FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED BALLINAGREE WIND FARM

REPORT TO INFORM THE APPROPRIATE ASSESSMENT PROCESS (SCREENING AND NATURA IMPACT STATEMENT)

Prepared for: Ballinagree Wind DAC

Ballinagree Wind farm

Date: January 2022

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TABLE OF CONTENTS

1. INTRODUCTION 1

1.1 Legislative Context 1

1.1 Statement of Competence 2

1.2 Methodology 11

1.2.1 Guidance 11

1.2.2 Process 11

1.2.3 Information Consulted in the Preparation of this Report 12

2. DESCRIPTION OF THE PROJECT 14

2.1 Existing Environment 14

2.1.1 Project Location 14

2.2 Wind Farm Site Project Description 21

2.2.1 Turbine Description 22

2.2.1 Replant Lands 35

2.2.2 Grid Connection 37

2.2.3 Turbine Delivery Route 40

2.2.4 Traffic Management 48

2.2.5 Biodiversity Enhancement and Management Plan (BEMP) Measures 48

2.3 Operation and Lifespan 49

2.4 Decommissioning 50

2.5 Potential Interactions of the Proposed Project with the Natural Environment 50

3. SCREENING FOR APPROPRIATE ASSESSMENT 60

3.1 Introduction 60

3.2 Identification of European Sites That May be Affected by the Proposed Project 60

3.3 Assessment of Likely Significant Effects 73

3.4 Screening Conclusion Regarding Likely Significant Effects 83

4. NATURA IMPACT STATEMENT 84

4.1 Introduction 84

4.2 European Sites Description 85

4.2.1 Blackwater River (Cork/Waterford) SAC 85

4.2.2 Aquatic Surveys 87

4.2.3 Mullaghanish to Musheramore Mountains SPA 98

4.2.4 Avifauna Surveys 98
4.2.5 The Gearagh SPA 103
4.3 Potential For Adverse Effects on Site Integrity 105
4.3.1 Potential Impacts 106
4.4 In-Combination Effects 109
4.4.1 Plans / Project with potential for potential in combination effects with the proposed project (Site, grid connection TDR and BEMP Lands) 109
4.5 Potential for Adverse Effects 118
4.6 Mitigation 131
4.6.1 Mitigation by Avoidance and Design 131
4.6.2 Mitigation Measures 132
4.7 Residual Effects on the Integrity of the Sites within the Potential Zone of Influence of the Proposed Project 145
4.8 Conclusion 145
5. REFERENCES 146

LIST OF APPENDICES

Appendix 1: Habitat Map

Appendix 2: Aquatic Ecology

Appendix 3: Avian Ecology

Appendix 4: CEMP

Appendix 5: Invasive Species Management Plan

Appendix 6: Geotechnical and Peat Stability Assessment Report

Appendix 7: BEMP

Appendix 8: List of Cumulative Projects

Appendix 9: Consideration of Afforestation

LIST OF FIGURES

Page

Figure 1-1: Site Location Map 7
Figure 1-2: Grid Connection Route 8
Figure 1-3: Turbine Delivery Route (TDR) 9
Figure 1-4: Biodiversity Enhancement and Management Plan Lands (BEMP) 10
Figure 2-1: Water Catchment Map 20
Figure 2-2: Hydrology Features 29
Figure 2-3: Recreational Amenity Trails 33
Figure 2-4: Site Layout 36
Figure 3-1: European Designated Sites within the ZoI 72
Figure 4-1: Existing Wind Farms within the 20km search radius of the Site 117

LIST OF TABLES

Table 2-1: Internal Access Track Watercourse Crossings 26
Table 2-2: Grid Connection Route Watercourse Crossings 38
Table 2-3: TDR Temporary Accommodation Works 41
Table 2-4: TDR Watercourse Crossings 47
Table 2-5: Potential Impacts of the Proposed Project 52
Table 3-1: European Sites Within the Potential ZoI 62
Table 3-2: Potential for significant effects on the Blackwater River (Cork/Waterford) SAC from the proposed project 74
Table 3-3: Potential for significant effects on the Mullaghanish to Musheramore Mountains SPA from the proposed project 77
Table 3-4: Potential for significant effects on the Gearagh SPA from the proposed project 80
Table 4-1: Threats, Pressures and Activities with Impacts on the Blackwater River (Cork/Waterford) SAC 86

Table 4-2: *n*=40 aquatic survey locations for the proposed project (watercourse names are according to the EPA) 88
Table 4-2: Summary of the potential occurrence of qualifying interests of the Blackwater River (Cork/Waterford) SAC (within the Blackwater[Munster]_SC_050 and Blackwater[Munster]_SC_070 sub-catchment survey area) 94
Table 4-3: Threats, Pressures and Activities with Impacts on the Mullaghanish to Musheramore Mountains SPA 98
Table 4-4: Summary of the potential occurrence of Species of Conservation Interests of Mullaghanish to Musheramore Mountains SPA within the area of the proposed project (including the Site, grid connection, TDR and BEMP Lands) 102
Table 4-5: Threats, Pressures and Activities with Impacts on The Gearagh SPA 103
Table 4-6: Summary of the potential occurrence of Species of Conservation Interests of The Gearagh SPA within the area of the proposed project (including the Site, grid connection, TDR and BEMP Lands). 104
Table 4-8: Conservation Objectives and Structure and Functions for Relevant Qualifying Interests / Species of Conservation Interest with Potential For Adverse Effects on Site Integrity from the Main Site. 119
Table 4-9: Details of Mitigation Measures to be Implemented for Proposed Project 132

LIST OF PLATES:

Plate 2-1: Eirgrid 110kV Single Circuit Joint Bay 39
Plate 4-1: Overview of the n=40 aquatic surey locations for the proposed project 90
Plate 4-2: Comparison of percentage Hen Harrier activity recorded during the four breeding VP survey years (2017-2020) 100
Plate 4-3: Comparison of percentage Hen Harrier activity recorded during the four winter VP survey seasons (2017/2018/ 2018/2019, 2019/2020 & 2020/2021) 102

Key Elements

The proposed project is comprised of the following key elements:

- The wind farm site (also referred to as 'the Site');
- The grid connection;
- The turbine delivery route (also referred to as 'the TDR');
- Biodiversity enhancement and management plan lands (also referred to as 'the BEMP lands').

1. INTRODUCTION

Fehily Timoney and Company (FT) was commissioned by the applicant to prepare an application for planning permission for a proposed wind farm development comprising of 20 no. wind turbine generators (WTG's), internal access tracks, hard standings, meteorological masts, recreational amenity infrastructure and associated signage, onsite substation, internal electrical and communications cabling, temporary construction compounds, drainage infrastructure, borrow pits and all associated works related to the construction of the wind farm. The Site consists of lands in the townlands of Knocknagappul, Crinnaloo South, Horsemountmountain, Ballynagree East, Finnanfield, Ballynagree West, Rahalisk, Mushera, Carrigduff, Maulnahorna, Carrigagulla, Inchamay South and Annagannihy in County Cork. Refer to Figure 1-1 for site location.

It is proposed to supply the power from Ballinagree Wind Farm to the Irish electricity network via an underground 110kV cable to the existing 110/220kV Substation at Clashavoon. The grid connection passes through the townlands of Clonavrick, Knocknagappul, Ballynagree East, Bawnmore, Ballynagree West, Derryroe, Rahalisk, Kilberrihert, Caherbaroul and Aughinida. Refer to Figure 1-2 for grid connection location.

Large components associated with the wind farm construction will be transported to Site via the identified turbine delivery route (TDR). The TDR commences at the Port of Foynes and finishes at the wind farm site and consists of the N69 towards Limerick, the M7, the N21, south along the N20 through the towns of Charleville and Buttevant before turning west onto the N72 at Mallow, the R583 towards Millstreet before turning onto the L2758 to the proposed wind farm site. Temporary accommodating works will be required at selected locations along the TDR to facilitate the delivery of large components to the site. Refer to Figure 1-3 for TDR route.

A Biodiversity Enhancement and Management Plan is included in Appendix 7 and comprises land management commitments and monitoring for approx. 304 hectares of lands in the vicinity of the proposed Ballinagree Wind Farm. In addition, the developer has undertaken to create wildlife corridors through strategic tree-felling between areas of upland habitat in the vicinity of the proposed wind farm area. The land management measures are designed to maintain and enhance local biodiversity. The BEMP lands are identified in Figure 1-4. **Note:** This is not being proposed as mitigation or compensation. It is being proposed as part of the project. It comprises agricultural and felling activities.

This report has been prepared to inform the competent authority in completing their statutory obligations in relation to Appropriate Assessment under Council Directive 92/43/EEC (Habitats Directive) as implemented in Ireland under *inter alia* the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended), and Part XAB of the Planning and Development Act, 2000 (as amended).

1.1 Legislative Context

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive) provides legal protection for habitats and species of European importance. The Directive requires that where a plan or project is likely to have a significant effect on a European Site, while not directly connected with or necessary to the nature conservation management of the site, it will be subject to 'Appropriate Assessment' to identify any implications for the European site in view of the site's Conservation Objectives. Specifically, Article 6(3) of the Habitats Directive states:

6(3) Any plan or project not directly connected with or necessary to the management of the site (Natura 2000 sites) but likely to have significant effect thereon, either individually or in combination with other plans or projects, shall be subject to Appropriate Assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

The provisions of Article 6 do not apply where the proposed plan or project is '*connected with or necessary to the management of the site'.* In this case, the proposed project is not directly connected with or necessary to the management of any European site(s).

Article 6 of the Habitats Directive is implemented by the provisions of sections 177U and 177V of the *Planning and Development Act, 2000* (as amended). Article 177U requires that before consent is given, the competent authority must carry out a screening for appropriate assessment to assess, in view of best scientific knowledge, if the development, individually or in combination with another plan or project is likely to have a significant effect on the European site. If it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site, an appropriate assessment of its implications for the European Site(s) in view of the Site's conservation objectives is required to be carried out.

1.1 Statement of Competence

This report has been prepared by Jason Guile and Jon Kearney of Fehily Timoney.

Jason is a Senior ecologist with Fehily Timoney and has over 10 years' experience in ecological assessment and holds a BSc in Marine Biology/Oceanography from the University of Wales, Bangor and a HND in Coastal Conservation with Marine Biology from Blackpool and Fylde College. Jason has prepared Appropriate Assessment Screening reports and Natura Impact Statements for numerous large scale infrastructure projects in the commercial, energy and transport sectors.

Jon is a Principal ecologist with Fehily Timoney and has 16 years' experience in the field of ecological assessment. He holds a BSc (Hons) in Applied Ecology from University College Cork and MSc in Ecological Management and Biological Conservation from Queens University Belfast. Jon is a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). In his time as an ecological consultant in both the UK and Ireland, he has worked on a broad diversity of projects including NIS's for several offshore renewable energy projects, circa. 50 wind farms projects, solar farms, road schemes and commercial developments. Jon as the lead ecologist has been the lead expert witness for biodiversity and Appropriate Assessment at several An Bord Pleanála Oral Hearings.

Aquatic surveys were undertaken by Ross Macklin and Bill Brazier of Triturus Environmental Ltd.

Ross Macklin PhD (Candidate) BSc (Hons) Applied Ecology HDip GIS Dip IPM MCIEEM IFM is an environmental scientist specialising in freshwater and fisheries ecology. He is currently completing his PhD in U.C.C. in fisheries ecology. He has undertaken river habitat, lake habitat, wetland habitat and fisheries assessments in professional work for 16 years. His specialist freshwater experience lies in biological and physiochemical water quality analysis, fisheries ecology, riparian habitat assessments, habitat mapping, protected species, geographical information systems, ecological design and invasive species.

Ross has expert experience in identifying and assessing macrophyte plant, aquatic bryophytes, fish and macroinvertebrates from a variety of aquatic habitats. He routinely undertakes Habitat Regulations Assessments, Fisheries Assessments, Protected Species Surveys, Invasive Species Surveys, Habitat & Surface Water Management Plans, CEMP, EcIA and EIAR reporting.

Bill Brazier (Ph.D. (candidate), B.Sc. (Hons.) Applied Freshwater & Marine Biology, MIFM) is an environmental scientist specialising in freshwater and fisheries ecology. He studied Applied Freshwater & Marine Biology at Galway-Mayo IT and is currently completing a Ph.D. in fish ecology and genetics at University College Cork. He specialises in freshwater fisheries ecology, biology and water quality. He has considerable experience of over ten years in a wide range of ecological and environmental projects including EIAR, EcIA and AA/NIS reporting, as well as the areas of fisheries assessments, fish health screening, aquatic baselines, riparian habitat assessments, geographical information systems (GIS), habitat mapping, protected species surveys (e.g., otter, FWPM, white-clawed crayfish etc.), biodiversity enhancement, invasive species and fisheries management. Bill has extensive experience in identifying and assessing fish, macrophytes, aquatic bryophytes and macro-invertebrates from a variety of aquatic habitats. He routinely undertakes aquatic work for wind farm developments, flood relief schemes, road schemes, blueways/greenways and biodiversity projects

Avifauna surveys were undertaken by the Ecology Ireland field team listed below.
Aidan Duggan, Athena Michaelides, Austin Cooney, Dr. Allan Mee, Barry O'Mahony, Ciaran Cronin, Claire Deasy, Dr Daphne Roycroft, Eamonn Delaney, Éinne Ó Cathasaigh, Gerard McGrath, Dr Isobel Abbott, Dr Gavin Fennessy, Dr Katherine Kelleher, Mark Shorten, Michelle O'Neill, Paul Troake, Tony Nagle and Rory Dalton.

Aidan Duggan has 16 years of experience working as a self-employed field surveyor specialising in bird surveys. As part of this work, he has undertaken Vantage Point surveys, Hen Harrier surveys (nest monitoring and winter roost watches), Red Grouse surveys, Merlin Surveys, White tailed Eagle surveys, breeding and wintering wader and wildfowl surveys, common bird census, countryside bird surveys, intertidal bird surveys, as well as transects and hinterland surveys. He has considerable experience conducting bird surveys on wind farms and power grid routes. Aidan has a lifelong interest in Ornithology and was a voting member of the Irish Rare Bird Committee (IRBC) from 1999 to 2005.

Athena Michaelides (BSc Zoology & Animal Biology) has over five years of experience as a professional ecological consultant. She is a former secretary of the Irish Wildlife Trust with particular experience in field surveys and reporting as part of Ecological Impact Assessments. Athena formerly was employed by Ryan Hanley Consulting Engineers and now works as an independent ecologist.

Austin Cooney has over 40 years birdwatching experience in Ireland and abroad. He has over six years' experience as a self-employed sub-contractor to various Environmental and Ecology companies in Ireland where he has carried out VP Surveys, Breeding Surveys, Roost watches, Estuary Surveys, Red Grouse and Merlin Surveys and Hinterland Surveys.

Allan Mee has 35 years' experience as a professional ornithologist in Ireland, UK and US working on threatened bird populations and species reintroduction projects including California condor and White-tailed Eagle as project manager since 2007. Allan has been working as a self-employed ecological consultant over the last six years including organising a number of national surveys for National Parks & Wildlife Service (hen harrier, ring ouzel), EU LIFE Nature and EIP projects (RaptorLIFE, Duhallow EIP) as well as waterbird and raptor surveys in relation to road and wind farm projects. These included writing Appropriate Assessment and Natura Impact Statements.

Barry O'Mahony has a life-long interest in birds and birdwatching and is a licensed Bird Ringer. He is a graduate of UCC with a B.Sc. (General) in Zoology and has been a self-employed freelance bird surveyor since 2007.

He has worked as Research Assistant on studies of Hen Harrier, Dipper and a variety of seabirds involving wing-tagging, the attachment and retrieval of data loggers and radio tracking. His survey work has included shorebird distribution monitoring, IWeBS, VP watches at windfarm sites, harrier roost watches, hinterland surveys and Vantage Point selection and Assessment.

Ciaran Cronin has been an active naturalist and birdwatcher for over 30 years with a particular passion for birds. Working as a professional ornithologist and ecologist for over 20 years, he has a wide range of experience along with a postgraduate qualification in 'Ecological Assessment' from University College Cork (1st Class Honours). He is an expert in both bird and marine mammal identification, runs bird identification courses nationally for professional ecologists, is a trainer/assessor for the international ESAS seabird group, former member of the Irish Rare Birds Committee and international wildlife tour guide with National Geographic/Lindblad Expeditions. He is also a full member of the Chartered Institute of Ecologists and Environmental Managers (CIEEM). His highly expert level knowledge of bird identification, both by sight and sound, allows for maximum detection of bird species through all habitats, at all times of year and he combines this with many years of experience at implementing rigorous survey protocols, consistent with guidance and to the highest standards. Although he has particular expertise with birds of prey and seabirds, his ornithological skills extend at high level across the complete range of Irish bird species.

Claire Deasy has over 18 years of experience in ecological and environmental impact assessment including project management, surveying, data analysis and report writing in support of planning applications, EIAR's, Appropriate Assessments and planning compliance reporting. She is a self-employed ecological consultant trading as EcoSource Consulting. Claire has experience and training across a wide variety of field skills including; Avian Surveys, Botanical and habitat surveys, Habitat classification and GIS mapping, Invasive Species Surveys, Ecological Clerk of works supervision and Project Management. Claire has also contributed to the design and implementation of Habitat & Species Management Plans for EU protected species such as the Annex I Hen Harrier and Annex II Marsh Fritillary Butterfly.

Daphne Roycroft has over 10 years of experience in the field of Ecological Consultancy and holds a BSc and PhD in Ecology from the National University of Ireland, Cork. She is a self-employed Ecological consultant, trading as Croft Ecology. Daphne is experienced in the preparation of Ecological Impact Assessment Reports and Appropriate Assessment screening appraisals as well as Natura Impact Statements for a variety of projects including wind farms, solar farms, roads, pipelines, residential developments, ports and landfill sites. She has published research papers in several peer-reviewed scientific journals and has lectured on several degree and certificate courses in The National University of Ireland, Cork.

Eamonn Delaney holds a B.Sc. (Hons) in Science, and M.Sc. in Environmental Science. Eamonn has 14 years' experience in ecological consultancy. Eamonn is a full and Chartered Member of the Chartered Institute of Ecology and Environmental Management (CIEEM). Eamonn is a member of the Botanical Society of Britain and Ireland (BSBI) and regularly attends local and regional BSBI field meetings in addition to carrying out recording for the proposed BSBI 2020 Atlas, in north Co. Galway and south Co. Mayo. Eamonn has extensive experience in habitat, botanical, ornithological and mammal surveying, as an Ecological Clerk of Works, habitat management and site-specific mitigation.

Éinne Ó Cathasaigh recently completed a MSc in Marine Biology at University College Cork, and previously obtained a BA in Zoology from Trinity College Dublin. For his master's dissertation, "Keeping your Distance on Porpoise", Éinne studied data collected from the OBSERVE program, and used spatial distribution modelling to explore the spatial relationship between bottlenose dolphins and harbour porpoises. As an early career researcher, he worked at the Marine Institute as a bursar cataloguing the benthic invertebrate specimen library while carrying out a ten year report into benthic community health in Irish aquaculture farms. Éinne also gave tours at the Zoological Museum during his time at TCD.

Currently he is working as a freelance consultant ecologist and established Éinne Ó Cathasaigh Ecological Service in 2020. He primarily works with bats, monitoring their activity at wind farms and other construction redevelopment projects.

Gerard McGrath Graduated from UCC in 2012 with an honours degree in Zoology, and subsequently in 2013 with a Master's degree in Ecological Assessment. There under the tutelage of current UCC president John O' Halloran, he developed a keen interest in birds and bats. He worked full time as a freelance surveyor for a number of years before moving into education and undertaking a Master's in Education (Biology and Agricultural Science). He currently teaches in St. Augustine's College Dungarvan full time, but still returns to the field to carry out surveys in summertime.

Isobel Abbott is a freelance ecological consultant, specialising for over 10 years in bat surveys, monitoring and mitigation. She graduated first in class in 2007 with a BSc in Zoology, and in 2012 with a PhD in Ecology from University College Cork. She has published a number of scientific papers relating to bat ecology and conservation. Isobel has worked on a variety of projects including national bat surveys, wind farms, solar farms, road construction, bridge repairs, quarries, and residential and industrial developments. She has extensive experience of designing and conducting bat surveys, evaluating potential impacts, and designing appropriate mitigation for a range of bat species. Isobel has been granted >35 NPWS bat licenses associated with planning permission applications or research. She currently holds nationwide NPWS licenses to capture/handle bat species, and to disturb bat roosts for the purpose of impact assessment.

Dr Gavin Fennessy (BSc PhD MCIEEM) is the Director & Principal Ecologist of Ecology Ireland Wildlife Consultants, a consultant ecologist with over 20 years of experience in environmental consultancy. Dr Fennessy has contributed to and Project Managed numerous ecological impact assessment projects including EcIA, EIA, AA, SEA etc. Gavin is also an experienced Expert Witness having presented expert testimony at several An Bord Pleanála Oral Hearings. He is also an experienced lecturer and has regularly contributed to B.Sc. Env. Sc. courses at UCC. Dr Gavin Fennessy has led the ecological impact assessment and associated ecology team regarding terrestrial biodiversity at the proposed wind energy study area here from 2017-2021.

John Deasy (Avian Surveys, Habitat Surveys, Mammal Surveys, Bat Surveys, Marsh Fritillary Surveys)
John is an independent ecological consultant with experience across a range of ecological disciplines including botanical and habitat surveys, bird surveys, mammal surveys and protected invertebrate surveys. He has over 7 years of experience as a professional ecologist and has undertaken a range of botanical and habitat surveys including baseline surveys for renewable energy projects, shared-use greenways and domestic and commercial properties. These surveys have included non-native invasive species surveys, rare species surveys and evaluations of habitats listed on Annex I of the EU Habitats Directive. John holds a MSc. in Ecological Assessment and BSc. in Earth and Environmental Science from University College Cork and is a member of the Botanical Society of Britain and Ireland.

Katherine Kelleher is a graduate of University College Cork with a BSc in Zoology and PhD in Ecology, and established Kelleher Ecology Services in 2011. She has over 15 years of experience in ecological consultancy, acting as project manager on a range of ecological assessments & projects including solar/wind farm, road, gas pipeline, landfill, grid connection, industrial development, retail and housing. Katherine has significant experience of research, evaluative and analytical work in relation to planning applications, planning compliance, commitments, licensing, baseline assessments, scoping studies etc.

Mark Shorten has been birding since 1975 and has been involved in many conservation projects and surveys since then. He has contributed to the Winter Atlas, Breeding Atlas 1988-91 and 2007-11, Chough Survey 1993, Cork Seabird survey 1985, Cork Harbour Counts 1978-2005, country bird survey and Dragonfly Atlas. He was editor of the Cork Bird Report 1990-95 and Cork bird recorder 1990-2021.

