensitive to the development. Details recorded included flightlines mapped, flight duration, direction and heights. This information was suitable to inform collision risk analysis with the proposed turbine layout.

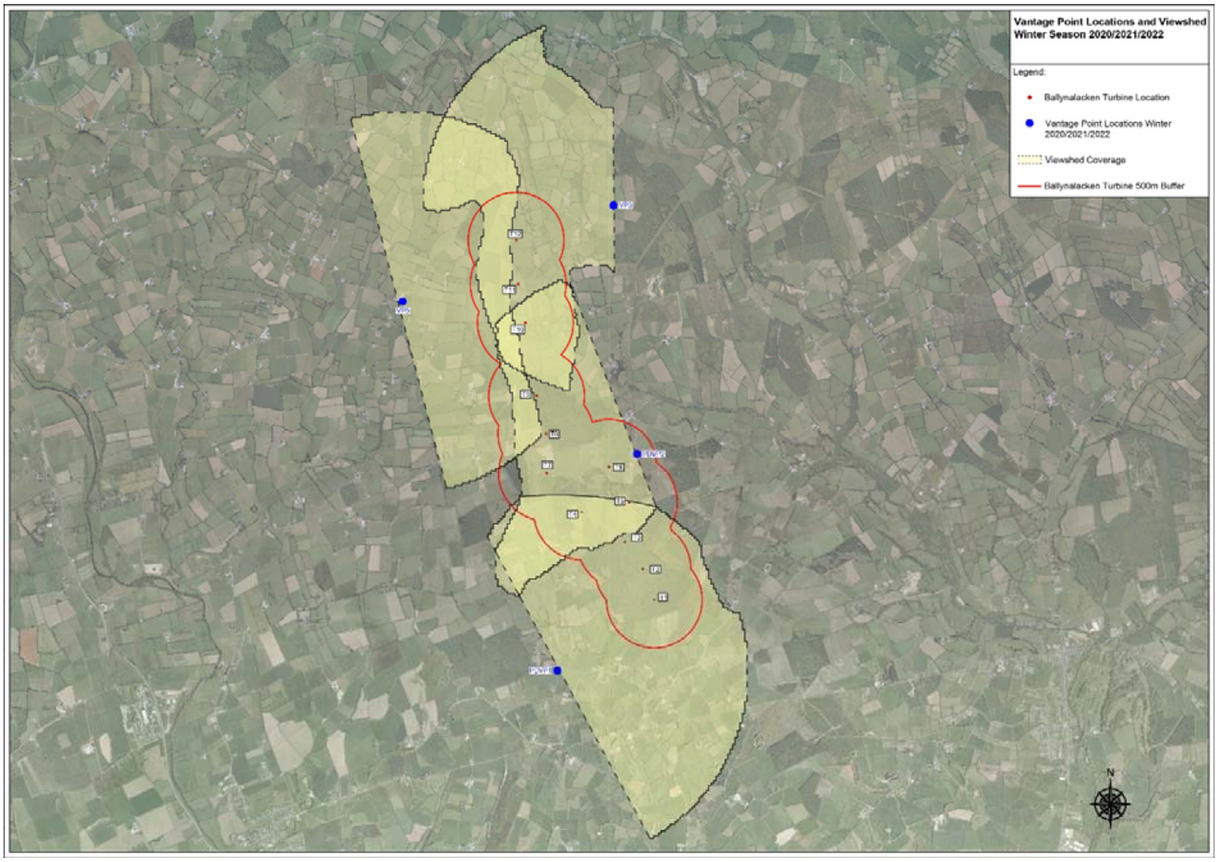
Three VP surveys were completed in the winter 2023-2024 between October 2023 and March 2024 (VP5, VP7 & PDVP1). VP7 replaced the coverage provided across VP6 and PDVP2 in the previous winter season.

In total, the viewshed coverage of lands under consideration and the total hours of survey effort in the Winter Season 2021-22 and in the Winter Season 2023-24 meets the necessary SNH (2017) guidance.