He is joint author of the forth coming 'The Birds of County Cork'. He wrote the original proposal to create a Harpers Island bird reserve and is involved with its management. Since 2018 he has worked on the BRIDE Project as bird surveyor and scoring Results Based Payments. Since 2019 he has worked as a bird surveyor on windfarm projects in Kerry, Cork, Offaly, Laois and Carlow. He has a particular interest in bird sound recording and has developed an expertise in Nocmig and bird call identification. He has sound recorded over 130 species in Ireland.

Michelle O'Neill has over 10 years of experience working as an ecological consultant within the public and private sector on projects that include habitat and botanical surveys, breeding and winter bird surveys, mammal surveys, data analysis, assessment and report writing. To date, she has completed habitat and botanical surveys for a range of projects as part of National Surveys, Ecological Monitoring, Ecological Impacts Assessments (EcIA/EIAR) and Appropriate Assessment (AA/NIS). She has a particular interest in botany and habitats and has worked on an Irish semi-natural grassland survey (2009—2012) and a habitat mapping project for the provision of a Teagasc pilot methodology for farmland habitat assessment of a sustainability scheme.

Paul Troake is an experienced ornithologist with excellent fieldwork skills, stemming from a lifelong passion for birds and birding. His career path involved warden positions on several English nature reserves before moving to Ireland over 14 years ago, since when he has been undertaking birds survey work for Birdwatch Ireland, UCC and numerous environmental consultancies. Much of his recent work has focused on vantage point bird surveys for wind farm developments, and to a lesser extent other surveys such as breeding raptors, walkovers, transects and point counts, amounting to over 600 days in total on 40 sites across Ireland. Additional experience has been gained on offshore boat surveys in the Irish Sea following qualification in ESAS (European Seabirds at Sea) survey methodology. He has earned a reputation for reliability with observation and data handling skills.

Tony Nagle has a BSc in Environmental Management, an MSc in Ecological Assessment and is a member of the Chartered Institute of Ecology and Environmental Management. He has over 30 years of experience in bird surveying including birds of prey, waders, wildfowl and nocturnal species. He has participated in the Irish Wetland Bird Survey since it began in 1994 and the Countryside Bird Survey since 1999 and continues to be involved in both surveys. He was a regional organiser of the 2005, 2010 and 2015 National Hen Harrier Surveys and a co-author of each of the reports and he was a regional organiser and validator for the Bird Atlas (2013). He has been involved in numerous surveys for wind energy, road construction and pipe-laying projects.

Rory Dalton is an ecologist with eight years of experience with a BSc. Hons in Environmental Science from University College Cork. He worked for three years as an ecologist with a consultancy, and for the last five years he has been running his own company. While his expertise is aquatic ecology, he carries out general work in the areas of birds, mammals and habitats. The projects he is involved with range in size from small bridge surveys to the largest wind energy project in the country and the largest water quality project in Europe. He carries out work for a number of County Councils, State Bodies, Semi-State Bodies, Engineering Consultants, Ecology Consultants, Environmental Consultants and Laboratories.

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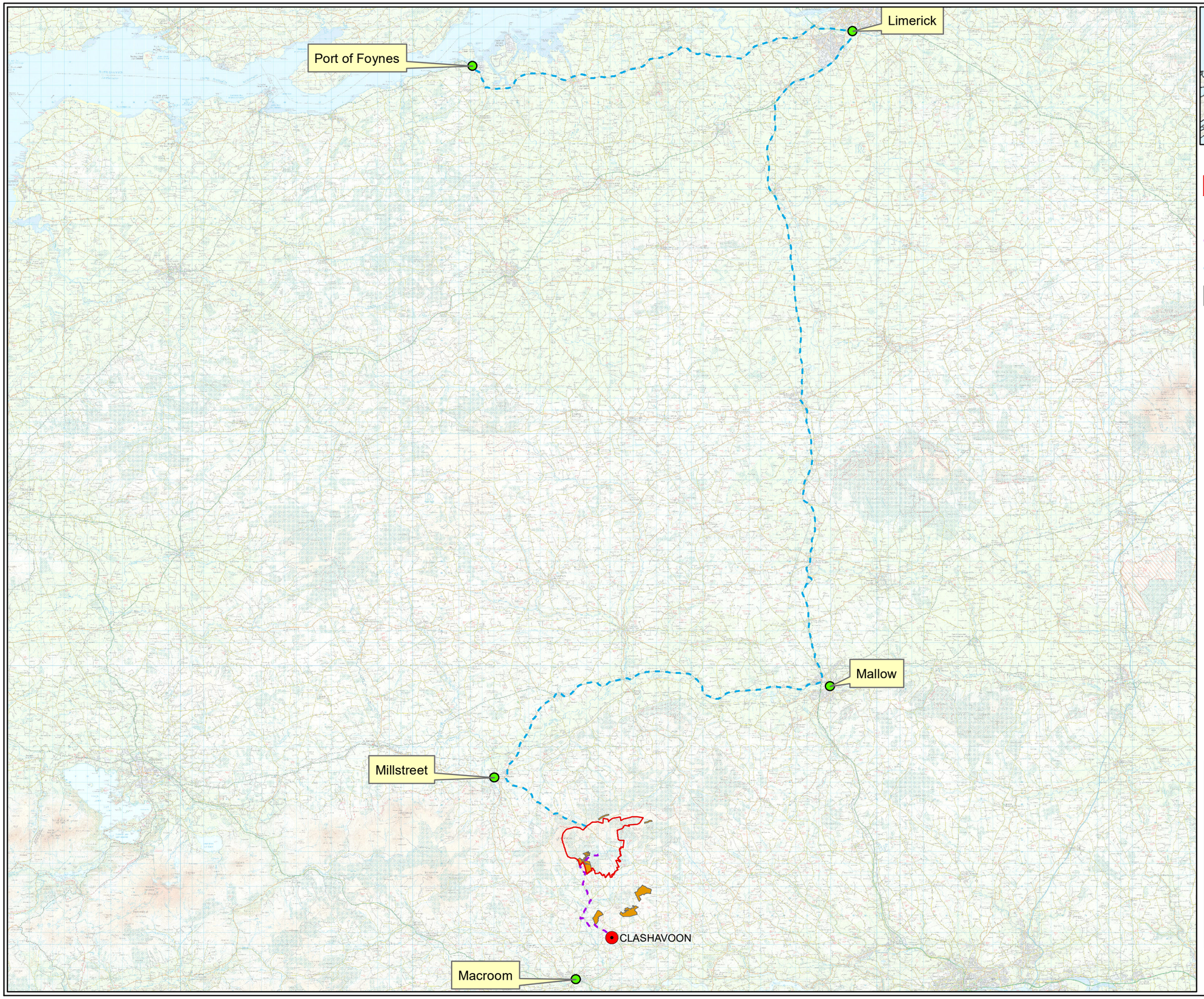

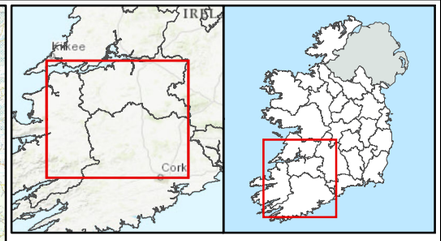

Legend

- Wind Farm Site
- Clashavoon Substation (110-220kV)
- Grid Connection
- Turbine Delivery Route
- BEMP Lands

N W E S

0 5 10 20 Kilometers

TITLE: Site Location			
PROJECT: Ballinagree Wind Farm			
FIGURE NO:	1.1		
CLIENT:	Coillte and Ørsted		
SCALE:	1:320000	**REVISION:**	0
DATE:	17/01/2022	**PAGE SIZE:**	A3

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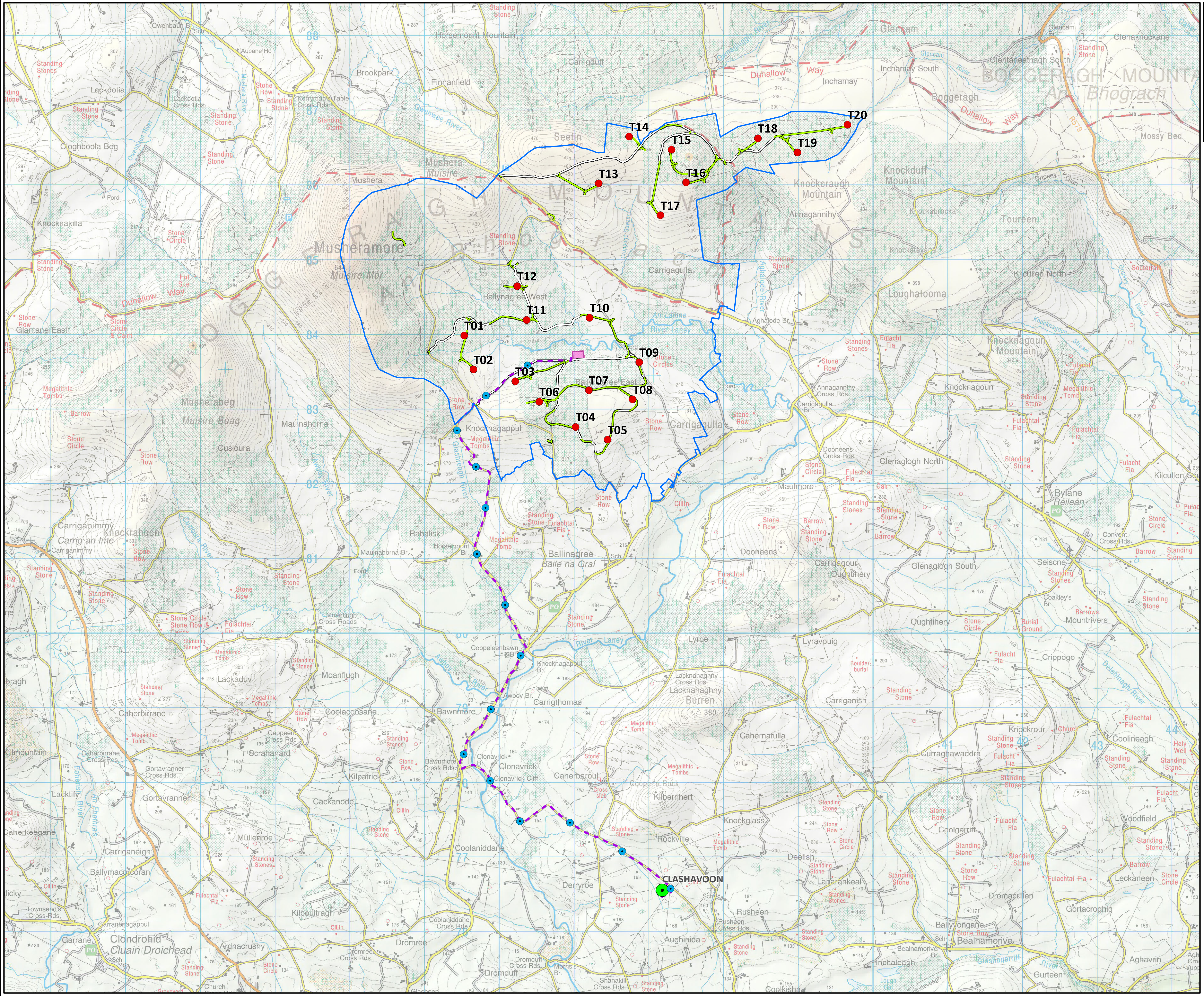

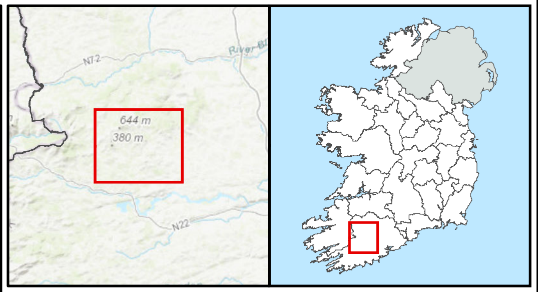

Legend

- Wind Farm Site
- Proposed Turbine Layout
- Joint Bays
- 220kV Substation
- Grid Connection
- Substation Compound

Access Tracks:

- Existing Track Upgrade
- New Access Track

TITLE:	Grid Connection		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	1.2		
CLIENT:	Coillte and Ørsted		
SCALE:	1:50000	**REVISION:**	0
DATE:	17/01/2022	**PAGE SIZE:**	A3

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0 0.5 1 2 Kilometers

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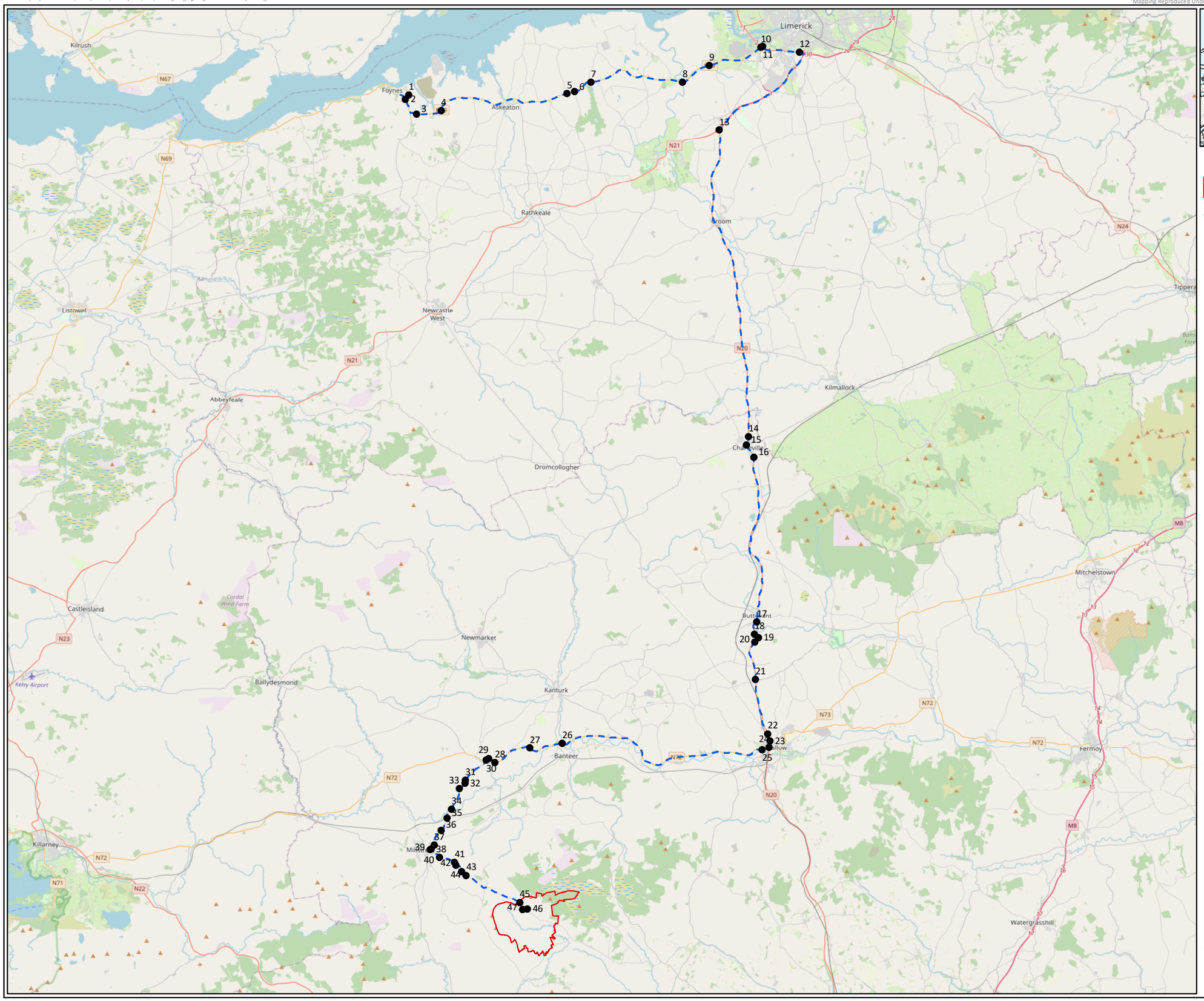

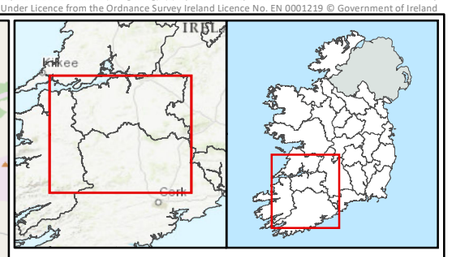

Legend

- Wind Farm Site
- Turbine Delivery Route
- TDR Nodes

N W E S

0 5 10 20 Kilometers

TITLE:	Turbine Delivery Route		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	1.3		
CLIENT:	Coillte and Ørsted		
SCALE:	1:300000	**REVISION:**	0
DATE:	24/01/2022	**PAGE SIZE:**	A3

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Coillte Wildlife Corridor

Coillte Wildlife Corridor

Coillte Wildlife Corridor

Kelliher's

Barrett's

Scannell's

Nunan's

Legend

- Wind Farm Site
- BEMP Lands

TITLE:	Biodiversity Enhancement and Management Plan (BEMP) Lands
PROJECT:	Ballinagree Wind Farm
FIGURE NO:	1.4
CLIENT:	Coillte and Ørsted
SCALE:	1:40000
REVISION:	0
DATE:	17/01/2022
PAGE SIZE:	A3

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1.2 Methodology

1.2.1 Guidance

The assessment was conducted in accordance with the following guidance:

- *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*, Office for Official Publications of the European Communities, Luxembourg (EC, 2002).
    - This document was updated by *Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. Commission Notice (2021) Brussels, 28.9.2021 C(2021) 6913 final;
- *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin (2009, updated 2010);
- *Managing Natura 2000 sites. The provisions of Article 6 of the Habitats Directive 92/43/EEC*. European Commission (2018). Brussels, 21.11.2018 C (2018) 7621 final;
- *Interpretation Manual of European Union Habitats*. Version EUR 28. European Commission 2013;
- OPR Practice Note PN01 *Appropriate Assessment Screening for Development Management,* Office of the Planning Regulator (March 2021).

1.2.2 Process

The process of determining the likelihood of significant effects from a proposed project on European sites is an iterative process centred around a Source-Pathway-Receptor assessment.

The assessment commences with a description of the project and the associated likely significant environmental effects. All elements of the project are presented including the project location and existing baseline environment. The type of impacts which are likely due to the project are identified having regard to the spatial and temporal scale of the project, resource requirements and likely emissions. The zone of influence (ZoI) of the project is therefore defined, and the potential source-pathway-receptor (S-P-R) connectivity to European Sites and their qualifying interests / special conservation interests are identified.

The potential for in-combination effects with other plans and projects is also assessed having regard to the identified impacts of the project.

The likelihood of significant effects on the European Sites within the ZoI is determined having regard to the sensitivity of the site to the impacts associated with the project on its own and in combination with other plans and projects. Having regard to the European Commission Communication on the Precautionary Principle (EC, 2000), where the likelihood of significant effects cannot be excluded on the basis of scientific evidence (e.g., through quantifiable cause and effect relationship), the precautionary principle is adopted and significant effects are assumed.

Where significant effects are determined to be likely, or where there is uncertainty regarding the likelihood of significant effects, the project will be required under law to be subjected to Appropriate Assessment.

Section 3 of this report presents an assessment of whether the proposed wind farm would be likely to have significant effects on European sites (either alone or in combination with other plans or projects). The Report has concluded potential for significant effects exists. As such, having regard to Article 177T(4) of the Planning and Development Act, 2000 (as amended) a Natura Impact Statement (NIS) has been prepared. The NIS is included in **Section 4** of this report.

The European Commission Notice C(2018) 7621: '*Managing Natura 2000 sites The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*' prescribes the content of the Appropriate Assessment and notes the following:

- it must be ensured that the Appropriate Assessment addresses all elements contributing to the site's integrity as specified in the site's conservation objectives and Standard Data Form, and is based on the best available scientific knowledge in the field;
- the information required should be up-to-date;
- The Appropriate Assessment should also include a comprehensive identification of all the potential effects of the plan or project likely to be significant on the site, taking into account cumulative and other effects likely to arise as a result of the combined action of the plan or project under assessment with other plans or projects.
- It should apply the best available techniques and methods to assess the extent of the effects of the plan or project on the integrity of the site(s).

The NIS as presented has been developed to address these requirements so as to present sufficient and up-to-date information to allow the Competent Authority to give full consideration of all elements contributing to the site integrity and allowing identification of potential impacts, mitigation measures and residual impacts.

1.2.3 Information Consulted in the Preparation of this Report

A desk study was carried out to collate available information on the proposed project's natural environment. This comprised a review of the following publications, data and datasets:

- Draft Cork County Development Plan 2022-2028
- Cork County Development Plan 2014
- Cork County Council Planning Enquiry System
- Draft Limerick County Development Plan 2022-2028
- Limerick County Development Plan 2010-2016 (as extended)
- Limerick County Council Planning Enquiry System
- Draft Kerry County Development Plan 2022-2028
- Kerry County Development Plan 2015-2021
- Kerry County Council Planning Enquiry System
- Blarney Macroom Municipal District Local Area Plan (2017)
- An Bord Pleanála Planning https://www.pleanala.ie/en-ie/home/
- Forestry applications forestry-maps.apps.rhos.agriculture.gov.ie/

- Environmental Protection Agency (EPA) (on-line map-viewer) http://watermaps.wfdireland.ie/HydroTool/Authentication/Login.aspx?ReturnUrl=%2fHydroTool%2fDefault.aspx
- EPA Geotool https://gis.epa.ie/EPAMaps/AAGeoTool
- Department of Housing, Planning, and Local Government – online land use mapping www.myplan.ie/en/index.html;
- Department of Housing, Planning, and Local Government- EIA Portal https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal
- Environmental Protection Agency (EPA) – Water Quality www.epa.ie, http://gis.epa.ie/Envision;
- Geological Survey of Ireland – Geology, soils and Hydrogeology www.gsi.ie;
- Water Framework Directive website – www.catchments.ie;
- National Parks and Wildlife Service – online European site network information, including site conservation objectives www.npws.ie;
- National Parks and Wildlife Service – Information on the status of EU protected habitats in Ireland (Article 17 and Article 12 Reports)
- Bat conservation Ireland (BCI) - https://www.batconservationireland.org/
- National Biodiversity Data Centre – www.biodiversityireland.ie;
- Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie; and
- Inland Fisheries Ireland - https://www.fisheriesireland.ie/.

2. DESCRIPTION OF THE PROJECT

2.1 Existing Environment

2.1.1 Project Location

The proposed Site is located in County Cork, approximately 35km northwest of Cork City, approximately 8km south east of Millstreet and approximately 10km north of Macroom.