Table 11: Ballynalacken Winter 21/22 and 23/24 VP Hours

VP	Winter 2021/2022							
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
3				12	12	12		36
5				6	18	6	6	36
PDVP2	**12**[1]	**6**[2]				18		36
PDVP1	6	3				16	36	61
Total	18	9	0	18	30	52	42	169
VP	Winter 2023/2024							
	Oct	Nov	Dec	Jan	Feb	Mar	April	Total
5	6	6	6		12	6		36
PDVP1	4	8	3	9	6	6		36
7	6	6	6	12		6		36
Total	16	20	15	21	18	18		108

[1] 6 hours sourced from October 2020
[2] 6 hours sourced from November 2020



For Vantage Point Survey results see Section A13.4.2 in Appendix 13.4.

Hen Harrier Roost Watch

Hen Harrier roost watch surveys were undertaken in the Winter Season 2021/22, from December 2021 to March 2022 and in Winter 2023/2024, October 2023 to March 2024 (one day per month, for a total of six days per season). Fieldwork methodology followed SNH (2005) guidance. Potential Hen Harrier roost locations within 2km of the Proposed Ballynalacken Windfarm Turbines, were identified during daytime walkover surveys. These potential roosts were observed during a time associated with roost activity, i.e. the last hour before dusk. Details noted during these surveys include identification of birds flying around the potential roost and bird flight behaviour approaching and departing the potential roost.

Wintering Wetland Bird Surveys

To assess the presence of wader species in the study area throughout the winter 2021-2022, surveys took place in areas of suitable peatland or wetland habitat within a study area of 5km from the Ballynalacken Windfarm Turbines. The surveys were carried out in December 2021 and January, February and March 2022. Surveys were also carried out between October 2023 and March 2024. Survey methods followed relevant guidance (I-WeBS, 2008) and all wetland birds (e.g. waders, wildfowl, rails, gulls and terns) present on site were recorded. Other species of conservation interest were also noted, along with their flight paths, during the walkover surveys.

A13.8.3.3 Bats – Fieldwork

Survey aims:

- Assess the bat roost suitability of bridges, buildings and mature trees that could be directly affected.
- Identify potential indirect effects on bats, e.g. from disruption of commuting routes/foraging routes, or lighting.

Survey of potential bat roosts

A preliminary ecological appraisal was carried out for all buildings within 250m of the Ballynalacken Windfarm Turbines in July 2021 using the approach outlined in Section 4.3 of Bat Conservation Trusts Guidelines (Collins, 2016). A second preliminary ecological appraisal was carried out for all buildings within 250m of the current layout of the Ballynalacken Windfarm Turbines in 2022, covering the turbines to the south of the site. All buildings were assigned a suitability category of negligible, low, moderate or high suitability, based on the age and condition of structural features used by roosting bats (e.g. roof tiles, attic spaces, soffit / fascia boards, walls).

Carried out alongside the preliminary ecological appraisals for buildings in 2021 and 2022, ground-level roost assessments were carried out for all trees with moderate or low bat suitability within 250m of the Ballynalacken Windfarm Turbines (as explained for the buildings surveys), using binoculars (Steiner SkyHawk 3.0 10x42). The aim of the ground-level inspection was to identify any potential roost features (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 Ballynalacken Windfarm Project will be developed over/across a small number of watercourse/drain crossing structures (i.e. bridges and culverts). Drains and watercourses with crossing structures in place were inspected in 2022. Watercourse and drain crossing structures were surveyed using a high-powered torch and/or an endoscope, allowing detailed inspections of all crevices.

Roost surveys consist of presence/absence surveys 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 (2016), presence/absence surveys are needed if:

- the preliminary roost assessment (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 preliminary roost assessment (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 Ballynalacken on four different structures with roosting potential (bridges, trees and buildings) August and September 2021.

Spring, Summer and Autumn Transect surveys were conducted in Ballynalacken in 2021.

Proposed Ballynalacken Wind Farm Bat Activity surveys

Bat Activity Surveys at the Proposed Ballynalacken Windfarm Site were undertaken using automated Anabat Express bat detectors (Titley Scientific). External microphones were mounted on canes at a height of approximately 1.5m in order to obtain 'clean' recordings that were not affected by surrounding vegetation. Between seven and nine locations were chosen for 2021 passive surveys, covering the northern section of the 11 turbine locations and the habitats in the surrounding areas. The southern section of the Ballynalacken Windfarm Project site was not subject to passive surveys in 2021 due to a change in the turbine layout which came into effect in 2022. Seven static detectors were deployed in spring, seven in summer and nine in autumn for between 10 and 15 nights per available season.