The site is located in a rural area. Settlement in the area is made up of one-off rural housing and farmyards generally located along the road network of the area (Linear settlement pattern). The nearest settlement is the village of Ballinagree which is located approximately 1.5km to the south of the wind farm site.

2.1.1.1 Hydrology

The Site is located within two hydrometric areas (catchment) of the Irish River Network System. These are Lee, Cork Harbour and Youghal Bay (ID 19) and Blackwater (Munster) (ID 18). Which are further defined as three sub-catchments by the WFD. These sub-catchments are:

- Sullane_SC_020 (19_7)
- Blackwater (Munster)_SC_050 (18_4)
- Blackwater (Munster)_SC_070 (18_7).

The wind farm site is situated within eight sub-basins as shown on Figure 2-1. These waterbodies are known as:

- Awboy_010 – IE_SW_19A030200
- Laney_030 – IE_SW_19L010400
- Laney_020 – IE_SW_19L010200
- Owenbaun (Rathcool)_010 – IE_SW_18O050500
- Laney_010 – IE_SW_19L010100
- Rathcool_010 – IE_SW_18R010400
- Nad_010 – IE_SW_18N010400
- Glen (Banteer)_010 – IE_SW_18G040600

There are no construction activities and surface runoff from the wind farm site in the Awboy_010 and Owenbaun (Rathcool)_010 sub-basins.

Turbines T1, T2, T3, T6, T7, T8, T9, T10, T11, T12, T13, T16 and T17 are within Laney_010 sub-basin.
Turbines T4 and T5 are within Laney_020.
Turbines T14, T15 and T18 are within Nad_010.
Turbine T19 and T20 are within Glen (Banteer)_010 sub-basin.

The main hydrology features within the wind farm site are the Laney River and Nadanuller Beg Stream as shown in Figure 2.2.

All surface runoff within the Laney_010 sub-basin drains to the River Laney or its tributaries. The River Laney runs in northwest-southeast direction. The River Laney joins the River Sullane near Ford's Mill, Macroom to the south of the Site.

The northern eastern part of the wind farm site drains ultimately into the Nadanuller Beg Stream which flows into the Blackwater River (Cork/Waterford) SAC approximately 3.6km northeast of the Site.

The surface runoff from turbine T19 and T20 will drain into the Glen (Banteer) Stream which flows into the Blackwater River (Cork/Waterford) SAC approximately 4.7km northeast of the wind farm site.

The grid connection between the proposed on-site substation and existing substation at Clashavoon is within four waterbodies (river sub-basins) catchments as defined by the WFD. These are:

- Laney_010_IE_SW_19L010100,
- Laney_030_IE_SW_19L010400,
- Awboy_010_SW_19A030200,
- Laney_040_SW_19L010500

All the waterbodies are part of the Sullane_SC_020 (19_7) sub-catchment.

The Biodiversity Enhancement and Management Plan Lands (BEMP) comprises of seven lands located within three sub-catchments: Blackwater (Munster)_SC_070, Sullane_SC_020 and Lee (Cork)_SC_040. The lands include three wildlife corridors that will be created and maintained on Coillte lands and four private landholdings.

The uppermost reaches of the Nadanuller Beg River and the Horsemount Mountain Stream are located along the northern boundary of the c.10ha wildlife corridor to the north of the proposed wind farm.

The upper reaches of the Glen River are located approximately 330m north-west of the c.6.6ha wildlife corridor to the north-east of the proposed wind farm.

There are no watercourses located in the vicinity of the c.0.1ha wildlife corridor located to the west of Kelleher's lands, with the nearest watercourse (Maulnahorna Stream) located c. 0.5km south according to EPA mapping. The northern part of the Anthony Kellar's lands drain into the West Ballynagree and Knocknagappul Stream which are tributaries of the Laney River. The southern lands drain towards the Carrighthomas and Maulnahorna Stream which ultimately join the Laney River south of the lands. Noel Nuna's lands are located approximately 3.3km south of the Kellar's Land. These lands drain towards the Clonavrick, Caherbaroul and Coolaniddane Stream which ultimately join the Laney River as well.

James Scannell and Joseph Barrett's land are located within Lee (Cork)_SC_040 sub-catchment. Scannell's lands ultimately drains into the Glashagarriff River, and its tributaries Carriganish Stream and an Unnamed Stream. Barrett's lands are located approximately 460m northeast of Scannell's lands. The main hydrological features are the Oughitehery Stream and an Unnamed Stream which join the Delehinagh River east of the lands.

2.1.1.2 Groundwater Vulnerability

The Groundwater Vulnerability within the proposed Ballinagree Wind Farm site boundary is classified by the GSI as ranging from 'High' to 'Extreme' with areas of exposed bedrock (X – Rock Near Surface) also present within the proposed development site.

The majority of the proposed wind farm site and the proposed grid connection of the Ballinagree Wind Farm is located within the Ballinhassig West Groundwater Body (GWB). The north-eastern extremity of the proposed wind farm lies within the Glenville GWB. The BEMP Lands are located within the Ballinhassig West GWB and Ballinhassig East GWB.

The GSI states that diffuse recharge for Ballinhassig West GWB will occur via rainfall percolating through the subsoil or areas of outcropping rock. The generally 'Low' permeability of the aquifer and the sloping topography in the north of the Ballinhassig West GWB indicate that a high proportion of recharge to the aquifer will discharge rapidly to surface water features. Groundwater flows within the GWB are relatively short from 30-300 m, with groundwater discharging to springs, or to the streams that traverse the aquifer.

The GSI states that diffuse recharge for Ballinhassig West GWB will occur via rainfall percolating through the subsoil or areas of outcropping rock. The generally 'moderate' permeability subsoils will not restrict percolation of recharge. However, due to the generally low permeability of the aquifers within the Ballinhassig East GWB, and the high slopes, a high proportion of the recharge will discharge rapidly to surface watercourses via the upper layers of the aquifer, effectively reducing further the available groundwater resource in the aquifer. The main discharges are to the gaining rivers and streams crossing the sandstones, mudstones, shales and impure limestone rock units and to generally small springs and seeps. Groundwater will also discharge at the coast. Localised seepages may develop on the cliff faces. Cross-flow may occur from the aquifers in this GWB to the adjacent karstic GWBs.'

The main recharge mechanism for the Glanville GWB is via diffuse recharge from rainwater percolating through the subsoils. According the GSI, groundwater within this GWB is generally unconfined with local groundwater flow towards the rivers and streams, and flow paths will not usually exceed a few hundred metres in length.

The main recharge mechanism for the Ballinhassig East GWB is via

2.1.1.3 Habitats

Wind farm site

The dominant habitats present within the proposed development works footprint are largely modified habitats; mature, semi-mature and young 1st and 2nd rotation commercial conifer plantation (WD4), improved agricultural grassland (GA1), semi-natural to semi-improved wet grassland (GS4) and buildings and artificial surfaces (BL3) including forestry tracks and local roads. Refer to Appendix 1 for the habitat map of the Site.

Complex open upland habitats present within the study site boundary are influenced by historic and current land-management activities which have altered habitat structure/function and species composition to varying degrees. For example, large areas of significantly disturbed/degraded rank Purple Moor-grass *Molinia caerulea* dominated wet heath (HH3) are present to the north and south of the study site. Similarly, altered peatland habitats: historic cut-over bog (PB4) and wet heath (HH3) and cutover bog (PB4) mosaic are also found to the north and south of the study area.

Other habitats present include eroding upland streams (FW1), dry-humid and acid grassland (GS3), poor fen and flush (PF2), stone walls and other stonework (BL1), conifer woodland (WD3), broadleaved woodland (WD1), Semi-natural woodland (WN), scrub (WS1), cut over bog (PB4), spoil and bareground (ED2) and spoil and bareground/recolonising bareground (ED2/ED3) mosaic. One small area of intact upland blanket bog (PB2) (Annex 7030), which is of international importance is present to the far north of the study site.

Two habitats listed on Annex I of the EU Habitats Directive: northern Atlantic wet heaths with *Erica tetralix* (4010) and European dry heath (4030) are present within the study area boundary. Both habitats occur together as a complex upland mosaic along the western boundary of the study site and areas of northern Atlantic wet heaths with *Erica tetralix* (4010) are found within upland habitat to the north and south of the study site and in a low-lying area of farmland towards the centre/east of the study site. One eroding upland stream (FW1) present within the study area supports water crowfoot vegetation, which may correspond to the Annex I habitat; Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260).

Grid Connection

There are no Annex I habitat present within the grid connection works footprint. The dominant habitat is buildings and artificial surfaces BL3 (i.e., tarmacked roads) with typical grassy roadside verges. The GCR will start from the proposed substation location, within conifer plantation WD4 traveling westerly along the forestry access track (Gravel Surface: buildings and artificial surfaces BL3), initially through conifer plantation WD4 and then along the track through adjacent wet heath HH3 (Annex 4010) and wet heath (HH3/4010) and historic cutover bog PB4 up until it meets the public road. The grid will follow the public road south from here (comprised of buildings and artificial surfaces BL3). The typical roadside verges are grassy (wet grassland GS4 and/or dry humid acid grassland GS3) with occasional scrubby areas and Sitka spruce treelines WL2 or scrub WS1. The dominant adjacent habitats are initially upland heathland before being replaced by improved grassland GA1 and occasional conifer plantation WD4 habitat, with occasional residential dwellings (e.g., buildings and artificial surfaces BL3, amenity grassland GA2 and non-native/ornamental shrubberies WS3).

TDR

The TDR shall be confined to the public road corridor associated with the above roads with the exception of locations where temporary accommodation works will be required to facilitate the delivery of oversized loads. The habitats along the TDR (adjacent to the public road corridor) mainly comprise buildings and artificial surfaces (roads and walls), improved agricultural grassland, ornamental/non-native shrub, hedgerows, woodlands, dry meadows and grassy verges and amenity grassland.

BEMP

Kelleher's lands

The farm contains extensive areas of Annex I habitat, predominantly Wet Heath (HH3), particularly in the north, with degraded Wet Heath and areas of dry-humid Acid Grassland (GS3). The northern part of the land holding has a range of habitats including an area of Semi-Natural Woodland/Poor Fen & Flush (WN/PF2). The southern part of the farm is dominated by Improved Agricultural Grassland (GA1). The Knocknagappul Stream runs through the northern section of the land holding. The West Ballinagree Stream joins the Knocknagappul and in turn enters the River Laney within the northeast corner of the farm.

Nunan's lands
It is dominated by improved and semi-improved grassland currently grazed by dry cattle stock. There is an area of forestry at the north of the land parcel. There is no significant watercourse within this land holding.

Scannell's lands
It is dominated by improved cattle-grazed agricultural grassland with relatively large fields and low-quality hedgerows. There is an area of forestry at the southwest of the land parcel. The land is fairly intensively managed at present and there are a series of internal farm tracks throughout the land holding. There are a number of watercourses within and directly adjacent to the land, including the Glashagarriff River and a number of minor tributaries.

Barrett's lands
It is dominated by improved agricultural grassland with a fairly extensive existing hedgerow network of variable quality. The land is fairly intensively managed and the field size is relatively large. A small watercourse flows along the northern boundary of the land holding.

Coillte Wildlife Corridors
Plantation woodland (WD4) at each of the locations.
A watercourse flows along the northern boundary of the c.10ha wildlife corridor to the northwest. There are no watercourses located within or on the boundary of the c.6.6ha wildlife corridor to the northeast or the c.0.1ha wildlife corridor located to the west of Kelleher's lands.

Invasive Non-native Flora Species

High impact invasive plant species, Japanese knotweed *Fallopia japonica* was recorded within a farmland holding towards the centre/east of the study area and off-site to the south of the study area. Japanese knotweed is also present in the wider environment and is present along roadsides in the wider area although it was not recorded along the grid connection or at POIs along the TDR. Rhododendron *Rhododendron ponticum* is occasionally present within conifer plantation towards the centre of the study area and to the south. No Third Schedule Invasive Species were recorded within the proposed BEMP lands.

*2.1.1.4 **Existing Soils and Geology***

The subsoils present within the wind farm site and wider study area comprise:

- Till derived from Devonian sandstones (TDSs);
- Bedrock outcrop or sub-crop (Rck);
- Blanket peat (BktPt);
- Alluvium (A).

The majority of turbine locations and associated infrastructure in the southern portion of the wind farm site are located within areas classified as Till derived from Devonian Sandstones and areas of bedrock outcrop or subcrop. Areas of blanket peat are concentrated in the northern part of the wind farm site. Peat deposits range from 0.2 to 3m across the site but predominantly in the northern part of the site. There are areas of peaty topsoil in the southern area that reach maximum depths of 0.3m. Refer to Appendix 6: Geotechnical and Peat Stability Assessment Report.

The majority of the proposed grid connection route is underlain by Till derived from Devonian Sandstones with limited areas of bedrock sub-crop or outcrop and alluvium indicated along the proposed route.

The BEMP Lands are underlain by Till derived from Devonian Sandstones with limited areas of bedrock sub-crop or outcrop.

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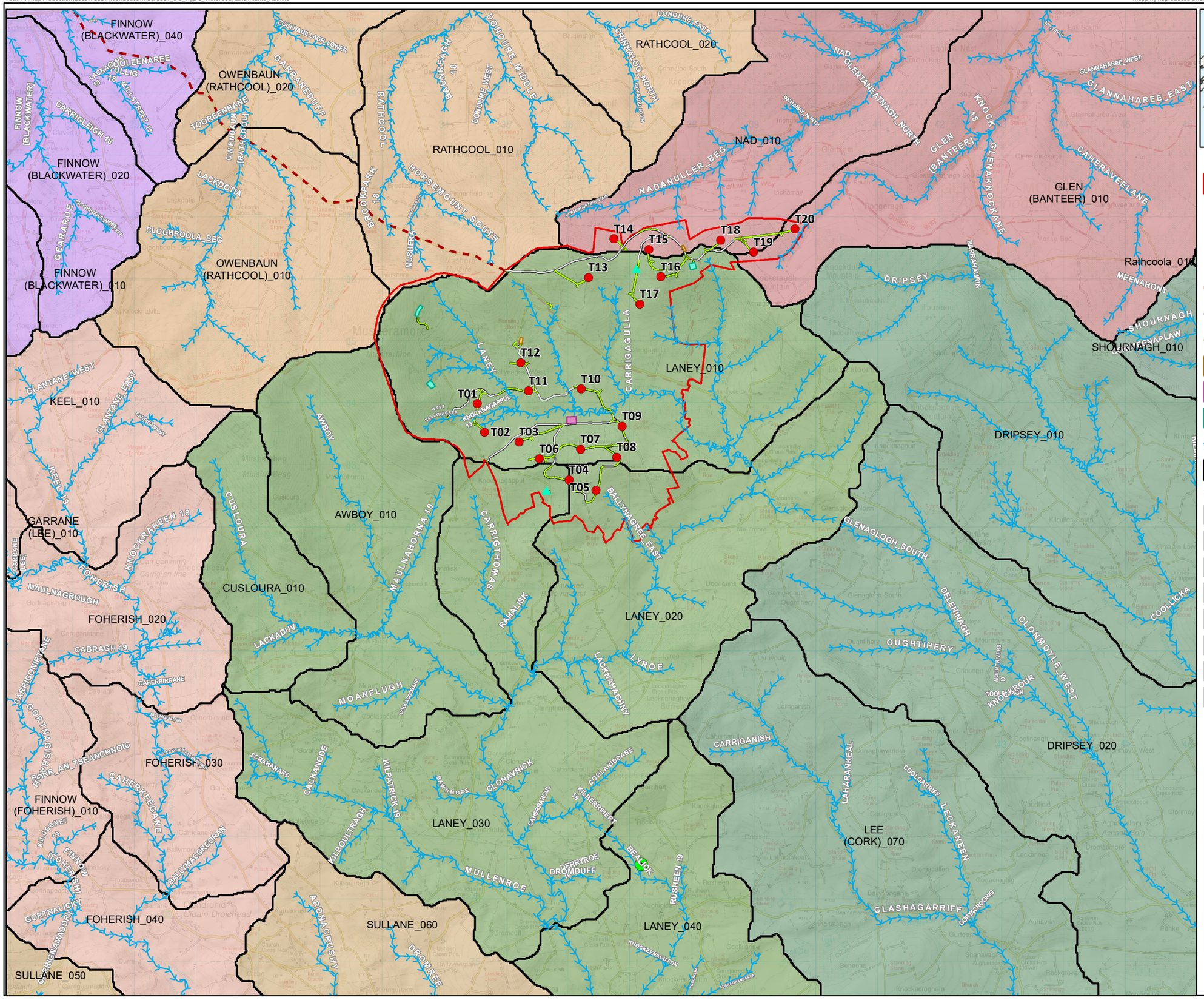

TITLE:	Waterbody Catchments
PROJECT:	Ballinagree Wind Farm
FIGURE NO:	2.1
CLIENT:	Coillte and Ørsted
SCALE: 1:60000	**REVISION:** 0
DATE: 17/01/2022	**PAGE SIZE:** A3

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2.2 Wind Farm Site Project Description

The development description as per the statutory newspaper notice and the application form for which consent from An Bórd Pleanála (ABP) is being sought is as follows:

- Construction of 20 no. wind turbines with a blade tip height range of between 179m and 185m, a hub height range of between 102.5 and 110.5m and a rotor diameter range of between 149m and 155m;
- Construction of turbine foundations and crane pad hardstanding areas including associated drainage infrastructure;
- Construction of new permanent site tracks and associated drainage infrastructure;
- Upgrading of existing tracks and associated drainage infrastructure;
- Upgrade of 2 no. existing forestry and agricultural access junctions for construction and operational access from 1) the Local Roads L2750-0/L1123-62 in the townlands of Finnanfield and Ballynagree East and 2) from the Local Road L7461-0 in the townland of Ballynagree West, Co. Cork;
- Upgrade of 2no. existing forestry access junctions for temporary construction access from the Local Road L7461-17 in the townland of Knocknagappul, Co. Cork;
- Use of 1 no. existing forestry and agricultural access junction for operational access only from the Local Road L-7461-44 in the townland of Knocknagappul, Co. Cork;
- Installation of new permanent watercourse and drain crossings and the reuse and upgrade of existing internal watercourse and drain crossings to include 1) the replacement of an existing stone bridge structure with a new clear span concrete bridge structure along the Local Road L-7461-0 in the townland of Ballynagree West and 2) a new clear span concrete bridge structure along a proposed new track in the townland of Carrigagulla, Co. Cork;
- 3 no. on site borrow pits and associated ancillary drainage within the townlands of Carrigagulla and Knocknagappul, Co. Cork;
- 2 no. temporary construction site compounds and associated ancillary infrastructure including parking within the townlands of Ballynagree West and Carrigagulla, Co. Cork;
- Use of proposed wind farm access tracks and existing forestry and agricultural tracks as permanent recreational amenity trails for community use including the installation of associated signage and information boards and; the partial reinstatement and re-purposing of the proposed temporary construction compound as a permanent trail head car park and picnic area including associated landscaping within the townland of Ballynagree West;
- Construction of 1 no. permanent on-site 110kV electrical substation including control buildings, electrical plant and equipment, welfare facilities, carparking, water and wastewater holding tanks, security fencing, lightening protection and telecommunications masts, security cameras, external lighting and, all associated infrastructure within the townland of Ballynagree East, Co. Cork;
- Installation of medium voltage underground electrical and communication cabling connecting the wind turbines to the proposed on-site substation and associated ancillary works;

- Installation of permanent high voltage 110kV underground electrical and communication cabling between the proposed on-site substation within the townland of Ballynagree East to the boundary of the existing Clashavoon substation within the townland of Aughinida, Co. Cork. The cabling will be laid primarily within the public road in the townlands of Knocknagappul, Ballynagree East, Ballynagree West, Bawnmore, Clonavrick, Derryroe, Rahalisk, Kilberrihert, Caherbaroul and Aughinida, Co. Cork. Associated works including the installation of 15 no. pre-cast joint bays and communication chambers; and horizontal directional drilling under 4 no. watercourse crossings in the townlands of 1) Knocknagappul, 2) Knocknagappul and Rahalisk, 3) Rahalisk and Bawnmore and 4) Bawnmore and Clonavrick;
- Tree felling to accommodate the construction and operation of the proposed development;
- Erection of 2no. meteorological masts with a height of 100m above existing ground levels for the measuring of metrological conditions within the townlands of Ballynagree East and Carrigagulla, Co. Cork. A lightning rod will extend above the masts by 4 meters;
- Temporary accommodation works at 6 no. locations adjacent to the public roads to facilitate delivery of turbine components to site within the townlands of Dromagh, Dromskehy, Liscahane, Tullig, Drominahilla, Finnanfield and Ballynagree East, Co. Cork. These works will primarily relate to trimming of trees and hedgerows, temporary lowering of boundary walls, temporary removal of boundary walls, temporary ground reprofiling and installation of temporary stone hard standing;
- Installation of a temporary off-site staging area for turbine components within the curtilage of Drishane Castle which is a Recorded Protected Structure (00319) and National Monument (296), within the townland of Drishane More. The works will include removal of a masonry wall and installation of temporary stone hard standing area and associated access track and entrances to and from the public road R583;
- All related site works and ancillary development including landscaping and drainage;
- A 35 year operational life from the date of commissioning of the entire wind farm is being sought.

Additional Project Elements Assessed

In addition to the above infrastructure for which consent from An Bórd Pleanála (ABP) is being sought, the following elements have also been fully assessed; Biodiversity Enhancement of lands shown in Figure 1-4 and described in Appendix 7 and; Turbine Delivery nodes described in Section 2.2.3.

2.2.1 Turbine Description

Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics with only minor cosmetic differences differentiating one from another.

The wind turbines that will be installed on site will be conventional three-blade horizontal axis turbines, that will be designed to ensure the rotors of all turbines rotate in the same direction at all times.

The rotor blades are bolted to the central hub, which is connected to a generator located in the nacelle. The nacelle holds the following turbine components:

- Generator
- Electrical components
- Control unit

A glass fibre reinforced polyester hood covers the nacelle. Earthing and isolation protect all components from lightning strikes.

The plans and particulars submitted with this application for consent are precise and provide specific dimensions for the turbine structures which incorporates a small range in dimensions. The turbine specifications are a hub height range of between 102.5 and 110.5m and a rotor diameter range of between 149m and 155m with a tip height of between 180m and 185m. The assessment has fully considered all combinations within this range in turbine specifications and the ultimate final turbine selection will fall within the parameters of this range.

The exact make and model of the turbine will be dictated by a competitive tender process, but it will not exceed the maximum or minimum size envelope set out above.

2.2.1.1 Turbine Blades

The blades of a modern turbine are made up of glass fibre reinforced polyester. They turn at between 5 and 15 revolutions per minute depending on wind speed and make of turbine. A turbine begins generating electricity at a wind speed of 3 to 4m/s depending on turbine type, with rated power generation at wind speeds of approximately 12 to 14m/s.