In order to accommodate a change in the turbine layout of the Ballynalacken Windfarm Project, a total of five locations were selected for 2022 passive surveys for between 11 and 18 nights per available season (spring, summer and autumn). These five locations covered turbines in the southern section of the Ballynalacken Windfarm Project site and habitats in the wider area.

We consider that this survey effort was sufficient to provide a good representation of bat activity during their most active periods, and that it was proportionate to the potential effects as discussed in Section 2.2.5 of Collins (2016). Surveys were carried out during suitable weather conditions, i.e. minimum temperatures above 10°C, average winds of less than 4m/s and little or no rainfall. There was wet weather or high winds on some of the survey nights, so the survey was extended until a suitable number of nights of suitable conditions were obtained. As such, certain spring efforts were conducted in summer months and some summer efforts in autumn. Appendix 13.3 provides survey results in the season effort relevant with dates specified to the exact dates activity was recorded. This is an accepted constraint in line with Collins (2023) guidance of timing surveys for activity monitoring where weather and other factors influence detector deployment. Results of this survey are still considered viable for the revised appraisal given little or no change to baseline habitat structure has occurred in the interim.

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, we use a bespoke system to discuss and compare levels of bat activity at the site, as outlined in the below Table. 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 12: 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

Species identification and interpretation of data

Sonograms from Anabat Express detectors were obtained in the 'zero-crossing' format and viewed using AnalookW software. 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 cf daubentonii*. There can also be overlaps in call frequency between Pipistrellus spp. - calls with a CF component at 50 kHz may be either soprano pipistrelle or common pipistrelle, while calls at 40 kHz may be either common pipistrelle or Nathusius' pipistrelles – but in most cases, it is possible to determine the species based on call characteristics and/or 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.).*

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.

Use of a Frequency Scale for comparing bat activity

For the purposes of this assessment the 2021-2022 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 13.3. For the purposes of this report, we use a bespoke system to discuss and compare levels of bat activity at the Site, as outlined in Table 13 below. This system is based on the professional judgement of the surveyor, and the results of peer reviewed research (Mathews *et al*. 2015). 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, 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.* 2015 report.

Table 13: Terminology used to categorise bat activity levels

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

For Bat Roost Survey Results and Bat Activity Survey Results see Appendix 13.3: Bat Survey Results.

A13.8.3.4 Terrestrial Mammals – Fieldwork

Walkover surveys were undertaken in June, and December 2021, January 2022, November 2022 and August 2023 for the presence of Badgers, Otters and other mammals. Surveys were undertaken within a 50m buffer of the Proposed Ballynalacken Windfarm, with the exception of Otter (listed separately below). Camera traps were deployed in June 2021, January 2022 and November 2022 and on site in locations that were expected to be of high-mammal use.

Otters

Otter surveys followed the NRA *Guidelines for Treatment of Otters During Construction of National Road Schemes* (NRA, 2006), 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 scheduled for Spring 2022 in order to optimize detection of otters. Follow up surveys were conducted in June and August 2023.

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 a linear search of 300m upstream and downstream of each watercourse crossing is undertaken. These transects were conducted at watercourse crossings W1, W2 and W3.

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 Inis ecologists. Badger territorial activity is high from mid-January to March and surveys at this time are most efficient in identification of badger paths, latrines and feeding signs. Surveys for evidence of the presence of Badgers within 50m of the proposed works were completed in June 2021 and January 2022.

Camera Traps

Camera traps were also deployed in 15 locations in across three deployment periods June 2021, January 2022 and November 2022. Three cameras were deployed in 2021. CT1 was located at the bend in the internal windfarm roads 144m from T9; CT2 was located 49m south of the Borrow Pit and 305m east of CT1, CT5 was located 159m to the east of T12.

Five camera traps were deployed in January 2022. CT1 and CT2 were deployed West of T12 in the field where the Otter spraints were found (Appendix 13.2). CT3 was deployed in a field East of L5840 outside the 50m study area of the red line boundary. CT4 was deployed in an area of scrub between the Wet Heath habitat and the L5840. CT5 was deployed in a transition area between Conifer Plantation and Wet Grassland, 238m Northwest of T9.