The turbines usually shut down at wind speeds greater than 25m/s, although some machines are designed to operate at up to 30m/s. The yaw mechanism turns the nacelle and blades into and out of the wind. A wind vane on the nacelle controls the yaw mechanism. Blades are pitched to match the wind conditions.

2.2.1.2 Turbine Tower and Foundation

The tower of the turbine is a conical steel tube, with multiple painted finish. It is generally delivered to site in four or five sections. The first section is bolted to the steel base, which is cast into the concrete foundation.

The upper sections of the tower are bolted to the lower ones in sequence. The base of the tower is approximately 5m in diameter, tapering to approximately 3m, where it is attached to the nacelle. The first floor of the tower is approximately 2-3m above ground level it is accessed by a galvanised steel staircase and a steel hatch door which will be kept locked except during maintenance.

The turbine will be anchored to the reinforced concrete foundation. Following detailed site investigations, it has been determined that the wind turbine foundations at Ballinagree will be standard shallow reinforced concrete foundations. For this project the turbine foundations will be circular in shape and will be 25m in diameter and 4m in depth.

2.2.1.3 Turbine Transformer

The turbine will have a transformer located within the tower. The turbine will generate electricity at approximately 660 volts, depending on the machine chosen. The turbine transformer will step up the voltage to 33kV to reduce the electrical loss on the cabling connector circuits that connect to the on-site substation.

2.2.1.4 Turbine Colour

The turbines have a multiple painted coating to protect against corrosion. They are coloured off-white or light grey to blend into the sky background.

2.2.1.5 Turbine Erection

Once the turbine components arrive on site they will be placed on the hardstand and lay down areas prior to assembly. The towers will be delivered in sections and each blade will be delivered in a separate delivery. Once there is a suitable weather window the turbine will be assembled.

It is anticipated that each turbine will take approximately 3 to 4 days to erect (depending on the weather), requiring two cranes. Finally, the turbines will be commissioned and tested.

It is expected that the entire construction phase, including civil, electrical and grid works, and turbine assembly will take between approximately 18-24 months.

2.2.1.6 Wind Farm Site Access

Ballinagree Wind Farm will involve the use of 5 no. existing forestry and agricultural field entrances as access points with the public road. The locations of these access points are shown on Figure 2.4.

The access points are numbered 1-5 and are described below in terms of their location and proposed use for the project. Wind turbine component deliveries will make use of Access Points 1 and 2 only. Access to the proposed main temporary construction compound will be via Access Point 1. This will also act as the main access to the recreational amenity trail head during the operational phase.

The access points have been selected with consideration for safety of public road users and construction staff and to ensure they can be constructed to comply with the requirements of both Cork County Council and TII design requirements for direct accesses. Each of the access points are described in detail below.

Access Point 1: This is the main site entrance for the southern part of the site and will also act as the main site entrance for the overall wind farm. An existing Coillte forestry access will be upgraded to facilitate the delivery of turbine components. All turbine components accessing the southern part of the site will use this entrance for the installation of turbines T1 to T13. This access point will also be used for all construction and operation vehicles and will be used by both HGV's and LGV's. This access point will also act as the main entrance to the recreational amenity trail head at the location of the southern temporary compound during the operational phase of the project. This access is already regularly used by HGV's associated with agricultural and forestry activities and will continue to be used during the construction and operation phases of the project.

Access Point 2: This is the main site entrance for the northern part of the site. An existing agricultural and forestry access will be upgraded to facilitate the delivery of turbine components. All turbine components accessing the northern part of the site will use this entrance for the installation of turbines T14 to T20. This access point will be used for construction and operation by both HGV's and LGV's. This access is already regularly used by HGV's associated with agricultural and forestry activities and will continue to be used for these activities during the construction and operation phases of the proposed project. This access has also been used in the past to facilitate the construction of the existing Boggeragh Wind Farm.

Access Point 3: This is an existing agricultural and forestry access which provides access to the southern part of the site. This access point will be used for operational access by LGV's only. This access is already regularly used by HGV's associated with agricultural activities.

Access Point 4: This is an existing Coillte forestry access which will be used during the construction phase by all LGV's and HGV's. This access point will form part of a public road crossing point with Access Point 5 for construction traffic travelling to and from the proposed borrow pits in the west of the site. This access is already regularly used by HGV's associated with agricultural and forestry activities.

Access Point 5: This is an existing Coillte forestry access which will be used during the construction phase by both LGV's and HGV's. This access point will form part of a public road crossing point with Access Point 4 for construction traffic travelling to and from the proposed borrow pits in the west of the site. This access is already regularly used by HGV's associated with agricultural and forestry activities.

2.2.1.7 Wind Farm Internal Access Tracks

11.1 km of internal access tracks will be required to be upgraded as part of the project and 14.4 km of new internal access tracks will be required. The proposed internal site track layout will permit access for vehicles during the construction phase, for maintenance during the operational phase and for vehicles to decommission the turbines at the end of the life of the project.

An extensive network of agricultural and forestry access tracks exists within the site. These existing access tracks have been utilised wherever possible for the proposed project.

All access tracks will be 5m wide along straight sections and wider at bends as required in accordance with wind turbine manufacturer requirements for the wind turbines of this size as shown on planning application drawings. The tracks will be finished with a well graded aggregate. The drainage system will be installed adjacent to the internal access tracks. Existing drainage infrastructure will be maintained and upgraded to the same standard as the proposed drainage infrastructure.

The stone required for the construction of the internal access roads will be sourced from licenced quarries in the vicinity of the project and the on-site borrow pits shown in Figure 2.4.

Existing forest track drainage is extensive throughout the wind farm site and shall be maintained wherever possible and upgraded as required to meet the requirements of the proposed wind farm drainage design. SuDS design approach shall ensure that existing drainage patterns shall be maintained throughout the wind farm site.

The drainage system for the existing tracks and roads will largely be retained. It is proposed to upgrade 11.8km of existing forestry and agricultural tracks which will involve widening by approximately 1m, with some additional widening at bends as required in accordance with wind turbine manufacturer requirements for the wind turbines of this size as shown on planning application drawings in accordance with wind turbine manufacturer requirements for turbines of this size. All track widening will be undertaken using clean uncrushable stone with a minimum of fines. This will involve slight relocation of existing roadside ditches to allow widening.

The majority of the proposed new internal access tracks will be founded on suitable substrate however it has been identified following site investigations that roads between T18 and T20 will be of floating road construction.

New floating roads within the site will be floated on both mineral soils and on peat soils. Floating roads are constructed without excavating the existing ground. They will consist of a layer of combined geotextile and geogrid laid directly on the existing surface. Layers of stone will then be placed on top with additional geogrid reinforcement as required. A layer of compacted Cl 804 material will be placed on top to provide a suitable running surface.

2.2.1.8 Wind Farm Internal Access Track Watercourse Crossings

The proposed wind farm internal access tracks will cross 13 no. watercourses in total.

Of the 13 no. watercourse crossings identified, 8 no. are existing pipe culverts which shall be either upgraded or replaced or left in-situ. 1no. existing stone bridge shall be replaced with a new clear span concrete bridge. The remaining crossings are proposed new structures in the form of 1no. clear span bridge and 3no. pre-cast box culverts. The proposed crossing designs have been developed in consultation with Inland Fisheries Ireland (IFI).

Minor watercourse and drain crossings within the site will be crossed using piped culverts. Piped culverts will only be used over very short stretches i.e., at track crossings. Pipe culverts will be sized to take the 1 in 100-year flood flow with a 20% allowance for Climate Change. Concrete or HDPE (high-density polyethylene) pipes will be used depending on the size of the watercourse to be crossed. Water being conveyed underneath wind farm access tracks from drains or minor watercourses will be done using 225mm and 450mm diameter pipes.

No works are proposed to existing watercourse crossings with the exception of WF-HF8. It is proposed to replace 1no. existing bridge structure identified as watercourse crossing no. WF-HF8 with a new concrete clear span bridge. The location of this crossing is shown in Figure 2.2. This feature, while located on the public road (as part of the TDR) is also located within the proposed wind farm planning boundary and therefore listed as an internal crossing. The replacement and design of this structure has been agreed with Inland Fisheries Ireland. This work will be the subject of a Section 50 consent from the OPW. Cable ducts associated with the wind farm internal collector circuit will be built into the bridge deck, which will be pre-fabricated off site.

Watercourses crossed by internal wind farm access tracks are described in Table 2.1 and shown in Figure 2-2.

Table 2-1: Internal Access Track Watercourse Crossings

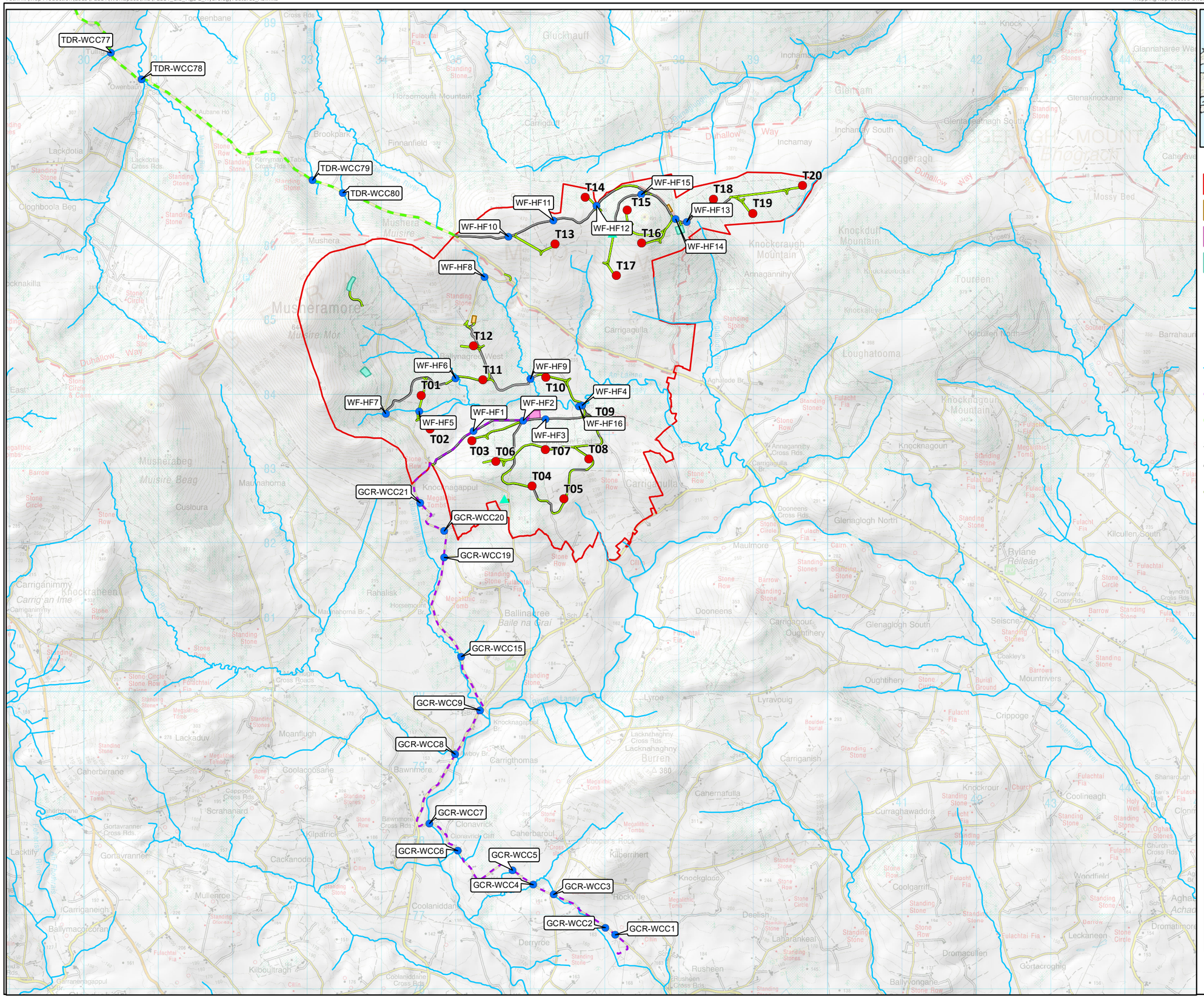
Feature ID	Existing / Proposed	Crossing Feature	Works Required at Crossing
WF-HF1	Existing	Cross drain under existing road, 450mm dia. pipe	Existing access track to be upgraded above pipe drain.
WF-HF2	Existing	Forestry pipe drain, 450mm dia pipe	Existing access track to be upgraded above pipe drain. Cable ducts* installed below existing pipe drain by standard trenching methods.
WF-HF3	Existing	Cross drain under existing road, 450mm dia. pipe	Existing access track to be upgraded above pipe drain.

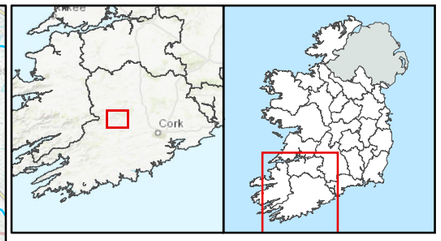
Feature ID	Existing / Proposed	Crossing Feature	Works Required at Crossing
			Cable ducts installed below existing pipe drain by standard trenching methods.
WF-HF4	Proposed	Single span bridge over the Laney River	New access track. Cable ducts to be incorporated into proposed pre-cast concrete structure.
WF-HF5	Proposed	Pre-cast box culvert over the West Ballinagree Stream	New access track. Cable ducts installed above proposed pre-cast concrete box culvert.
WF-HF6	Proposed	Pre-cast box culvert over the Laney River	New access track. Cable ducts installed above proposed pre-cast concrete box culvert.
WF-HF7	Existing	Pipe culvert, 1000mm dia. over the West Ballinagree Stream	Existing access track. Cable ducts not required at this crossing
WF-HF8	Existing	Existing bridge to be replaced by single span bridge.	Local road. Cable ducts to be incorporated into proposed pre-cast concrete structure.
WF-HF9	Proposed	Pre-cast box culvert over the Unnamed Stream	New access track. Cable ducts installed above proposed pre-cast concrete box culvert.
WF-HF10	Existing	Cross drain under existing road, 450mm dia. pipe	Existing access track. No upgrades required. Cable ducts installed below existing pipe drain by standard trenching methods.
WF-HF11	Existing	Cross drain under existing road, 450mm dia. pipe	Existing access track. No upgrades required. Cable ducts installed below existing pipe drain by standard trenching methods.
WF-HF12	Existing	Cross drain under existing road, 450mm dia. pipe	Existing access track to be upgraded above pipe drain. Cable ducts installed below existing pipe drain by standard trenching methods.
WF-HF13	Existing	Cross drain under existing road, 450mm dia. pipe	Existing access track to be upgraded above pipe drain. Cable ducts installed below existing pipe drain by standard trenching methods.
WF-HF14	Existing	Cross drain under existing road, 450mm dia. pipe	Existing access track to be upgraded above pipe drain. Cable ducts installed below existing pipe drain by standard trenching methods.

Feature ID	Existing / Proposed	Crossing Feature	Works Required at Crossing
WF-HF15	Existing	Cross drain under existing road, 450mm dia. pipe	Existing access track to be upgraded above pipe drain. Cable ducts installed below existing pipe drain by standard trenching methods.

* Cable ducts to connect turbines to the on-site substation

As per table above manmade agricultural and forest drains will be crossed using 450mm diameter pipes. Where new cross drains are to be provided to convey the drainage across the track, the minimum sizes of these cross drains will be 300 mm diameter pipes and the maximum size will be 600 mm diameter pipes.





Legend

- Proposed Wind Farm Site
- Temporary Construction Compound
- Substation Compound
- Proposed Borrow Pits
- Proposed Turbine Layout
- Met Mast
- Hydrological Features New
- Rivers
- Grid Connection
- Turbine Delivery Route

Access Tracks:

- Existing Track Upgrade
- New Access Track

TITLE:	Hydrology Features		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	2.2		
CLIENT:	Coillte and Ørsted		
SCALE:	1:50000	**REVISION:**	0
DATE:	17/01/2022	**PAGE SIZE:**	A3

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2.2.1.9 Turbine Hardstanding's

A turbine hardstanding area consists of a main crane pad hardstanding of 40m x 75m and smaller hardstanding's that act as set down and assembly areas (refer to planning drawings for details of general arrangements). This area will accommodate a main crane and an assist crane during the assembly of the turbine, as well as during occasional maintenance periods during operation. It will also facilitate parking for operation and maintenance staff.

A turbine hardstanding area will be constructed at the base of each turbine to provide a solid area for the installation crane that will be used to erect the turbine and for the assembly of the turbine.

The stone required for the construction of the hardstanding's will be sourced from licenced quarries in the vicinity of the project and the on-site borrow pits shown in Figure 2.4.

The majority of the proposed hardstanding's will be founded on suitable substrate however it has been identified following site investigations that floating construction will be required in the north-east of the site where peat depths are greatest.

Floated hardstanding's will be floated on both mineral soils and on peat soils. Floating hard standings are constructed without excavating the existing ground. They will consist of a layer of combined geotextile and geogrid laid directly on the existing surface. Layers of stone will then be placed on top with additional geogrid reinforcement as required. A layer of compacted Cl 804 material will be placed on top to provide a suitable running surface.

2.2.1.10 On-site Electricity Substation

An onsite electricity substation will be constructed within the proposed wind farm site as shown in Figure 2.4. This will provide a connection point between the wind farm and the proposed grid connection point at the existing Clashavoon substation.

The dimensions of the substation compound will be 150m x 105m and will include a substation control building and electrical components necessary to export the electricity generated from the wind farm to the national grid. The substation compound will be surrounded by a 2.5 metre high steel palisade fence and internal fences will also be provided to segregate different areas within the main substation compound.

Lighting will be required on site and this will be provided by lighting poles located around the substation and exterior wall mounted lights on the control buildings.

2no. control buildings will be located within the substation compound. The Independent Power Producer (IPP) control building will measure up to 14.1m by 14.9m and up to 8m in height. The grid operator control building will measure up to 25m by 18m and up to 8m in height. Both control buildings will include control rooms, office space and welfare facilities for staff during the operational phase of the wind farm. Due to the nature of the project, there will be a small water requirement for occasional toilet flushing/hand washing with a rainwater harvesting tank adjacent to the control building.

The substation compound will also contain external electrical and ancillary infrastructure in the form of the following:

• Cable sealing ends; • Surge arrestors; • Cable disconnectors; • Post insulators; • Circuit breakers; • Current and voltage transformers; • Steel gantry's and cable chairs; • Power transformers;	• Power quality compensation equipment; • Concrete plinths and bunds; • External lighting; • Lightening protection masts; • Telecommunications masts; • Security cameras; • Palisade fencing and gates.

Lightening protection and telecommunications masts will represent the tallest structures in the compound and shall not exceed 18.1m in height.

A wastewater holding tank will be provided outside the substation compound fence line so that it can be maintained where required without requiring access to the substation compound.

2.2.1.11 On-site Electrical Cabling

Electricity generated from wind turbines will be collected at medium voltage (20/33kV) by an internal circuit of buried cables which will follow on-site access tracks. This circuit will be terminated at a proposed onsite substation.

Internal collector circuit cable routes will follow the alignment of the internal access tracks. A section of the collector circuit will follow the public road between the two wind farm areas (north and south). The cable shall exit the northern part of the site through Access Point 2 and following local road, entering the southern part of the site via Access Point 1. From here the cable will follow the internal wind farm access track network to the onsite substation where it will be terminated.

The electricity will be transmitted as a three-phase power supply so there will be three individual conductors (or individual cables) in each cable circuit. The three conductors will each be laid in separate ducts which will usually be laid in a trefoil formation but may also be laid in a flat formation where conditions require it such as where the ducts need to cross an existing structure or culvert. At several locations the internal wind farm access tracks will cross watercourses using pre-cast box culverts and clear span bridge (see Section 2.2.1.8). In such cases, cable ducts will be cast into the structures to allow the power cables to cross the watercourses under the access track.

The width of the internal cable trench with a trefoil formation will be 600mm, a flat formation will require a wider trench width as shown on planning application drawings. The depth of cover to the ducts carrying the cables will be 900mm to the top of the upper ducts. The depth of trench for the cables will be 1200mm. The diameter of the ducting will be selected to suit the range of cross-sectional areas of electrical cables and will fall between 100mm and 200mm diameter.

2.2.1.12 Temporary Site Facilities

During the construction phase, it will be necessary to provide temporary facilities for construction personnel. The location of the temporary site compounds are shown on Figure 2.4. Wheel wash facilities will be provided within the site near the site entrance points 1 and 2 as shown on Figure 2.4. Ballinagree will have 2no. temporary compounds; one located near the main entrance to the southern part of the site (Access Point 1 described above) which will include welfare facilities and offices and will act as the primary construction site compound, and a second, smaller compound in the northern part of the site as shown in Figure 2.4.

Facilities to be provided in the temporary site compounds will include the following:

- site offices, of Portacabin type construction
- portaloos
- bottled water for potable supply
- a water tanker to supply water used for other purposes
- canteen facilities
- material/non-fuel storage areas
- employee parking
- bunded fuel storage
- contractor lock-up facility
- diesel generator
- waste management areas

Temporary compounds shall be aggregate hard standings surrounded by security fencing. Temporary facilities will be removed and the lands reinstated on completion of the construction phase with the exception of the proposed southern temporary construction compound which will be partially reinstated. The remaining hard standing area shall be repurposed following construction stage as a trail head car park for the proposed recreational amenity trails for use throughout the operational phase of the project. This is described in further detail in section 2.2.1.9.

2.2.1.13 Recreational Amenity Trail

Tracks that will be built and/or upgraded for the construction and operation of the wind farm will be made available as a recreational amenity during the operational phase of the project. In this regard 15.05 km of tracks will be made available as recreational amenity trails for community use and will include trail signage and way-markers. The proposed amenity trails will not require any additional track construction and will make use of existing and proposed wind farm and forestry internal access tracks.

As described above, the proposed wind farm temporary construction compound shall be partially reinstated following construction of the wind farm to provide a trail head car park. This shall include the partial reinstatement of the overall hard standing compound, landscaping, tree planting and installation of picnic tables. The proposed car park shall facilitate 40no. parking spaces for visitors.
The location and alignment of the proposed amenity trail is shown in Figure 2-3.