Seven additional camera traps were deployed in November 2022. CT2 was deployed 174m Southeast of T7 within an area of forestry. CT4 was deployed near the access road of the substation internal cable route within an area of mixed bare ground and scrub. CT5 was deployed along a hedgerow treeline bordering the Ballyragget Substation. CT6 was deployed 153m Northeast of T2 within an area of Conifer Plantation forestry. CT7 was deployed 136m Northwest of T5 bordering an area of conifer forestry. CT8 was deployed 238m Southwest of T12 on the opposite side of the L5840 within an area of conifer forestry. CT9 was deployed within a habitat of artificial surfaces and conifer forestry 104m Southwest of T9.

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 pine cones, badger snuffle holes)
- Places of shelter and features or areas likely to be of particular value as foraging resources (NRA 2009).

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

For Terrestrial Mammals Survey Results see Appendix 13.2: Mammal Survey Results

A13.8.3.5 Invertebrates, Reptiles & Amphibians - Fieldwork

'Ecological Surveying Techniques for Protected Flora and Fauna During the Planning of National Road Schemes' were followed when carrying out surveys (2008).

- Walkover surveys were conducted to determine the presence and suitability of habitats for insects, invertebrates, amphibians, and reptiles.

Marsh Fritillary

Marsh Fritillary surveys were undertaken in September 2021 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.

A13.8.3.6 Aquatic Ecology/Fisheries – Fieldwork

A13.8.3.6.1 Sensitive Species Data Request

A sensitive species data request was submitted (02/06/2022) to the National Parks and Wildlife Service for the 10km grid squares containing and adjoining the proposed wind farm project (i.e. S47) and was received on the 23rd of June 2022. Records for a number of rare or protected aquatic species were available although most did not overlap directly with the survey area.

A13.8.3.6.2 Selection of Watercourses for Assessment

All freshwater watercourses which could be affected directly or indirectly by the proposed wind farm project, including those crossed by the Internal Cable Link and the Ballynalacken Grid Connection, were considered as part of the current assessment. A total of n=21 sites were selected for detailed aquatic assessment (Figure 13.6). The nomenclature for the watercourses surveyed is as per the Environmental Protection Agency's (EPA) online map viewer[1].

Aquatic survey sites were present on the Kilcronan stream (EPA Code: 15K29); Owveg River *(Owenbeg River)* (15O01); Nore (also known as the River Nore) (15N01), Unnammed pond/wetland (n/a); Castlecomer Stream (15C01); Cloghnagh river (15C04); Castlemarket_East stream (15C89); Nicholastown_15 stream (15N06); Loughill river (15L13); Rathduff_15 river (15R24) and Dinin [North] (also known as Dinin River) (15D07).

Surveys at each of these sites included a fisheries assessment (electro-fishing on riverine sites, habitat appraisal at pond site), and, where suitable, biological water quality sampling (Q-sampling) (Figure 13.6). White-clawed crayfish (sweep netting & hand searching) surveys were also undertaken at each site, in addition to macrophyte and aquatic bryophyte surveys. This holistic approach informed the overall aquatic ecological evaluation of each site in context of the proposed wind farm project.

A13.8.3.6.3 Freshwater Pearl Mussel Surveys

The River Nore was checked for the Nore Freshwater Pearl Mussel *Margaritifera durrovensis* and the Freshwater Pearl Mussel *Margaritifera margaritifera* along a 15.6km stretch of the river path at 500m sections 3.8km upstream of Ballyragget town in August 2023 and 11.8km Downstream of Ballyragget town in April 2024. They were surveyed under license no.'s C92/2023 & C21/2024 respectively in bright weather with good visibility and under base flow conditions. This helped to maximise visibility of pearl mussel against dark substrata and also helped to increase the chances of detection when mussels are actively filtering. An additional 4.5km stretch of Castlecomer Stream was also surveyed in April 2024 under the C21/2024 license.