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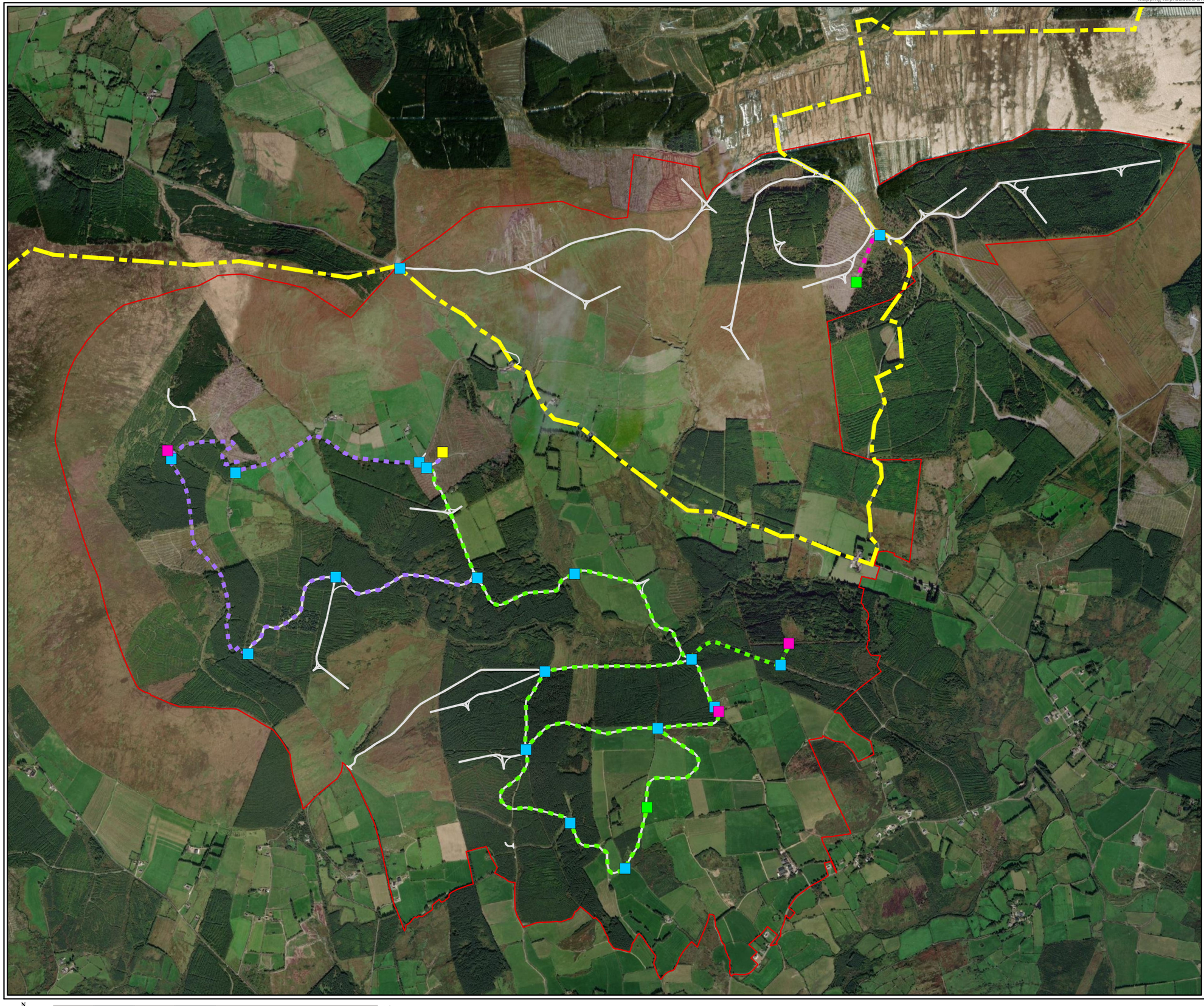

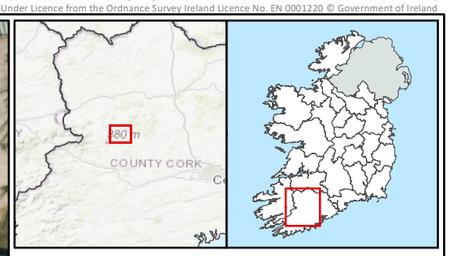

Legend

- Proposed Wind Farm Site
- Access Tracks
- Duhallow Way Walking Route
- Heritage Information Board
- Trail Viewing Point
- Trail Waymarker
- Trailhead carpark, picnic area and information

Trail Routes:

- Northern Trail
- Southern Loop
- Western Loop

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TITLE: Recreational Amenity Trails			
PROJECT: Ballinagree Wind Farm			
FIGURE NO:	2.3		
CLIENT:	Coillte and Ørsted		
SCALE:	1:23000	**REVISION:**	0
DATE:	17/01/2022	**PAGE SIZE:**	A3

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2.2.1.14 Borrow Pits

A total of 3 no. proposed borrow pit locations have been identified as a potential source of site won general fill for construction activities. The locations were selected as potential sources of general fill (Class 1 material) for the proposed project using the criteria of no peat deposits, low landslide susceptibility and proximity to existing access tracks and proposed infrastructure.

The proposed borrow pits shall provide site-won stone that will significantly reduce the amount of construction aggregates that would need to be delivered to site. The proposed borrow pits shall also be reinstated with excavated soil material which will avoid the need to export excess spoil to off-site facilities.

Each borrow pit shall have its own drainage network to manage surface runoff which will be implemented prior to excavation as shown on the planning drawings.

The proposed borrow pits will each have a footprint area of 1ha (maximum assessed) and a maximum depth of 6m. Refer to planning drawings.

At each borrow pit location approximately 1.0m of overburden material will be required to be stripped to access the underlying deposits. This material will be temporarily stockpiled prior to re-use in the reinstatement of the borrow pits. No permanent stockpiles of material will remain after construction.

It is proposed that all onsite materials excavated will be retained on site and re-used where suitable as part of the construction phase to minimise the import materials requirements.

The location of the proposed on-site borrow pits are shown in Figure 2.4.

2.2.1.15 Permanent Meteorological Masts

2 no. permanent meteorological (Met) masts (PMM's) shall be erected on site as shown in Figure 2.4.

The permanent met mast will be of the following general configuration:

- 100m high lattice steel mast with a shallow concrete foundation. A lightning rod will extend above the masts by 4 meters.

The foundation will be 10m x 10m x 1.8m in size. An access track will be extended towards the mast location from the proposed wind farm access track (in the case of the northern PMM) and existing forest track network (in the case of the southern PMM), as shown on Figure 2.4. The access track will be up to 3.5m in width. Temporary and permanent drainage infrastructure will be extended also.

2.2.1.16 Tree Felling

Much of the proposed wind farm site comprises commercial coniferous forestry. 10 no. turbines are located within forestry and consequently tree felling will be required as part of the project. Permanent felling of approximately 70 ha of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbines, hardstands, crane pads, access tracks and the proposed onsite substation. The felling area proposed is the minimum necessary to construct the proposed project.

In addition to the wind farm infrastructure felling described above, 18 ha of coniferous forestry is being felled as part of the proposed BEMP measures. The total amount of felling proposed for the project therefore is 88 hectares. In advance of construction works, clearance felling will commence on site and is expected to take up to 3 months.

The above felling hectarage includes some areas which have recently been felled already for commercial timber extraction. It may be the case that these areas are replanted prior to planning permission being granted or commencement of construction as part of the on-going commercial operation of the forest. Regardless the area will be permanently felled to make way for the wind farm infrastructure and therefore this area is included in the total felling hectarage.

The felling will be the subject of a Felling Licence Application to the Forest Service prior to construction as per the Forest Service's policy on granting felling licenses for wind farm developments. The Forest Service Policy requires that a copy of the planning permission for the wind farm be submitted with a felling license application therefore the felling license cannot be applied for until planning permission is received for the proposed project site. The license will include the provision of relevant replant lands to be planted in lieu of the proposed tree felling on the site as discussed in Section 2.2.2 below. It should be noted that the forestry within the proposed wind farm site was originally planted as a commercial crop and will be felled and replanted in the coming years should the project proceed or not.

2.2.1 Replant Lands

Replacement replanting of forestry in Ireland is subject to license in compliance with the Forestry Act 2014 as amended. The consent for such replanting is covered by the Forestry Regulations 2017 (S.I. No. 191 of 2017). The total amount of felling proposed for the project therefore is 88 hectares. It should be noted that the clear-felling of trees in the State requires a felling licence. The associated afforestation of alternative lands equivalent in area to those lands being permanently clear-felled is also subject to licensing ('afforestation licensing').

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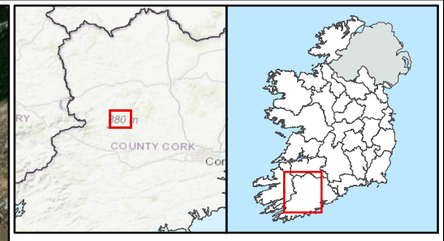

Legend

- Wind Farm Site Boundary
- Wheel Wash
- Access Points
- Heritage Information Board
- Trail Viewing Point
- Trail Waymarker
- Proposed Turbine Layout
- Met Mast
- Turbine Delivery Route
- Construction Compound
- Proposed Borrow Pits
- Substation Compound
- Turbine Hardstanding Area
- Turning Heads and Passing Bays

Access Tracks

- Existing Track Upgrade
- New Access Track

TITLE:	Site Layout		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	2.4		
CLIENT:	Coillte and Ørsted		
SCALE:	1:25000	**REVISION:**	0
DATE:	17/01/2022	**PAGE SIZE:**	A3

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2.2.2 Grid Connection

Electricity generated from wind turbines will be collected at medium voltage (20/33 kV) by an internal circuit of buried cables which will follow on-site access tracks. This circuit will be terminated at a proposed onsite substation and exported to the grid via a 110 kV buried cable to the existing Clashavoon substation. This section relates to the 110 kV underground grid connection between the proposed onsite substation and the existing Clashavoon substation.

2.2.2.1 Grid Connection Cable Route

The grid connection route (grid connection) will consist entirely of underground 110kV cable and will connect the on-site substation to the existing 110/220kV substation at Clashavoon, within the townland of Aughinida. The grid connection will be ca. 11.37 km in length, with 9.35 km to be constructed within the existing road corridor. Refer to Figure 1.2.

Connection works from the on-site substation to Clashavoon substation will involve the installation of ducting, joint bays and ancillary infrastructure and the subsequent running of cables along the existing road network. This will require delivery of plant and construction materials, followed by excavation, laying of cables and subsequent reinstatement of trenches and road surfaces.

The grid connection construction works will require a combination of temporary road closures with traffic diversions and temporary lane closures along the proposed route. This will enable the works to be completed as quickly and as safely as possible, with minimal disruption time for residents of the area. These works shall be undertaken on a rolling basis with short sections closed for short periods before moving onto the next section.

In advance of the construction phase cable detection tools, a ground penetrating radar and slit trenches will be used, as appropriate, to verify the exact locations of existing services. The final locations of the proposed cable routes in the public roads and in the verge along the public road will be within the area indicated in Figure 1.2 and will minimise conflicts with other services.

2.2.2.2 Watercourse Crossings Along the Grid Connection

A total of 13no. watercourse crossings have been identified along the proposed grid connection route.

The grid connection cable route contains 3 No. bridge watercourse crossings and one large culvert crossing which will be completed using horizontal directional drilling (HDD). A number of other minor watercourses crossing locations have been noted along the cable route, i.e., culverts, pipe drains and minor field drains. Crossing of these existing culverts will be as per undercrossing or an overcrossing methods, depending on the depth of the culvert or using open trenching.

The following table summarises existing watercourse crossing points and works required at each, along the grid connection route.

Table 2-2: Grid Connection Route Watercourse Crossings

Feature ID	ITM_X	ITM_Y	Crossing Method	Crossing Structure
GCR - WCC1	537107.75	576788.20	Ducts installed under existing service by standard trenching methods.	Pipe culvert, cover level 300mm
GCR - WCC2	536977.57	576884.77	Ducts installed under existing service by standard trenching methods.	Pipe culvert, cover level 200mm
GCR - WCC3	536281.19	577329.27	Ducts installed under existing service by standard trenching methods.	Pipe culvert, cover level 500mm
GCR - WCC4	536008.14	577458.39	Ducts installed under existing service by standard trenching methods.	Pipe culvert, cover level 300mm
GCR - WCC5	535728.74	577653.12	Ducts installed above existing service by standard trenching methods.	Pipe culvert, cover level 1300mm
GCR - WCC6	534992.49	577917.84	Ducts installed under existing service by standard trenching methods.	Pipe culvert, cover level 300mm
GCR - WCC7	534610.85	578281.04	Ducts installed beside the arch bridge by horizontal directional drill methods.	Arch Bridge, cover level 300mm
GCR - WCC8	534957.21	579214.70	Ducts installed beside the arch bridge by horizontal directional drill methods.	Arch Bridge, cover level 300mm
GCR - WCC9	535292.70	579807.10	Ducts installed beside the arch bridge by horizontal directional drill methods.	Arch Bridge, cover level 200mm
GCR - WCC15	535039.28	580524.91	Ducts installed above existing service by standard trenching methods.	Pipe culvert, cover level 900mm
GCR - WCC19	534809.36	581860.59	Ducts installed above existing service by standard trenching methods.	Box culvert, cover level 500mm
GCR - WCC20	534810.11	582216.59	Ducts installed under existing service by standard trenching methods.	Pipe culvert, cover level 200mm
GCR - WCC21	534488.56	582592.96	Ducts installed under existing service by standard trenching methods.	Pipe culvert, cover level 200mm

2.2.2.2.1 Horizontal Directional Drilling (HDD) Operations

HDD will be employed at 4 no. locations along the proposed grid connection route as part of the proposed project.

The operation shall take place from one side of the watercourse within the public road corridor and will be carried out by an experienced HDD specialist. Each crossing is expected to take place in a single day under one mobilisation.

The process will involve setting up a small, tracked drilling rig on one side of the watercourse at least 10m back from the watercourse bank.

A shallow starter pit will be excavated at the point of entry and will be located at a sufficient distance from the watercourse to achieve a minimum 3m clearance depth below the bed of the watercourse.

2.2.2.2.2 Standard Trench Crossings of Existing Culverts or Services (Ducting Below or Above)

For the crossing of buried pipe drains, culverts or services, if encountered, ducts will be installed above or below the existing infrastructure. Refer to Table 2.2 *Grid Connection Route Watercourse Crossings*.

2.2.2.3 Joint Bays

Joint bays are pre-cast concrete chambers where individual lengths of cables are joined to form one continuous cable. A joint bay is constructed in a pit. The bay is up to 6m x 2.5m x 2.05m deep. A reinforced precast concrete slab is laid in the bay to accommodate the jointing enclosure. Plate 2.1 shows a standard Eirgrid 110kV single circuit joint bay.

Joint bay locations along the grid connection route have been identified and assessed.

It is expected that 15 no. of joint bays will be required for the grid connection. Of these, 12 no. joint bays will be located in public roads with up to 3 no. located on private lands. The location of joint bays are shown on Figure 1.2.

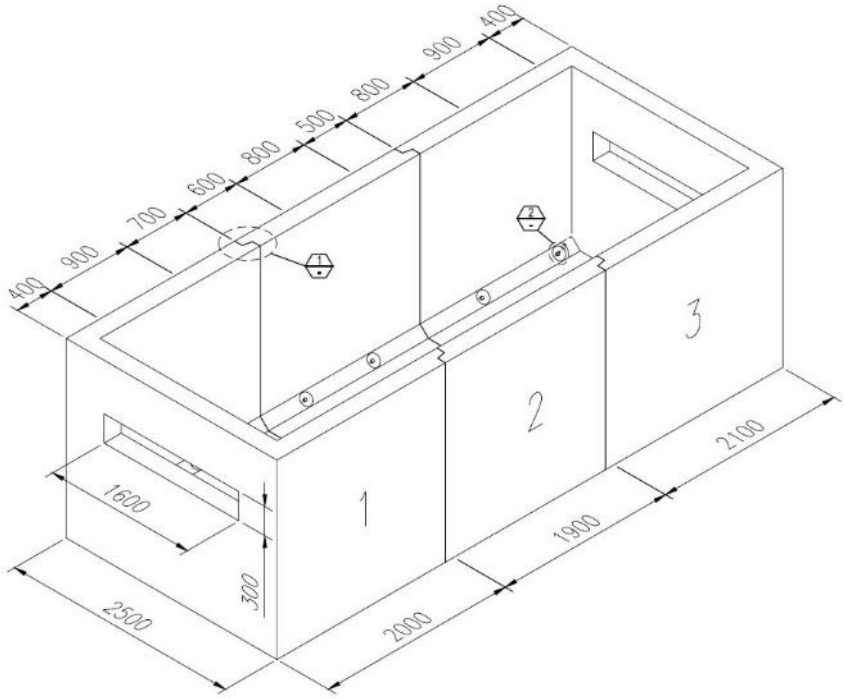


Plate 2-1: Eirgrid 110kV Single Circuit Joint Bay

2.2.3 Turbine Delivery Route

Large components associated with the wind farm construction will be transported to site via the identified turbine delivery route (TDR). It is proposed that turbine deliveries shall approach the site from the North via Foynes Port, the N69, the M7, the N21, the N20 through Charleville, Buttevant and Mallow, the N72, the R583 and shall turn left onto the L2758 before the town of Millstreet, approaching the site from the North-West.

Temporary accommodation works will be required at selected locations along the TDR to facilitate the delivery of large components to the site. The proposed turbine delivery route is presented in Figure 1-3. A Delivery Route Selection and Assessment was carried out to identify the optimum delivery route to the wind farm site.

Large components associated with the wind farm construction will be transported to the Site via the identified turbine delivery route (TDR). The proposed access route to site is as follows:

- Loads will depart the Port of Foynes and turn left onto the N69 towards Limerick;
- Loads will travel onto the M7 and turn onto the N21;
- Loads will turn onto the N20 and travel south through the towns of Charleville and Buttevant;
- Loads will turn west onto the N72 at Mallow and travel west;
- Loads will turn onto the R583 towards Millstreet;
- Loads will turn left onto the L2758 before entering Millstreet;
- Loads will travel South-East along the L2758 to the proposed wind farm site and will access the northern part of the site as Access point 2 and the southern part of the site at Access point 1.

2.2.3.1 Temporary Accommodation Works

Temporary accommodation works required for the delivery of turbines are detailed in Table 2-3 below. The accommodation works locations, or TDR nodes, are shown in Figure 1-3 and listed as “Points of Interest (POI’s)”.

All temporary accommodation works associated with the TDR shall be fully reinstated following the construction stage. Overhead utilities and obstructions will need to be removed at several locations to provide adequate overhead clearance. The removal of overhead utilities will be either temporary disconnections or permanent re-routing as occurring within the red line at the subject locations. Such works will be carried out by the utility providers in advance of turbine delivery to site.

Temporary accommodation works will only be required during the operational phase in the unlikely event of a major turbine component replacement. The temporary accommodation works will not be required for the decommissioning phase as turbine components can be broken up on site and removed using standard HGVs.

Table 2-3: TDR Temporary Accommodation Works

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works	**European Site / Distance to closest Node (km)**	**Ecological Connectivity to Works being undertaken**
1	Foynes Exit Road gate and rail crossing	Notification to Irish Rail prior to crossing line No works required	Lower River Shannon SAC River Shannon and River Fergus Estuaries SPA 0.7	No
2	Foynes Port Access Road/N69	Temporary removal of street furniture. Overrun of splitter island. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Tree and vegetation trimming.	Lower River Shannon SAC River Shannon and River Fergus Estuaries SPA 1.0	no
3	N69 North of Shrulane	Utility check recommendation	Lower River Shannon SAC River Shannon and River Fergus Estuaries SPA 0.4	No
4	N69 Barrigone	Traffic management	Lower River Shannon SAC River Shannon and River Fergus Estuaries SPA 0.2	No
5	N69 Carrig	Ground clearance check No works required	Askeaton Fen Complex 0.3	No
6	N69 West of Toreen	Trimming of tree canopy	Askeaton Fen Complex 0.6	No
7	N69 Toreen	Trimming of tree canopy	Curraghchase Woods 0.1	No
8	N69 Ferry Bridge	Ground clearance check. Trailers should be set on their higher suspension settings for this location. No works required	Lower River Shannon SAC River Shannon and River Fergus Estuaries SPA 0.01	No
9	N69 Clarina Roundabout	Temporary removal of street furniture. Overrun and oversail of northern edge of roundabout island. Placement of temporary	Lower River Shannon SAC River Shannon and River Fergus Estuaries SPA	No

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works	**European Site / Distance to closest Node (km)**	**Ecological Connectivity to Works being undertaken**
		load bearing surface. Removal of trees and vegetation.	2.0	
10	N69/N18 Dock Road West Roundabout	Temporary removal of street furniture. Overrun and oversail of northern edge of roundabout island. Placement of temporary load bearing surface. Removal of trees and vegetation.	River Shannon and River Fergus Estuaries SPA 0.4	no
11	N69/N18 Dock Road East Roundabout	Temporary removal of street furniture. Overrun and oversail of public road verge. Placement of temporary load bearing surface.	River Shannon and River Fergus Estuaries SPA 0.4	No
12	N18 Junction 1 Offslip	Temporary removal of Street furniture	Lower River Shannon SAC 2.0	No
13	N21/N20 Junction 5	Temporary removal of street furniture	Tory Hill SAC 5.2	No
14	N20 entering Charleville	Temporary removal of street furniture	Blackwater River (Cork/Waterford) SAC 5.0	No
15	N20 entering Charleville	Temporary removal of street furniture. Overrun of two traffic islands. Overrun and oversail of western footway. Placement of temporary load bearing surface.	Blackwater River (Cork/Waterford) SAC 4.4	No
16	N20 exiting Charleville	Temporary removal of street furniture	Blackwater River (Cork/Waterford) SAC 3.3	No
17	N20 leaving Buttevant	Temporary removal of street furniture	Blackwater River (Cork/Waterford) SAC 0.2	No
18	N20 Ballybeg East	No works required	Blackwater River (Cork/Waterford) SAC 0.2	No
19	N20 Ballybeg bends	Public road verge oversail. Temporary removal of street furniture. Removal of trees and vegetation.	Blackwater River (Cork/Waterford) SAC 0.3	No
20	N20 Kilcloosha bends	Public road verge oversail. Removal of vegetation.	Blackwater River (Cork/Waterford) SAC	No