The survey methodology used was in accordance with the Stage 1 and 2 guidelines provided by the NPWS (Anon., 2004) (guidelines currently being updated but unpublished at the time of survey). The surveys were also cognisant of the latest European-wide guidance for freshwater pearl mussel survey methodology (e.g. Boon *et al*. 2019; CEN, 2017).

Stage 1 and 2 surveys were undertaken along a total of 15.6km of the River Nore channel between Archer's Island (500m upstream of the Owveg River confluence) and the Dinin River confluence, i.e. downstream of potential hydrological pathways from the proposed wind farm. As per best practice guidelines, the survey area was delineated into ≤500m survey sections, with surveys carried out in an upstream direction in order to maximise visibility and minimise potential damage to mussels. A total of 32 no. ≤500m contiguous sections

[1] https://gis.epa.ie/EPAMaps/Water

were surveyed for the River Nore and nine no. ≤500m contiguous sections for the Castlecomer Stream. Surveys incorporated a combination of bathyscope and snorkelling methodologies (with the use of a kayak), dependant on local water depths and flow regimes. An estimation of the number of pearl mussel within each 500m survey section was made (where applicable). To clarify the most important areas for pearl mussel, survey sections were classified according to relative mussel abundance (total counts per 500m), i.e. absent (no live mussels), occasional (1-10 mussels), common (11-50), frequent (51-100) or abundant (>100).

Notes were also taken on the aquatic habitat conditions and suitability for freshwater pearl mussels, based on the criteria of Moorkens & Killeen (2020), Skinner *et al*. (2003) and Hastie *et al*. (2000).

eDNA: To clarify the presence/absence of freshwater pearl mussel in the Cloghnagh river and Dinin River (watercourses with no pearl mussel records located downstream of the proposed project), composite water samples were collected from the lowermost reaches of both rivers in April 2024 and analysed for freshwater pearl mussel *Margaritifera margaritifera* environmental DNA (eDNA). The sites were 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.

A13.8.3.6.4 Aquatic Site Surveys

Surveys of the watercourses within the vicinity of the proposed Ballynalacken Windfarm Project were conducted in September 2021, July, August 2023 and April 2024 (n=21 sites). Survey effort focused on both instream and riparian habitats in the vicinity of each survey site (Appendix 13.6). The watercourses at each survey site were described in terms of the important aquatic habitats and species. This helped to evaluate species and habitats of ecological value in the vicinity of each site. The aquatic baseline prepared would inform mitigation for the proposed Ballynalacken Windfarm Project.

A broad aquatic 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). All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e., width, depth etc.)
- Substrate type, listing substrate fractions in order of dominance (i.e., bedrock, boulder, cobble, gravel, sand, silt etc.)
- River profile in the sampling area
- An appraisal of the macrophyte and aquatic bryophyte community at each site
- Riparian vegetation composition

A13.8.3.6.5 Catchment Wide Electro-Fishing

A catchment-wide electro-fishing (CWEF) survey of the watercourses within the vicinity of the proposed wind farm was conducted in September 2021 and in July/August 2023 (n=20 riverine sites, Figure 13.6), under the conditions of a Department of Communications, Climate Action & Environment (DCCAE) licence. The survey was undertaken in accordance with best practice and Section 14 licencing requirements. One site location was not sampled via electro-fishing due to unsuitability to conduct this method of sampling (Site B1).

Furthermore, a fisheries habitat appraisal of all 22 watercourses and waterbodies in the vicinity of the proposed wind farm project (Figure 13.6) was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The baseline assessment also considered the quality of spawning, nursery and holding habitat for salmonids and lamprey within the vicinity of the survey sites.

Fisheries assessment of survey area

The proposed survey sites were located within the Nore_SC_060; Nore_SC_080 and Dinin[North]_SC_010 river sub-catchments. Whilst not located within a European site, the proposed wind farm site (via several watercourses) shared downstream hydrological connectivity with the River Barrow and River Nore SAC (002162). Four survey sites on the Kilcronan stream (A3), Owveg River (A4), River Nore (A5) and Dinin River (B9) were located within this European site.

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 Ballynalacken Windfarm Project in September 2021, following notification to Inland Fisheries Ireland and under the conditions of a Department of Communications, Climate Action & Environment (DCCAE) licence. 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, European 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 reach could be determined as a longer representative length of channel can be 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 n=20 sites (see Appendix 13.6).