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works	**European Site / Distance to closest Node (km)**	**Ecological Connectivity to Works being undertaken**
			0.7	
21	N20 New Twopothouse village	Temporary removal of street furniture	Blackwater River (Cork/Waterford) SAC 3.7	No
22	N20 Mallow	Temporary removal of street furniture	Blackwater River (Cork/Waterford) SAC 1.3	No
23	N20/R883 Roundabout, Mallow	Overrun and oversail through roundabout island. Ground reprofiling and placement of temporary load bearing surface. Removal of trees and vegetation.	Blackwater River (Cork/Waterford) SAC 0.7	No
24	N20/N72 Roundabout Mallow	Overrun and oversail through roundabout and footpaths. Placement of temporary load bearing surface. Temporary removal of street furniture. Removal of tree.	Blackwater River (Cork/Waterford) SAC 0.2	No
25	N72 Exiting Mallow	Temporary removal of street furniture. Oversail through roundabout	Blackwater River (Cork/Waterford) SAC 0.01	No
26	N72 Dromcummer Beg	Vegetation trimming. Temporary removal of street furniture.	Blackwater River (Cork/Waterford) SAC 0.01	No
27	N72 Coolclough Bends	Temporary removal of street furniture. Relocation of telegraph pole. Removal of vegetation.	Blackwater River (Cork/Waterford) SAC 1.0	No
28	N72 Dromagh	Trimming of trees and vegetation.	Blackwater River (Cork/Waterford) SAC 1.2	No
29	N72 Dromtarriff Bends	Trimming of trees and vegetation. Removal of hedgerow. Temporary removal of street furniture. Oversail into third party lands. Placement of temporary load bearing surface.	Blackwater River (Cork/Waterford) SAC 1.8	No
30	N72/R583 Junction	Removal of trees and vegetation. Temporary removal of street furniture and wall.	Blackwater River (Cork/Waterford) SAC	No

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works	**European Site / Distance to closest Node (km)**	**Ecological Connectivity to Works being undertaken**
			1.7	
31	R583 Killetragh	Trimming of trees and vegetation.	Blackwater River (Cork/Waterford) SAC 1.2	No
32	R583 Minehill	Overrun and oversail of public road verge. Placement of temporary load bearing surface. Trimming and removal of trees and vegetation.	Blackwater River (Cork/Waterford) SAC 1.1	No
33	R583 Garrane North	No works required	Blackwater River (Cork/Waterford) SAC 1.0	No
34	R583 River Blackwater Bridge	No works required	Blackwater River (Cork/Waterford) SAC 0.0	No
35	R583 Railway Underbridge	No works required	Blackwater River (Cork/Waterford) SAC 0.4	No
36	R583 Drishane Castle	Construction of a temporary staging area comprising aggregate hard standing and associated access track to and from the public road R583 in the grounds of Drishane Castle. Removal of masonry wall to facilitate temporary access from public road R583. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Relocation of telegraph pole. Trimming of trees and vegetation.	Blackwater River (Cork/Waterford) SAC 0.6	Yes
37	R583 Right Bend Entering Millstreet	Relocation of overhead lines	Blackwater River (Cork/Waterford) SAC 1.2	No
38	R583/L1123 Junction	Relocation of utility poles and overhead lines. Removal of walls. Temporary removal of street furniture. Placement of load bearing surface on third party land. Overrun and oversail	Blackwater River (Cork/Waterford) SAC 0.9	No

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works	**European Site / Distance to closest Node (km)**	**Ecological Connectivity to Works being undertaken**
		of public road footpaths. Suspension of parking.		
39	R583 west of L1123 Junction	No works required	Blackwater River (Cork/Waterford) SAC 0.8	No
40	L1123 Left bend south of Millstreet	Relocation of utility poles and overhead lines. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Suspension of parking.	Blackwater River (Cork/Waterford) SAC 1.2	No
41	Tulig road right bend	Relocation of utility poles and overhead lines. Trimming of vegetation.	Blackwater River (Cork/Waterford) SAC 0.9	No
42	Tulig Road left/ right bend	Trimming of trees and vegetation. Relocation of utility poles and overhead lines.	Blackwater River (Cork/Waterford) SAC 0.6	No
43	River Owenbawn Left Bend	Removal of trees and vegetation. Relocation of utility poles and overhead lines. Removal of wall.	Blackwater River (Cork/Waterford) SAC 0.01	No
44	Auhane West of Tullig	Ground reprofiling and placement of load bearing surface on third party land. Relocation of utility poles and overhead lines. Temporary removal of street furniture. Removal of hedge.	Blackwater River (Cork/Waterford) SAC 0.1	Yes
45	Proposed site access	Refer to Section 2.2.1.6.	Blackwater River (Cork/Waterford) SAC 4.0	No
46	Temporary widening of existing junction between Butter Road (L1123/L2758) and unnamed local road on approach to main site entrance.	Ground reprofiling and placement of load bearing surface on third party land. Removal of hedge.	Blackwater River (Cork/Waterford) SAC 4.6	No
47	Local Road on approach to main site entrance	Placement of temporary load bearing surface to roadside verges.	Blackwater River (Cork/Waterford) SAC 4.6	No

All POI's have undergone initial assessment as to nature of work required at the POI and the proximity / connectivity to a European site.

There are four POI locations (POI-8 and 34) within the boundaries of a European site, however no works are proposed within these areas.

POI 7 involves trimming of trees within 100m of the Curraghchase Woods SAC. The SAC is designated for Lesser Horseshoe bats (*Rhinolophus hipposideros*). Although the proposed works are within the core sustenance zone for the bat species, there is no tree removal proposed and this species is does not roost in trees (BCI and Vincent Wildlife Trust [1]). Therefore no connectivity to the proposed works at this TDR Node.

POI 25 and 26 involve the removal of street furniture and subsequent replacement upon completion of the use of the TDR. Although the nodes are adjacent to the Blackwater River (Cork/Waterford) SAC, the minor works are confined to small localised areas outside the SAC. The works proposed at POI 25 are located c.100m north of the River Blackwater with no hydrological connectivity and the works proposed at POI 26 are the removal of street furniture and trimming of ornamental hedgerow at a private residential entrance with hydrological connectivity. It is not anticipated that these will have any impact to the SAC.

POI 36, POI 43 and POI 44 are being carried forward for further assessment due to the works proposed at these locations, their proximity and potential connectivity to the Blackwater River (Cork/Waterford) SAC.

The remaining POI's have no connectivity to European sites with regards to the nature of work required.

Drishane Castle Staging Area (POI 36)

A staging area is required at TDR Node POI 36 in the grounds of Drishane Castle, off the R583 to facilitate the delivery of large turbine components to the site.

The staging area will comprise a 200m x 50m temporary aggregate hard standing with tracks providing access from the R583. At this location, turbine blades travelling from the port of entry shall be transferred using cranes from flat, extendible carrier trailers, onto blade lifting trailers for the remainder of the route. The purpose of this is to minimise the amount of temporary accommodation works required between Millstreet and the site.

The staging area shall be fenced by security construction fencing and gated and will comprise also of temporary cabins for welfare and security requirements. The staging area will be in use throughout the duration of the turbine installation works.

[1] Accessed January 2022

River Owenbawn Left Bend POI 43

POI 43 involves the removal of trees and vegetation, removal of a wall and relocation of utility poles and overhead lines. Works will be completed within 2 days. The POI will be in use throughout the duration of the turbine installation works.

Auhane West of Tullig (POI 44)

Ground reprofiling and placement of load bearing surface (stone) are required at TDR Node POI 44 within the townland of Tullig, Co. Cork, within third party lands, to facilitate the delivery of large turbine components to the site. The area will require the installation of a load bearing surface.

The POI will be in use throughout the duration of the turbine installation works.

2.2.3.2 Turbine Delivery Route (TDR) Watercourse Crossings

There are a total of 80 watercourse crossings along the TDR. No works are required at any of the crossings. The locations and name of the waterbody being crossed are provided in Table 2-4.

Table 2-4: TDR Watercourse Crossings

Feature ID	Waterbody	Feature ID	Waterbody
TDR-WCC1	Foynes	**TDR-WCC41**	Knockaunavoddig
TDR-WCC2	Ardandeen	**TDR-WCC42**	Maigue
TDR-WCC3	Sroolane_north	**TDR-WCC43**	Creggane 24
TDR-WCC4	Robertstown 24	**TDR-WCC44**	Broghill north
TDR-WCC5	Shanagolden	**TDR-WCC45**	Charleville (stream)
TDR-WCC6	Ahacronane	**TDR-WCC46**	Ballyhubbo
TDR-WCC7	Glenbane west stream	**TDR-WCC47**	Ballysallagh 24
TDR-WCC8	Lismakeery (stream)	**TDR-WCC48**	Awbeg [buttevant] [east]
TDR-WCC9	Deegerty	**TDR-WCC49**	Newtown 18
TDR-WCC10	Deegerty	**TDR-WCC50**	South castlewrixon
TDR-WCC11	Askeaton	**TDR-WCC51**	Lisballyhay
TDR-WCC12	Cragmore	**TDR-WCC52**	Awbeg [buttevant]
TDR-WCC13	Upper ballyengland	**TDR-WCC53**	East boherascrub
TDR-WCC14	Deegerty	**TDR-WCC54**	Ballyclogh (stream)
TDR-WCC15	Dromlohan 24	**TDR-WCC55**	Ballyclogh (stream)
TDR-WCC16	Tonlegee 24	**TDR-WCC56**	East baltydaniel
TDR-WCC17	Faha 24	**TDR-WCC57**	South cloghlucas
TDR-WCC18	Elmpark_demense	**TDR-WCC58**	Ashgrove 18
TDR-WCC19	Elmpark demense	**TDR-WCC59**	Ashgrove 18
TDR-WCC20	Barnakyle	**TDR-WCC60**	East baltydaniel
TDR-WCC21	Rossbrien	**TDR-WCC61**	Annabella
TDR-WCC22	Rossbrien	**TDR-WCC62**	Scarteen 18
TDR-WCC23	Ballynaclogh 24	**TDR-WCC63**	Ballyclogh (stream)
TDR-WCC24	Derryknockane	**TDR-WCC64**	Ruanes 18

Feature ID	Waterbody	Feature ID	Waterbody
TDR-WCC25	Rootiagh	**TDR-WCC65**	Woodpark lombardstown
TDR-WCC26	Rootiagh	**TDR-WCC66**	Awbeg [kanturk]
TDR-WCC27	Rootiagh	**TDR-WCC67**	North kilcaskan
TDR-WCC28	Barnakyle	**TDR-WCC68**	Allow
TDR-WCC29	Patrickswell 24	**TDR-WCC69**	Knockanroe 18
TDR-WCC30	Islandduane	**TDR-WCC70**	Dromagh
TDR-WCC31	Mondellihy	**TDR-WCC71**	Maulyclickeen
TDR-WCC32	Garranroe 24	**TDR-WCC72**	Keale stream
TDR-WCC33	Garranroe 24	**TDR-WCC73**	Blackwater [Munster]
TDR-WCC34	Laskiltagh	**TDR-WCC74**	Drishane_more
TDR-WCC35	Maigue	**TDR-WCC75**	Coomlogane
TDR-WCC36	Croom	**TDR-WCC76**	Drominahilla
TDR-WCC37	Anhid_east	**TDR-WCC77**	Tooreenbane
TDR-WCC38	West liskennett	**TDR-WCC78**	Owenbaun [rathcool]
TDR-WCC39	Glenma	**TDR-WCC79**	Brookpark 18
TDR-WCC40	Cappanafaraha	**TDR-WCC80**	Finnanfield

It is proposed to replace 1no. existing bridge structure identified as watercourse crossing no. WF-HF8 with a pre-cast concrete box culvert. This feature, while located on the public road and TDR, is also located within the proposed wind farm development boundary and therefore listed as an internal crossing (refer to Section 2.2.1.8).

This TDR has also been used previously for the construction of the Boggeragh Wind Farm (Planning Ref. 011248 and 085944). Vehicle axle loads associated with the proposed project will not exceed those for Boggeragh Wind Farm and/or national road axle load limits.

2.2.4 Traffic Management

A careful approach will be taken to planning the entirety of the works associated with the proposed project to ensure minimal impacts on road users and the general public. For the grid connection construction, cable trenching will be carried out with the aid of either lane closures or road closures, which will ensure that the trenching works are completed as expeditiously as possible. Due to the length of cabling within the road corridor, these works will be conducted over a period of up to 6-months (ca. 24 weeks). Short term road closures will be applied for by the appointed contractor and will outline local diversions whilst maintaining local access at all times for residents, farms and businesses. Road closures will be subject to the applicable statutory processes as implemented by the Roads Authority. Road closures will be facilitated by the existing road network. 'Rolling road closures' will be implemented, whereby the site will progress each day along a road, which will have the effect of reducing the impact for local residents.

2.2.5 Biodiversity Enhancement and Management Plan (BEMP) Measures

A Biodiversity Enhancement and Management Plan (BEMP) has been prepared to outline a set of land management prescriptions (commitments and monitoring) as part of proposed Ballinagree Wind Farm Development. A combined total of c. 304 ha of lands in the vicinity of the wind farm, but beyond 250m of any proposed turbine, have been identified and landowners have agreed to a long-term commitment to detailed land management measures designed to maintain and enhance local biodiversity.

In addition, the developer has undertaken to create wildlife corridors through strategic tree-felling between areas of upland habitat in the vicinity of the proposed wind farm area.

The BEMP lands are spread across 6 no. land parcels in the townlands of Carrigduff, Annagannihy, Knocknagappul, Rahalisk, Oughtihery, Dooneens, Carriganish, Kilberrihert and Caherbaroul, Co. Cork. The BEMP lands are identified in Figure 1.4.

The measures set out in the BEMP include those designed to protect watercourses, prevent overgrazing and to clear invasive and site inappropriate plants. Higher value habitats will be actively managed to maintain and improve their value and lower value habitats will see specific interventions designed to improve their attractiveness for a wide range of species. Inputs (e.g., fertiliser, herbicide) will be controlled and appropriate planting will increase the available feeding, roosting and nesting cover for wildlife. Certain measures (e.g., control of stocking density) will be universal across the management lands. Other measures (e.g., planting of wildbird cover and native deciduous woodland) will be entirely site specific. The measures proposed for each land parcel take into account the habitats present and their current condition and importance in the local landscape.

The BEMP programme represents a significant commitment to enhance the biodiversity value and ecological connectivity across a large land bank. The programme will run for the lifetime of the wind farm and many of the proposed features (e.g., tree and hedgerow planting) will have a longer-lasting biodiversity benefit to the lands included in this plan and the wider locality. The BEMP is not designed to mitigate or address particular potential impacts associated with the construction, operation or decommissioning of the proposed wind farm. It is instead a commitment provided to yield a lasting biodiversity benefit to the area around Ballinagree.

The BEMP measures are described in detail in Appendix 7. It is expected that measures associated with the implementation of the proposed BEMP will be equivalent to standard agricultural activities and will be carried out and maintained by the involved landowners. **Note:** These protective measures have not been considered in the screening assessment. The screening assessment has considered the potential for likely significant effects from implementation of the BEMP.

2.3 Operation and Lifespan

During the operational period, the turbines will operate automatically on a day-to-day basis, responding by means of anemometry equipment and control systems to changes in wind speed and direction. The turbine manufacturer or a service company will carry out regular maintenance of the turbines. Scheduled services will typically occur twice a year.

The operation of the wind turbines will be monitored remotely, and an operative working from a remote headquarters will oversee the day to day running of the proposed wind farm.

The applicant requests the grant of permission is on the basis of a 35-year operational period from the date of full operational commissioning of the wind farm. With permission for the onsite substation sought in perpetuity given that the substation will form part of the national electricity network. Therefore, the substation will be retained as a permanent structure and will not be removed.

The anticipated minimum useful lifespan of wind turbines is 35 years is which are being produced for the market today.

The lifespan of wind turbines has been increasing steadily in recent years and allowing this duration will improve the overall carbon balance of the development, therefore maximising the amount of fossil fuel usage that will be offset by the wind farm. Leaving the wind turbines in-situ until the end of their useful lifespan would be optimum from an environmental viewpoint, particularly in relation to carbon savings.

During this operational period the wind turbines will generally operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

Maintenance activities associated with the implementation of the proposed BEMP will be equivalent in nature to agricultural activities and will be carried out by the involved landowners. The BEMP measures are described in Appendix 7.

2.4 Decommissioning

On decommissioning, cranes will disassemble the above ground turbine components which will be removed off site for recycling. All the major component parts are bolted together, so this is a relatively straightforward process.

The foundation pedestals will be covered over and allowed to re-vegetate naturally. Leaving the turbine foundations in situ is considered a more environmentally sensible option as to remove the reinforced concrete associated with each turbine would result in environmental nuisances such as noise, vibration and dust.

It is proposed that the internal site access tracks and turbine hard standings will be left in place. These will continue to be used for recreation, forestry and agriculture. Turbine hardstanding's shall be covered over with topsoil previously stripped and used for landscaping purposes during the construction stage and left to revegetate naturally. The recreational trails and associated signage shall be left in situ.

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

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

No decommissioning activities are envisaged for the Biodiversity Enhancement and Management Plan lands.

It is expected that the decommissioning phase will take no longer than 6 months to complete.

2.5 Potential Interactions of the Proposed Project with the Natural Environment

Having regard to the 'Habitats Directive assessment review package' set out in the guidance document '*Assessment of Plans and Projects significantly affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC'*, (European Commission, 2021), the features of the proposed project with potential for interaction with the natural environment are set out relative to the following headings:

- Size and scale;
- Land-take;
- Physical changes to the environment;
- Resource requirements;
- Emissions, wastes and residues;
- Transportation requirements;

These project features are further examined in defining the likely Zone of Influence (ZoI) of the project and in determining likely significant effects through the Source-Pathway-Receptor assessment (Section 3.)

All elements of the project as described in the previous section have been considered and everything not mentioned below has been considered and deemed to have no potential impact.

Table 2-5: Potential Impacts of the Proposed Project

Project Feature	Description	Potential Impact
Size and scale/ Land-take / Overall Affected Area	*Construction* Wind Farm Site Construction will require the permanent loss of habitat, including felling of plantation areas and clearing of grassland and wetland habitats, within and around the wind farm infrastructure to accommodate the construction of turbines, hardstands, crane pads, access tracks and the onsite substation. Turbines 2, 3, 13, 14, 15, 17, 18, 19 and 20 were recorded to have peat present within the foundation footprint. Peat deposits were generally noted to be limited to the northern area of the site (turbines 13, 14, 15, 17, 18, 19 and 20) and thicknesses of between 0.1 – 2.7m. Peaty topsoil was present in the southern area of the site. The findings of the peat assessment showed that the Ballinagree Wind Farm site has an acceptable margin of safety, is suitable for the proposed wind farm development and is considered to be at low risk of peat failure. Refer to Appendix 6. Grid Connection The majority of the cable route will be within existing road, with limited requirement for vegetation removal. Where excavation is required within the road verge or road boundary (narrow grassy verge (wet grassland GS4, dry-humid acid grassland GS3 and/or occasional dry grassy verge GS2) with bramble and willow scrub WS1, hedgerow WL1 or occasional treeline WL2) to accommodate the installation of the grid cable, the vegetation will be reinstated as part of the Local Authority requirement for road reinstatement. Any disturbance to vegetation will be temporary and localised. TDR Habitat disturbance to accommodate turbine delivery is limited to laying of temporary hardcore along road verges and grassed areas , lowering of walls, trimming of vegetation, hedgerow cutting and tree felling. There is limited requirement for vegetation removal to accommodate turbine delivery. Vegetation will be reinstated following the works. POI 36, however, requires the construction of a temporary staging area comprising aggregate hard standing and associated access track to and from the public road R583, the removal of masonry wall to facilitate temporary access from public road R583 and placement of temporary load bearing surface. POI 43, involves the removal of trees, vegetation and a wall, along with the relocation of utility poles and overhead lines. POI 44 requires the ground reprofiling and the placement of a temporary load bearing surface. BEMP The BEMP lands will require the permanent loss of coniferous plantation to accommodate the wildlife corridor sections. *Operation* The site will comprise 20 no. wind turbines with a hub height range of between 102.5 and 110.5m and a rotor diameter range of between 149m and 155m with a tip height of between 179m and 185m. *Decommissioning*	The construction of the wind farm will result in the permanent removal of 70 ha of plantation woodland from within the Site. Additionally, areas of improved agricultural grassland, semi-natural to semi-improved Wet Grassland (incl. Wet Grassland/Poor Fen and Flush), Wet Heath and Cutover bog Mosaic and Wet Heath along with hedgerow and treelines, will be permanently removed from within the proposed wind farm site to accommodate the development. The consent application for the wind farm is for a 35 year operational period. Decommissioning will reinstate turbine locations with topsoil and allow to revegetate naturally. Where proposed access roads and turbine bases adjoin or are located in proximity to peatland and heathland habitats, in particular T17, T12 and T02, there is the risk of indirect impacts to these habitats during the construction phase. Excavations, infilling of excavated areas and the construction of haul and access routes could impact drainage patterns and the hydrological functionality of adjacent peatland and heathland habitats, leading to drying out of peat soils with consequent reduction in species diversity and the deterioration of habitat quality and potential indirect habitat loss. The BEMP lands will result in the permanent removal of 18 ha of plantation woodland. Vegetation disturbance associated with the grid connection and TDR will be localised and temporary. The vegetation to be disturbed is marginal and of low ecological value.

Project Feature	Description	Potential Impact
	Internal site access tracks, turbine hard standings, grid connection infra-structure (including on-site sub-station and ancillary electrical equipment), amenity trail and car parks will be left in place. Turbine hard standings will be covered over with topsoil and left to revegetate naturally.	
Physical changes to the environment / change in existing environmental pressures	*Construction* Wind Farm Site Of the 13 no. internal wind farm site watercourse crossings identified, 8 no. are existing pipe culverts which shall be either upgraded or replaced or left in-situ. 1no. existing stone bridge shall be replaced with a new clear span concrete bridge. The remaining crossings are proposed new structures in the form of 1no. clear span bridge and 3no. pre-cast box culverts. The excavations for turbine foundations has potential to alter the local hydrology due to the depth required being 4m. The Scottish Environmental Protection Agency (2017) specifies the zone of influence for Ground Water Dependent Terrestrial Ecosystems (GWDTE) from excavations deeper than 1m to be a 250m buffer around the works area. Grid Connection Thirteen watercourse crossings are required for the installation of the grid cable route, 10 no. the ducts will be installed above/under the existing services by standard trenching methods. 3 no. (GCR - WCC7, GCR - WCC8 and GCR – WCC9) crossings, the proposed crossing method is by HDD. The HDD crossing will require the excavation of an entry (pilot) pit and exit pit on either side of the river crossing point. These lands are currently in agricultural use. They will be reinstated following the works. It will not be necessary to remove / disturb riparian habitat to accommodate the HDD crossing. BEMP The wildlife corridors are existing mature conifer plantation that will be felled to improve the connectivity between patches of upland peatland habitat. Higher value habitats will be actively managed to maintain and improve their value and lower value habitats will see specific interventions designed to improve their attractiveness for a wide range of species. *Operation* During the lifetime of the project there will be an increased level of activity within the site with potential for disturbance to species. Following construction, the development of the proposed windfarm will result in the long-term reduction in the density of forest cover within the site in order to accommodate the construction of the proposed 20 no. wind turbines *Decommissioning* Turbines will be removed from the Site. Internal site access tracks, turbine hard standings, grid connection infra-structure (including on-site sub-station and ancillary electrical equipment), amenity trail and car parks will be left in place. Turbine hard standings will be covered over with topsoil and left to revegetate naturally.	There will be a permanent loss of aquatic habitat associated with the installation of culverts within their footprint. There will be some disturbance to the streams/ drains immediately adjacent to the culvert locations caused by excavation to accommodate the works. Construction of WF-HF4 and WF-HF8 within the main wind farm site and GCR - WCC7, GCR - WCC8 and GCR – WCC9 within the GCR, watercourse crossings and the installation of culverts on the drainage ditches / small watercourses will result in the permanent loss of habitat within the footprint of the works. Along with indirect impacts to water quality and aquatic species (refer to emissions to water section below). Due to the depth of the foundations required for the turbines, impacts to groundwater dependant terrestrial ecosystems (GWDTE) may include change in water depth (dewatering), rate of flow, timing of the change. Ruddock & Whitfield (2007) notes that animals' avoidance of humans or human activities can have several adverse effects on their distribution and abundance. The development of the wind farm has the potential to result in displacement of birds / mammals (bats) due to on-site construction activities coupled with long-term loss of suitable feeding and/or breeding/wintering habitat associated with site clearance. Potential for bird collision with turbine towers, blades (moving or stationary) and/or associated infrastructure; and barrier to dispersal, regular movements or migration for migratory bird species.
Resource Requirements	*Construction*	The proposed borrow pits will each have a footprint area of approximately 1ha (maximum assessed). This will provide a potential volume of approximately 30,000m^3 of site won general fill based on an aggregate resource thickness of 3.0m at each of the borrow pits.