Salmonids and European Eel

For salmonid species and European eel, as well as all other incidental species, electro-fishing was carried out in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson *et al*. 2018). A total of approx. 50-100m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages. At certain, more 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 noted in the subsequent results section (Appendix 13.6).

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 European eel to the anode without harm. For the moderate to high conductivity waters of the sites (most draining calcareous geologies) a voltage of 220-275v, frequency of 30-35Hz and pulse duration of 3-3.5ms was utilised to draw fish to the anode without causing physical damage.

Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted box 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 European 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, approx. 10-15 cm 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).

Fisheries Habitat

A broad appraisal of the upstream and downstream habitat at each site was also undertaken to evaluate the wider contribution to salmonid and lamprey spawning and general fisheries habitat. River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (EA, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the riverine sites (i.e., channel profiles, substrata etc.).

Biosecurity

A strict biosecurity protocol following the Check-Clean-Dry approach was employed during surveys for all equipment and PPE used. Equipment and PPE used was disinfected with Virkon® between survey sites to prevent the transfer of pathogens and/or invasive species between survey areas. Particular cognisance was given to preventing the introduction or spread of crayfish plague (*Aphanomyces astaci*) given the known presence of white-clawed crayfish in the wider survey area (i.e., Owveg River, Castlecomer Stream, River Nore). Where feasible, equipment was also thoroughly dried (through UV exposure) between survey areas. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. As per best practice, surveys were undertaken at sites in a downstream order (i.e., uppermost site surveyed first etc.) to prevent the upstream mobilisation of invasive propagules and pathogens.

A13.8.3.6.6 White Clawed Crayfish Survey

White-clawed crayfish (*Austropotamobius pallipes*) surveys were undertaken at the aquatic survey sites in September 2021 under a National Parks and Wildlife (NPWS) open licence (no. C145/2021), as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2023), to capture and release crayfish to their site of capture, under condition no. 6 of the licence. As per Inland Fisheries Ireland recommendations, the crayfish surveys started at the uppermost site(s) of the wind farm catchment/sub-catchments in the survey area to minimise the risk of transfer 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). Trapping of crayfish was not feasible given the small nature of most aquatic survey sites sampled. An appraisal of white-clawed crayfish habitat at each site was conducted based on physical channel attributes, water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider Ballynalacken Windfarm survey area was undertaken.

A13.8.3.6.7 Biological Water Quality (Q-Sampling)

The aquatic survey sites were assessed for biological water quality through Q-sampling in September 2021. Sites A1, B3, C1, C2, C6 and C7 were dry or semi-dry at the time of survey and, thus, it was not possible to collect a biological water sample at these locations. Therefore, a total of n=14 sites were sampled for biological water quality (i.e., sites A2, A3, A4, A5, B2, B4, B5, B6, B7, B8, B9, C3, C4 & C5).

Macro-invertebrate samples were converted to Q-ratings as per Toner *et al*. (2005). All riverine samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a three-minute sample. Large cobble was also washed at each site where present and samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification. 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 14: 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

A13.8.3.6.8 eDNA Surveys

To validate site surveys and to detect potentially cryptically-low populations of protected and or rare aquatic species within the study area, composite water samples were collected from the Owveg River (A4), Castlecomer Stream (B8) and the Dinin River (B9) in August 2023. The samples were analysed for Freshwater Pearl Mussel, White-clawed Crayfish and Crayfish plague (*Aphanomyces astaci*) environmental DNA (eDNA), with the sites strategically chosen to maximise longitudinal (instream) coverage within the catchment (i.e. facilitating a greater likelihood of species detection) (Appendix 13.7). Targeted eDNA sampling for Freshwater Pearl Mussel were conducted in April 2024 along the Cloghnagh river and Dinin River (see Appendix 13.7).

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.

A13.8.3.6.9 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).

Detailed Survey Results

Appendix 13.6: Aquatic Ecology Survey Results.

A13.8.4 Reference List

Anon. (2004) *Margaritifera margaritifera*. Stage 1 and Stage 2 survey guidelines. Irish Wildlife Manuals, No. 12. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

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