Project Feature	Description	Potential Impact
	Suitable site won material (Siltstone and Sandstone bedrock) will be used as general fill in the construction of access tracks, hardstands and in reinstatement around turbine foundations. Surplus overburden (topsoil and glacial till) will be re-used on site in the form of landscaping and for reinstatement purposes at the proposed borrow pits (peat and glacial till). All materials shall be re-used onsite for other suitable purposes e.g.: • Re-use of excavated materials (excluding peat) for screening, berms etc.; • Use of suitable site won material (bedrock) as general fill in the construction of access tracks, hardstands and in reinstatement around turbine foundations. • Surplus overburden will be re-used on site in the form of landscaping and for reinstatement purposes at the proposed borrow pit. There are no peat deposition areas required as part of this project. Any peat excavated for construction within the site will be re-used as fill for the borrow pits. Topsoil will be re-used for landscaping and will also be used for reinstatement purposes around turbine bases and hardstanding areas. The excavations for the borrow pits have potential to alter the local hydrology. The Scottish Environmental Protection Agency (2017) specifies the zone of influence for Ground Water Dependent Terrestrial Ecosystems (GWDTE) from excavations deeper than 1m to be a 250m buffer around the works area. *Operation* No resource requirements during operation *Decommissioning* No resource requirements during decommissioning	Impacts include the potential disruption of groundwater flow, dewatering of GWDTE and emissions to water (see below)
Emissions	**Emissions to Air (dust)** *Construction* The principal sources of potential air emissions during the construction of the proposed project will be from the wind farm, grid connection, TDR and BEMP Lands; from dust arising from earthworks, tree felling activities, trench excavation along cable routes, construction of the new access tracks, the temporary storage of excavated materials, the construction of the proposed substation, the movement of construction vehicles, loading and unloading of aggregates/materials and the movement of material around the site. *Operation*	The Institute of Air Quality Management 'Guidance on the Assessment of dust from demolition and construction' (Holman et al, 2014) states that "*Dust can have two types of effect on vegetation: physical and chemical. Direct physical effects include reduced photosynthesis,* *respiration and transpiration through smothering. Chemical changes to soils or watercourses may lead to a loss of plants or animals for example via changes in acidity. Indirect effects can include increased susceptibility to stresses such as pathogens and air pollution. These changes are likely to occur only as a result of long-term demolition and construction works adjacent to a sensitive habitat. Often impacts will be reversible once the works are completed, and dust emissions cease*". The guidance prescribes potential dust emission risk classes to ecological receptors. The guidance specifies that, for sensitive ecological receptors, sensitivity to dust is 'High' up to 20m from the source and reduces to 'Medium' over 50m from the source The guidance (Holman et al, 2014) also stipulates that trackout [2] may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The wind farm site would be considered a large site, as such the dust effects from tractout are likely to occur within 500m from the site exit.

(2) Trackout is dirt, mud, or other debris tracked onto a paved public roadway by a vehicle leaving a construction site. Dirt and mud is adhered to the exterior or undercarriage of the vehicle leaving the construction site, which then deposits the dirt, mud, and other debris onto the roadway.

Project Feature	Description	Potential Impact
	Once the proposed wind farm and grid connection are constructed there will be no significant direct emissions to atmosphere. A diesel generator will be located at the proposed wind farm substation; however, this will only be operated as a back-up/emergency power supply in the unlikely event of an emergency. The emissions expected from the diesel generator include cardon dioxide (CO2), nitrogen oxide (NOx), and particulate matter. The generator if in use will produce approximately 2.6kg of CO2 per litre of diesel. *Decommissioning* There will be truck movements associated with removing the wind turbines from the wind farm resulting in vehicular emissions and also dust. However, the number of truck movements would be significantly less than the construction phase. There will also be emissions from machinery on site including for the movement of soil to cover the foundations.	Construction works, (albeit no invasive species were recorded within the construction footprint of the wind farm / grid connection / BEMP Lands or at POIs requiring work along the TDR during surveys) can potentially disturb stands of invasive plants and/or soils contaminated with invasive plant material and cause them to spread onsite as dust particles. In addition to lands within the proposed works areas, there is an identified risk of invasive plant species being spread onto neighbouring lands and onto public roads and other locations. Construction works could therefore result in the spread of invasive plant species both in-situ and ex-situ.
Emissions	**Noise Emissions** *Construction* The main aspects of the construction phase with the potential to generate noise include: • the construction of the turbine foundations, • the erection of the turbines, • the excavation of trenches for cables, • excavation of the borrow pits, • felling • the construction of associated hard standings and access tracks, and construction of the substations, • the delivery of the turbine components, • the delivery of construction materials, notably aggregates, concrete and steel reinforcement, and • works associated with grid connection. *Operation* Once the proposed wind farm and grid connection are constructed there will be both mechanical and aerodynamic noise emissions from the turbines. Mechanical noise is produced by components such as generators and gearboxes, and the aerodynamic noise comes from the movement of turbine blades. *Decommissioning* The main aspects of the decommissioning phase with the potential to generate noise are similar to that of the construction phase, however a number of elements will be left in situ (see above) therefore impacts from noise will be lesser than during construction.	Disturbance to noise varies between species and is dependent on the nature of the noise source and sensitivity of the species e.g., the potential effects of anthropogenic sound on fish can range from direct mortality to no obvious behavioural responses and are dependent on the class of sound i.e., either continuous or impulsive (Popper et al. 2014, Popper & Hawkins 2019). Similarly, for birds disturbance response (e.g., becoming alert or a flight response) can vary depending on season, species sensitivity, and weather. The construction and demolition of the proposed wind farm has potential for noise disturbance to terrestrial and aquatic species along with bird species. .
Emissions	**Water Pollution** *Construction* Vegetation clearance / tree felling, new access tracks and upgrade of existing agricultural tracks, turbine hardstanding areas, the on-site substation, bridge/culvert crossings have the potential to contribute to the increase in runoff from the wind farm site. An increase in surface water runoff from the wind farm site during construction, particularly from areas of exposed soil and peat, has the potential to result in increased sedimentation of the drains and watercourses within the site. Similarly, water in excavations could contain an increased concentration of suspended solids as a	Sedimentation of watercourses runoff has potential to temporarily degrade the quality of these watercourses and as such reduce the carrying capacity of the watercourses for aquatic species. HDD crossing of watercourses for the grid connection has potential to cause frac-out (an unintentional loss of drilling fluids during a drilling operation) which could result in a degradation of aquatic habitat quality. The release of cement / concrete to an aquatic environment can have the effect of altering the levels of pH, nitrate, phosphate, total solids, total suspended solids, total dissolved solids, turbidity and biological oxygen demand in the

Project Feature	Description	Potential Impact
	result of the disturbance of the underlying soils, dewatering of excavations has a potential to result in sedimentation of nearby drains / watercourses. The method for crossing the WF-HF4 and WF-HF8 watercourses within the wind farm site is by single-span concrete bridge over each. The bridge design of WF-HF4 is such that it does not require in-stream works for its installation. Notwithstanding this, the site preparation works for the bridge installation will require ground disturbance. The remaining water crossings will also generate ground and instream disturbance. The replacement bridge at WF-HF8 will require in-stream works for the removal of the old bridge. Thirteen watercourse crossings are required for the installation of the grid cable route, 11 no. the ducts will be installed under the existing services by standard trenching methods. 3 no. (GCR - WCC7, GCR - WCC8 and GCR – WCC9) the proposed crossing method is by HDD. The HDD crossing will require the excavation of an entry (pilot) pit and exit pit on either side of the river crossing point. These lands are currently in agricultural use. They will be reinstated following the works. It will not be necessary to remove / disturb riparian habitat to accommodate the HDD crossing. Watercourses crossed by HDD are at risk of suspended solid releases, hydrocarbon pollution (fuel spillage) and escapement of drilling lubricants (e.g., frac-out). Cement based product will be used in turbine / substation foundations and hardstanding's and will also be used for constructing new watercourse / drain crossing structures (in particular for blinding of foundations). Cement-based products could lead to contamination of nearby watercourses. Refuelling activities / storage of fuel could result in fuel spillages which could pollute underground and surface water. *Operation* The design of the wind farm will include SuDS. As such the existing hydrology of the site will not be altered. Due to the grassing over of the drainage swales and revegetation of other exposed surfaces, and the non-intrusive nature of operations, there is a negligible risk of sediment release to the watercourses during the operational stage. The proposed development is located within areas of 'Low' susceptibility for slope slippage. There will be no further disturbance of overburden post-construction. There is a low probability for slope failure during operation. *Decommissioning* The internal site access tracks and turbine hard standings will be left in place. Grid connection infrastructure including substation and ancillary electrical equipment shall form part of the national grid and will be left in situ. Temporary accommodation works along the TDR will not be required for the decommissioning phase as turbine components can be broken up on site and removed using standard HGVs.	water. Cement products are particularly harmful to aquatic life due to the associated change in alkalinity in the water, which can cause burns to fish skin. The introduction of crayfish plague to the drains / streams within the Lee, Cork Harbour and Youghal Bay (ID 19) and Blackwater (Munster) (ID 18) catchments would likely be detrimental to the crayfish populations in the catchments, as has been witnessed in other rivers in Ireland e.g., the River Suir and River Barrow. Hydrocarbons are toxic to flora and fauna, including fish, and these chemicals tend to be persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms. There is a risk that machinery associated with tree felling could act as a vector for introducing or dispersing non-native invasive species, which may spread along nearby watercourses (albeit no invasive species were recorded in the vicinity of watercourse crossings during surveys). Potential for scouring the stream beds downstream of the operational wind farm due to increase flow rate from hard surfaces associated with the development.
Waste Emissions	*Construction* The following categories of waste will be generated during the construction of the project: • municipal solid waste (MSW) from the office and canteen • construction and demolition waste	Sedimentation runoff has potential to temporarily degrade the quality of the watercourses and as such reduce the carrying capacity of the watercourse for aquatic species. The release of generated waste to an aquatic environment can have the effect of altering the levels of pH, nitrate, phosphate, total solid, total suspended solids, total dissolved solids, turbidity and biological oxygen demand in the water.

Project Feature	Description	Potential Impact
	• waste oil/hydrocarbons • paper/cardboard • timber • steel When possible, non-hazardous materials shall be re-used onsite for other suitable purposes e.g.: • re-use of shuttering etc. where it is safe to do so; • re-use of rebar cut-offs where suitable; • re-use of excavated materials for screening, berms etc.; • re-use of excavated material etc. – where possible will be used as suitable fill elsewhere on site for site tracks, the hardstanding areas and embankments where possible; • excess subsoils from excavations shall be used to reinstate the borrow pit on site. It is important to clarify that any excess excavated material that will be used for fill, re-instatement, or similar activities, within the wind farm site boundary is not categorised as a waste material under relevant waste legislation, rather this material is exempt from waste classification. *Operation* No waste will be produced during the operation of the proposed project *Decommissioning* Waste produced during the decommissioning of the proposed project will be similar to that produced during construction, however, greatly reduced, primarily due to wind turbine components will be dismantled on site and can be removed on standard HGV's eliminating the requirement for temporary accommodation requirements needed at construction stage.	
Transportation Requirements	*Construction* Up to 11.1 km of internal access tracks will upgraded and 14.4 km of new internal access tracks will be required as part of the proposed project, this includes new access points, new roads and widening for access. The proposed internal site track layout will permit access for vehicles during the construction phase, for maintenance during the operational phase and for vehicles to decommission the turbines at the end of the life of the project. All transport (e.g., plant and deliveries etc) for the proposed project will by via road. There will be an average daily increase of 71 HGV trips per day over a construction period of 18 months. This includes 7 average daily HGV trips for the construction of the grid connection over the course of the construction programme. LGV traffic generated by the construction of the project will average 37 daily trips per day. The combined HGV and LGV average daily increase is 107 trips per day. *Operation*	Refer to the sections above for potential impacts from the construction of the access tracks. The increase in traffic volumes fall below the screening criteria set out in the UK DMRB guidance (UK Highways Agency 2007). The guidance states that road links meeting one or more of the following criteria can be defined as being 'affected' by a project and should be included in the local air quality assessment: • Road alignment change of 5 metres or more; • Daily traffic flow changes by 1,000 AADT or more; • HGVs flows change by 200 vehicles per day or more; • Daily average speed changes by 10 km/h or more; or • Peak hour speed changes by 20 km/h or more. The combined HGV and LGV average daily increase is 107 trips per day, the operational traffic not exceeding the criteria and the decommissioning traffic being of much lower magnitude to that of the construction stage, the model is not required in this instance.

Project Feature	Description	Potential Impact
	Traffic associated with the operational phase of the project will be associated with the wind farm owner/operator and grid network operator personnel visiting the substation, and maintenance staff. There will also be a limited infrequent attendance by routine environmental monitoring/compliance staff. Along with private cars associated with the recreational amenity trails for community use. *Decommissioning* Impacts associated with the decommissioning of the project will be similar in nature to the construction stage but of a much lower magnitude primarily due to the following key reasons: • Wind farm access tracks will be left in-situ and reinstated using material from the site; • The grid connection will form part of the grid network and will be left in place; • Wind turbine components will be dismantled on site and can be removed on standard HGV's eliminating the requirement for temporary accommodation requirements needed at construction stage.	
Duration of construction, operation, decommissioning	The planning application is for A 10 year planning permission and 35 year operational life from the date of commissioning of the entire wind farm. The construction phase of the site is estimated at 18-24 months (worst case). It is expected that the decommissioning phase will take no longer than 6 months to complete.	Potential for seasonal displacement of birds due to loss of suitable feeding and/or breeding/wintering habitat during each stage of the lifetime of the proposed project. Generally, birds can experience disturbance impacts if disturbance incident occurs within 500m of foraging, nesting, or roosting areas (Holloway 1997; Scarton 2018; Maarten & Henkensj 1997). Furthermore, hen harrier have been found to avoid habitats within 250m to 500m from an operational turbine (Pearce-Higgins et al., 2012). Therefore, displacement equates to habitat loss for the lifetime of the wind farm for these species. Potential for seasonal displacement of QI species (i.e., otter) due to disturbance during key seasonal stages of the lifecycle during the construction and decommissioning stages. Disturbance to otter can occur up to 150m from the proposed works area (NRA guidance 2008). Potential for displacement of bird species due to the barrier effect of active wind farms, impacting regular movements or migration routes for migratory bird species causing species to exert more energy going around the site and finding new suitable locations. Potential for collision as the turbines will be much greater in height than the existing surrounding landscape.
In-combination	The potential impacts of the proposed project are considered in combination with other plans or projects within the zone of influence (refer to Table 3.1 below). This is to determine plans or projects which clearly have no connectivity to a European site's qualifying interests or where it can be excluded that the conservation objectives for the site's qualifying interests will be undermined despite a connection. The projects that have no connectivity / will not undermine the European site's conservation objectives, have been ruled out for assessment (refer to Appendix 8 for the full list of projects). All other plans or projects, including those where there is reasonable doubt as to the magnitude and nature of their impact to a European site's qualifying interests/ conservation objectives, are carried through to the next stage of assessment (Section 4). The plans and projects carried through to the next stage of assessment are outlined below. They have potential for in-combination effects with the proposed project due to the size, scale and/or potential connectivity to the proposed project or European site's within the zone of influence (refer to Table 3.1) of the proposed project. *Projects*	The construction phase of the proposed project has the greatest potential to contribute suspended solids/pollutants to nearby watercourses due to excavation works and general construction works (see above). If the construction phase of the proposed project were to occur in parallel with other plans or projects, in-combinations impacts may occur on the watercourses within the same sub-catchments. Flight height or the flight heights which birds habitually use along either migration or local flight paths is an influencing factor in determining whether the proposed development will combine with additional wind farms to produce additive, synergistic or antagonistic effects. These effects include increased 'Barrier Effect' (potentially obstructing migratory flightpaths), increased 'collision risk' (through combined mortality in susceptible species) and increased 'disturbance' to birds utilising foraging grounds whilst on migration. The proposed wind farm site and grid connection, along with BEMP Lands, are predominantly located within forestry and agricultural land. Potential impacts could arise if previously fertilised land were to be disturbed and mismanagement allowing nutrients / sediment to escape the site. Cumulative effects could occur if felling and construction activities at the wind farm site are undertaken in parallel with off-site forestry activities (particularly harvesting) and agricultural activities (particularly manure spreading) within the same catchment.

Project Feature	Description	Potential Impact
	Wind Farm Site, Grid Connection, TDR and BEMP There are no proposed or extant wind farms currently within the planning application system and eight operational wind farms within 20 km of the wind farm site with potential for in-combination effects. There are three finalised applications and one extension of duration for solar farms located within 20km of the proposed wind farm site with potential for in-combination effects. Large Scale/Infrastructure Projects include: • The construction of an extension to existing 110kv Boggeragh substation • The upgrading/replacement and extending of the existing wastewater treatment plant (WWTP) and installation of a new outfall pipe • The construction of a new two-storey primary school on a greenfield site • The uprate of a section of the existing Clashavoon to Tarbert 220kV overhead line • An extension to an existing limestone quarry • Retention of existing telecommunications support structures • Construction of a battery storage compound Small Scale Projects The majority of consent applications pertain to one-off residential dwelling or farm buildings/structures. The individual projects may not have potential for in-combination effects with the proposed project, however, cumulatively there is potential for in-combination effects with the proposed project. Replant Lands *Plans* • Draft Cork County Development Plan 2022-2028 • Cork County Development Plan 2014 • Draft Limerick County Development Plan 2022-2028 • Limerick County Development Plan 2010-2016 (as extended) • Draft Kerry County Development Plan 2022-2028 • Kerry County Development Plan 2015-2021 • River Basin Management Plan for Ireland 2018 – 2021 • Inland Fisheries Ireland Corporate Plan 2016 -2020	Rhododendron is also occasionally present within conifer plantations within the study area and in the surrounding landscape. There is a risk that machinery associated with tree felling could act as a vector for introducing or dispersing non-native invasive species, which may spread to adjacent lands and along nearby watercourses. Cumulative effects could occur if felling and construction activities at the wind farm site are undertaken in parallel with off-site forestry activities (particularly harvesting) within the same catchment.

3. SCREENING FOR APPROPRIATE ASSESSMENT

3.1 Introduction

This section of the report aims to determine if the proposed project is likely to have a significant effect upon European sites either alone or in combination with other plans or projects.

The screening assessment comprises the following steps:

1. Description of the plan or project subject to assessment (section 2.2 of this report)
2. Existing baseline of the plan or project study area (section 2.1 of this report)
3. Identification of relevant European sites (section 3.2 of this report)
4. Assessment of the likely significant direct, indirect and in-combination effects on the conservation objectives of the European site(s) of concern in relation to the proposed project (Section 3.3 of this report)
5. Screening conclusion (section 3.4 of this report)

The proposed project is not directly connected with or necessary to the management of a European site.

3.2 Identification of European Sites That May be Affected by the Proposed Project

European Commission Notice (2021) on the 'Assessment of plans and projects in relation to Natura 2000 sites – Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC, states that in identifying European sites (Natura 2000 sites) which may be affected by the project, the following should be identified:

- any European sites geographically overlapping with any of the actions or aspects of the plan or project in any of its phases, or adjacent to them;
- any European sites within the likely zone of influence of the plan or project. European sites located in the surroundings of the plan or project (or at some distance) that could still be indirectly affected by aspects of the project, including as regards the use of natural resources (e.g., water) and various types of waste, discharge or emissions of substances or energy;
- European sites in the surroundings of the plan or project (or at some distance) which host fauna that can move to the project area and then suffer mortality or other impacts (e.g., loss of feeding areas, reduction of home range);
- European sites whose connectivity or ecological continuity can be affected by the plan or project.

There are no European sites geographically overlapping with the Site, grid connection and BEMP Lands.

The Turbine Delivery Route will be along existing roads which traverse the following European sites:

- Lower River Shannon SAC (002165)
- Barrigone SAC (000432)

- Curraghchase Woods SAC (000174)
- Askeaton Fen Complex SAC (002279)
- River Shannon and River Fergus Estuaries SPA (004077)

However, there are no works proposed at these locations for the purpose of turbine delivery and as such the movement of delivery vehicles along the road will have no effects on these European sites.

Lesser horseshoe bats have been recorded in very low numbers, within the southwest of the study area. There are however no European sites designated for this QI species within the initial 15km search radius of European designated sites. As the designated sites for this species are all beyond the 2.5km core sustenance zone (CSZ) for lesser horseshoe bat (NPWS 2018) those recorded are not considered part of a population for which a site has been designated. Therefore, there are no potential impacts to the population of a European designated site from the proposed project.

The European sites within the likely zone of influence (ZoI) of the project were identified having regard to CIEEM (2018) '*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine'*. This guideline defines the ZoI as *"… the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities*." The likely spatial and temporal biophysical changes associated with the impacts (which was determined with reference to relevant published literature and guidance documents) are set out in Table 2-5. However, as a precautionary approach in defining the ecological features which may be affected, an initial buffer of 15km was first examined using Geographic Information System (GIS) Mapping (refer to *Figure 3-1*) and the conservation interests of these European sites were examined in order to ascertain whether there could be potential physical or ecological connectivity to the project and the associated likely project impacts. Additionally, any European sites beyond the initial 15km buffer with hydrological or physical connectivity were also identified for further examination. The findings of the ZoI assessment are presented in Table 3-1.

Table 3-1: European Sites Within the Potential ZoI

European Site (code)	List of Qualifying Interest/Special Conservation Interest	Distance from Proposed Project (km)	Pathway	Considered further in screening Y/N
Mullaghanish to Musheramore Mountains SPA (004162)	Hen Harrier (*Circus cyaneus*) [A082] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004162.pdf	0.5km to closest turbine, 0.0km to grid connection 2.7km to closest POI of the TDR (POI -44) 0.0km to closest BEMP Lands	SCI species have potential to occur in the environs of the proposed project given the foraging and migratory ranges (2-10km) of the species (having regard to Thaxter et al, 2012 and Scottish Natural Heritage, 2016) Hen Harrier have been observed within and outside the site study area. The SCI bird species are susceptible to habitat loss, noise and human presence during the construction stage. During the operational stage the SCI bird species are potentially susceptible to collision risk with turbine towers, blades (moving or stationary) and/or associated infrastructure and the barrier effect to regular movements. Hen Harrier have been found to avoid habitats within 250m to 500m from an operational turbine (Pearce-Higgins et al., 2012), therefore, displacement of the species is for the lifetime of the project. The wind farm site, grid connection and BEMP Lands are within the core feeding range (a defined range according to SNH 2016) of the SCI bird species of the SPA. As such it is assessed that the SPA is within the ZoI.	Y

European Site (code)	List of Qualifying Interest/Special Conservation Interest	Distance from Proposed Project (km)	Pathway	Considered further in screening Y/N
Blackwater River (Cork/Waterford) SAC (002170)	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Perennial vegetation of stony banks [1220] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Austropotamobius pallipes* (White-clawed Crayfish) [1092] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] A*losa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Trichomanes* speciosum (Killarney Fern) [1421] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf	3.5km to closest turbine 3.3km to grid connection 3.2km to closest BEMP Lands	Freshwater aquatic QI habitats (e.g., Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]) and species (e.g., *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029], Austropotamobius *pallipes* (White-clawed Crayfish) [1092] and *Salmo salar* (Salmon) [1106]) are highly susceptible to potential changes in water quality as a result of emissions to water and waste emissions. Having regard to the Precautionary Principle and noting the proximity of the onsite watercourses (for those which flow north into the Nadanuller Beg Stream and Glen (Banteer) Stream ultimately connecting to the SAC downstream), it is determined that there is potential for emissions released to the watercourses to ultimately enter the SAC. Therefore, the SAC is within the ZoI of the wind farm site.	Y
		0m to closest POI of the TDR (POI 34) POI 44 is 50m	Although there are no in-stream works required on the TDR, having regard to the Precautionary Principle and noting the proximity of the works required at Node 44 (50m from the SAC), it is determined that there is potential for emissions released to the River Owenbaun (Rathcool) which may ultimately enter the SAC. Therefore, the SAC is within the ZoI of the TDR.	Y

European Site (code)	List of Qualifying Interest/Special Conservation Interest	Distance from Proposed Project (km)	Pathway	Considered further in screening Y/N
The Gearagh SAC (000108)	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation [3270] 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] *Lutra lutra* (Otter) [1355] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000108.pdf	11.4km to closest turbine 6.1km to grid connection 14.6km to closest POI of the TDR (POI-45) 6.4km to closest BEMP Lands	Having regard to the spatial scale of the potential project impacts set out in Table 2-2 and given the distance of the European site from project, coupled with the fact that there are no mobile conservation interests associated and there is no connectivity (physical or hydrological) between the QI's and the project site, the European Site is assessed as outside of the ZoI of the project.	N
The Gearagh SPA (004109)	Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Mallard (*Anas platyrhynchos*) [A053] Coot (*Fulica atra*) [A125] Wetland and Waterbirds [A999] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004109.pdf	11.8km to closest turbine 6.6km to grid connection 14.9km to closest POI of the TDR (POI-45) 6.9km to closest BEMP Lands	Outside the core feeding range (a defined range according to SNH 2016 and Johnson et al 2014) of the SCI species Wigeon (*Anas penelope*) up to 5km, Teal (*Anas crecca*) up to 8.4km and Coot (*Fulica atra*) up to 1km, for the SPA, however, within the core feeding range for Mallard (*Anas platyrhynchos*) identified as up to 15km (Johnson 2014). Therefore, the based Precautionary Principle the SPA is within the ZoI of the wind farm site.	Y
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (000365)	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) [3110] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* [3130] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	11.9km to closest turbine 10km to grid connection 5.6km to closest POI of the TDR(POI-39) 11.9km to closest BEMP Lands	Although two Annex I habitats identified within the study boundary (4010 and 4030) are Qualifying Interests (QI) of the SAC (closest SAC to the proposed project for these QI's), there is no connectivity (including hydrological) between the proposed project and the SAC therefore there are no implications which are	N

European Site (code)	List of Qualifying Interest/Special Conservation Interest	Distance from Proposed Project (km)	Pathway	Considered further in screening Y/N
	Northern Atlantic wet heaths with Erica tetralix [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Juniperus communis formations on heaths or calcareous grasslands [5130] Calaminarian grasslands of the *Violetalia calaminariae* [6130] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Blanket bogs (* if active bog) [7130] Depressions on peat substrates of the Rhynchosporion [7150] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] Taxus baccata woods of the British Isles [91J0] *Geomalacus maculosus* (Kerry Slug) [1024] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Euphydryas aurinia* (Marsh Fritillary) [1065] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Najas flexilis* (Slender Naiad) [1833] *Alosa fallax killarnensis* (Killarney Shad) [5046]		liable to affect the conservation objectives of the site.	

European Site (code)	List of Qualifying Interest/Special Conservation Interest	Distance from Proposed Project (km)	Pathway	Considered further in screening Y/N
	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000365.pdf			
Mullaghanish Bog SAC (001890)	Blanket bogs (* if active bog) [7130] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO001890.pdf	12.5km to closest turbine 11.1km to grid connection 10.0km to closest POI of the TDR (POI-40) 12.0km to closest BEMP Lands	Having regard to the spatial scale of the potential project impacts set out in Table 2-2 and given the distance of the European site from the project, coupled with the fact that there are no mobile conservation interests associated and there is no ecological continuity (e.g., hydrological links) between these habitats and the project site, the European Site is assessed as outside of the ZoI of the project.	N
St. Gobnet's Wood SAC (000106)	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000106.pdf	15.5km to closest turbine 14.2km to grid connection 14.3km to closest POI of the TDR (POI-40) 14.9km to closest BEMP Lands	Having regard to the spatial scale of the potential project impacts set out in Table 2-2 and given the distance of the European site from the project, coupled with the fact that there are no mobile conservation interests associated and there is no ecological continuity between these habitats and the project site, the European Site is assessed as outside of the ZoI of the project.	N
Lower River Shannon SAC (002165)	Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170]	0.0km to closest POI of the TDR (POI-8) >15km to closest turbine, grid connection and BEMP Lands	Although the TDR traverses the road network within the SAC, no works are proposed and no invasive species have been identified at POIs that intersect the SAC. There is no connectivity (e.g., hydrological links) between the SAC and the proposed project, the	N

European Site (code)	List of Qualifying Interest/Special Conservation Interest	Distance from Proposed Project (km)	Pathway	Considered further in screening Y/N
	Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae*) [91E0] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002165.pdf		European Site is assessed as outside of the ZoI of the project.	

European Site (code)	List of Qualifying Interest/Special Conservation Interest	Distance from Proposed Project (km)	Pathway	Considered further in screening Y/N
Curraghchase Woods SAC (000174)	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] *Taxus baccata* woods of the British Isles [91J0] *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000174.pdf	0.08km to closest POI of the TDR (POI-7) >15km to closest turbine, grid connection and BEMP Lands	Although the TDR traverses the road network within the SAC, no works are proposed and no invasive species have been identified at POIs that intersect the SAC. There is no connectivity (e.g., hydrological links) between the SAC and the proposed project, the European Site is assessed as outside of the ZoI of the project.	N
Askeaton Fen Complex SAC (002279)	Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae [7210] Alkaline fens [7230] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002279.pdf	0.3km to closest POI of the TDR (POI-5) >15km to closest turbine, grid connection and BEMP Lands	Although the TDR traverses the road network within the SAC, no works are proposed and no invasive species have been identified at POIs that intersect the SAC. There is no connectivity (e.g., hydrological links) between the SAC and the proposed project, the European Site is assessed as outside of the ZoI of the project.	N
Barrigone SAC (000432)	*Juniperus communis* formations on heaths or calcareous grasslands [5130] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210] Limestone pavements [8240] *Euphydryas aurinia* (Marsh Fritillary) [1065] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000432.pdf	0.3km to closest POI of the TDR (POI-4) >15km to closest turbine, grid connection and BEMP Lands	Although the TDR traverses the road network within the SAC, no works are proposed and no invasive species have been identified at POIs that intersect the SAC. There is no connectivity (e.g., hydrological links) between the SAC and the proposed project, the European Site is assessed as outside of the ZoI of the project.	N
River Shannon and River Fergus Estuaries SPA (004077)	Cormorant (*Phalacrocorax carbo*) [A017] Whooper Swan (*Cygnus cygnus*) [A038] Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Wigeon (*Anas penelope*) [A050]	0.0km to closest POI of the TDR (POI-8) >15km to closest turbine, grid connection and BEMP Lands	Although the TDR traverses the road network within the SAC, no works are proposed and no invasive species have been identified at POIs that intersect the SAC.	N

European Site (code)	List of Qualifying Interest/Special Conservation Interest	Distance from Proposed Project (km)	Pathway	Considered further in screening Y/N
	Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Scaup (*Aythya marila*) [A062] Ringed Plover (*Charadrius hiaticula*) [A137] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Lapwing (*Vanellus vanellus*) [A142] Knot (*Calidris canutus*) [A143] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Redshank (*Tringa totanus*) [A162] Greenshank (*Tringa nebularia*) [A164] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004077.pdf		There is no connectivity (e.g., hydrological links) between the SAC and the proposed project, the European Site is assessed as outside of the ZoI of the project.	
Cork Harbour SPA (004030)	Little Grebe (*Tachybaptus ruficollis*) [A004] Great Crested Grebe (*Podiceps cristatus*) [A005] Cormorant (*Phalacrocorax carbo*) [A017] Grey Heron (*Ardea cinerea*) [A028] Shelduck (*Tadorna tadorna*) [A048] Wigeon (*Anas penelope*) [A050] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Red-breasted Merganser (*Mergus serrator*) [A069] Oystercatcher (*Haematopus ostralegus*) [A130] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141]	>15km to proposed project	Having regard to the spatial scale of the potential project impacts set out in Table 2-2 and given the distance of the European site from the project (c. 37km / c. 60km instream), coupled with the fact that the proposed project is beyond the core feeding range (a defined range according to SNH 2016 and Johnson et al 2014) of all the SCI, the European Site is assessed as outside of the ZoI of the project.	N

European Site (code)	List of Qualifying Interest/Special Conservation Interest	Distance from Proposed Project (km)	Pathway	Considered further in screening Y/N
	Lapwing (*Vanellus vanellus*) [A142] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Redshank (*Tringa totanus*) [A162] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Common Gull (*Larus canus*) [A182] Lesser Black-backed Gull (*Larus fuscus*) [A183] Common Tern (*Sterna hirundo*) [A193] Wetland and Waterbirds [A999]			
Great Island Channel SAC (001058)	Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]	>15km to proposed project	Having regard to the spatial scale of the potential project impacts set out in Table 2-2 and given the distance of the European site from the project (c. 37km / c. 60km instream), coupled with the fact that there are no mobile conservation interests associated and there is no ecological continuity between these habitats and the project site, the European Site is assessed as outside of the ZoI of the project.	N

The supporting documents for the sites listed in Table 3.1, available through the protected sites portal https://www.npws.ie/protected-sites, were accessed in January 2022.

Having further examined the likely spatial and temporal biophysical changes associated with the project impacts, it was determined that the following European Sites are within the ZoI of the project:

- Mullaghanish to Musheramore Mountains SPA
- Blackwater River (Cork/Waterford) SAC
- The Gearagh SPA

Once the ZoI is defined, an assessment must be made of the sensitivity of the qualifying interests to such impacts and as such the potential for significant effects. To that end, a 'Source-Pathway-Receptor' model was applied to determine European sites which may potentially be significantly affected having regard to the pathway for impact and the sensitivity of the conservation interests to the effect of the impact (see Tables 3-2 to Table 3-4).

004161 SPA

002170
SAC

000365 SAC

001890
SAC

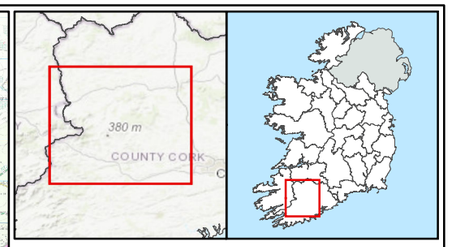
004162 SPA

000106
SAC

CLASHAVOON

004109
SPA

000108 SAC



Legend

- Wind Farm Site
- 15km Buffer of Wind Farm Site
- Clashavoon Substation (110-220kV)
- Grid Connection
- Turbine Delivery Route
- BEMP Lands
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

TITLE: European Sites within the Zone of Interest			
PROJECT: Ballinagree Wind Farm			
FIGURE NO:	3.1		
CLIENT:	Coillte and Ørsted		
SCALE:	1:150000	**REVISION:**	0
DATE:	17/01/2022	**PAGE SIZE:**	A3

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3.3 Assessment of Likely Significant Effects

3.3.1 Source-Pathway-Receptor Assessment & Potential for Significant Effects

The Office of the Planning Regulator's Practice Note PN01 recommends that the zone of influence of a project should be considered using the Source-Pathway-Receptor model.

European sites which may potentially be significantly affected by the proposed project are identified using the 'source-pathway-receptor' (S-P-R) conceptual model. The S-P-R model is a standard tool in environmental assessment to determine links between sensitive features and sources of impacts. In order for an effect to occur, all three elements of this mechanism must be in place. The absence of one of the elements of the mechanism means there is no likelihood for the effect to occur e.g., if there is no ecological pathway or functional link between the proposed development and the European site, there is no potential for impact and as such no potential for significant effects.

An impact may occur without having a significant effect. An impact is essentially the 'source' in the S-P-R assessment. It is the biophysical change caused to the environment by the project e.g., increase in sediment runoff due to ground disturbance. For the effect to be significant, the Qualifying Interests / Special Conservation Interests of the European site must be sensitive to the biophysical change. The likely impacts of the proposed project are set out in Section 2.6 of this report. The European sites within the Zone of Influence of these impacts are determined as outlined in Section 3.2. The potential for the proposed project to have significant effects on the aforementioned European sites are assessed hereunder on the basis of the source-pathway-receptor connectivity, and the sensitivity of the European sites qualifying interests to the effects of the impacts: *Table 3-2: Potential for significant effects on the Blackwater River (Cork/Waterford) SAC from the proposed project, Table 3-3: Potential for significant effects on the Mullaghanish to Musheramore Mountains SPA from the proposed project* and *Table 3-4: Potential for significant effects on the Gearagh SPA from the proposed project.*

Table 3-2: Potential for significant effects on the Blackwater River (Cork/Waterford) SAC from the proposed project

Source	Pathway	Receptor	Potential for Significant Effects
Land-take / Excavations of the Site and BEMP Works undertaken within the northeast of the Site (including construction of turbines 14, 15, 18, 19 and 20 along with associated works and felling for BEMP Lands) will potentially ultimately drain to the watercourses of the Nad_010 and Glen (Banteer)_10 sub-catchments. Trenching works at WF-HF12 and WF-HF15 within the northeast of the Site will result in the permanent loss of habitat within the footprint of the works. Along with potential indirect impacts to water quality and aquatic species within the watercourses of the Nad_010 **sub-catchment.**	Nadanuller Beg Stream and the Glen (Banteer) Stream The northeast of the Site drains ultimately into the Nadanuller Beg Stream and the Glen (Banteer) Stream which forms part of the Blackwater River (Cork/Waterford) SAC approximately 3.6km and 4.7km northeast of the wind farm site respectively. The Blackwater River (Cork/Waterford) SAC is designated for several aquatic species and habitats. Inappropriate site management of land take / excavations could lead to loss of silt laden run-off and/or suspended solids, as such having potential to alter the physicochemical conditions of the Nadanuller Beg Stream and Glen (Banteer) Stream with potential for similar effects in the downstream Blackwater River (Cork/Waterford) SAC.	Given that the impact pathway is a hydrological one, the qualifying interests of the Blackwater River (Cork/Waterford) SAC which may be vulnerable to such impact are the aquatic habitats and species. The aquatic qualifying interests of the Blackwater River (Cork/Waterford) SAC require particular environmental conditions such as physical habitat structure and water quality to support their conservation objectives within the SAC. The release of sediment or pollutants to the watercourse network could potentially impact the attributes needed to support the qualifying interests.	Potential for Significant Effects
Land-take / Excavations of the Grid Connection Vegetation disturbance associated with the grid connection and TDR will be localised and temporary. The vegetation to be disturbed is marginal and of low ecological value.	No pathway The grid connection is within the Sullane_SC_020 (19_7) sub-catchment, therefore, not within the catchments of the Nadanuller Beg Stream and Glen (Banteer) Stream. There is no pathway for impacts to the Blackwater River (Cork/Waterford) SAC from the grid connection.		No Potential for Significant Effects
Physical changes to the environment / change in existing environmental pressures Due to the depth of the foundations required for the turbines, impacts to GWDTE may include change in water depth (dewatering), rate of flow, timing of the change. The development of the wind farm has the potential to result in displacement of mammals (otters) due to on-site construction activities coupled with long-term loss of suitable feeding and/or breeding habitat associated with site clearance.	Disturbance to terrestrial and aquatic species Ruddock & Whitfield (2007) notes that animals' avoidance of humans or human activities can have several adverse effects on their distribution and abundance.	Given that the impact pathway is a physical one, the qualifying interests of the Blackwater River (Cork/Waterford) SAC which may be vulnerable to such impact are otter.	Potential for Significant Effects
Resource Requirements The proposed borrow pits (4 no.) will each have a footprint area of approximately 1ha, however none are proposed within the Nad_010 and Glen (Banteer)_10 sub-catchments	No pathway There are no proposed borrow pits within the Nad_010 and Glen (Banteer)_10 sub-catchments. There is no pathway for impacts to the Blackwater River (Cork/Waterford) SAC from the borrow pits.		No Potential for Significant Effects
Emissions to Air (dust) Earth works and movement of materials during construction works and decommissioning within the northeast of the Site will generate dust that has potential to ultimately drain (refer to emissions to water) to	Nadanuller Beg Stream and the Glen (Banteer) Stream The northeast of the Site drains ultimately into the Nadanuller Beg Stream and the Glen (Banteer) Stream which forms part of the Blackwater River (Cork/Waterford) SAC.	Given that the impact pathway is a hydrological one, the qualifying interests of the Blackwater River (Cork/Waterford) SAC which may be vulnerable to such impact are the aquatic habitats and species.	Potential for Significant Effects

Source	Pathway	Receptor	Potential for Significant Effects
the watercourses of the Nad_010 and Glen (Banteer)_10 sub-catchments. Machinery associated with tree felling could act as a vector for introducing or dispersing non-native invasive species, which may spread within the proposed development and to adjacent lands / watercourses.		The aquatic qualifying interests of the Blackwater River (Cork/Waterford) SAC require particular environmental conditions such as physical habitat structure and water quality to support their conservation objectives within the SAC. The release of sediment or pollutants to the watercourse network could potentially impact the attributes needed to support the qualifying interests.	
Noise Emissions The construction and demolition of the proposed wind farm has potential for noise disturbance to terrestrial and aquatic species.	Disturbance to terrestrial and aquatic species Disturbance to noise varies between species and is dependent on the nature of the noise source and sensitivity of the species e.g., the potential effects of anthropogenic sound on fish can range from direct mortality to no obvious behavioural responses and are dependent on the class of sound i.e., either continuous or impulsive (Popper et al. 2014, Popper & Hawkins 2019).		Potential for Significant Effects
Emissions to Water Sedimentation within runoff has potential to temporarily degrade the quality of watercourses of the Nad_010 and Glen (Banteer)_10 sub-catchments and as such reduce the carrying capacity of the watercourses for aquatic species. The release of cement / concrete to an aquatic environment can have the effect of altering the levels of pH, nitrate, phosphate, total solids, total suspended solids, total dissolved solids, turbidity and biological oxygen demand in the water. Cement products are particularly harmful to aquatic life due to the associated change in alkalinity in the water, which can cause burns to fish skin. The introduction of crayfish plague to watercourses of the Nad_010 and Glen (Banteer)_10 sub-catchments would likely be detrimental to the crayfish populations in the Blackwater (Munster) (ID 18) catchments, as has been witnessed in other rivers in Ireland e.g., the River Suir and River Barrow. Hydrocarbons are toxic to flora and fauna, including fish, and these chemicals tend to be persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms. Machinery associated with tree felling could act as a vector for introducing or dispersing non-native invasive species, which may spread to watercourses (albeit no invasive species were recorded in the vicinity of watercourse crossings during surveys). Potential for scouring the stream beds downstream of the operational wind farm due to increase flow rate from hard surfaces associated with the development.	Nadanuller Beg Stream and the Glen (Banteer) Stream The northeast of the Site drains ultimately into the Nadanuller Beg Stream and the Glen (Banteer) Stream which forms part of the Blackwater River (Cork/Waterford) SAC. The Blackwater River (Cork/Waterford) SAC is designated for several aquatic species and habitats. Inappropriate site management of emissions to water could lead to loss of silt laden run-off and/or suspended solids, having potential to alter the physicochemical conditions of the Nadanuller Beg Stream and Glen (Banteer) Stream with potential for similar effects in the downstream Blackwater River (Cork/Waterford) SAC.	Given that the impact pathway is a hydrological one, the qualifying interests of the Blackwater River (Cork/Waterford) SAC which may be vulnerable to such impact are the aquatic habitats and species. The aquatic qualifying interests of the Blackwater River (Cork/Waterford) SAC require particular environmental conditions such as physical habitat structure and water quality to support their conservation objectives within the SAC. The release of sediment or pollutants to the watercourse network could potentially impact the attributes needed to support the qualifying interests.	Potential for Significant Effects

Source	Pathway	Receptor	Potential for Significant Effects
Emissions to Water (TDR) Inappropriate management of tree removal at POI-43 has the potential to impact the River Owenbaun (Rathcool). Inappropriately managed ground reprofiling and placement of load bearing surface at POI 44 have potential to impact the River Owenbaun (Rathcool).	River Owenbaun (Rathcool) Although node 43 is adjacent to the River Owenbaun which forms part of the Blackwater River (Cork/Waterford) SAC c. 50m downstream of the proposed works, the minor works are confined to a small localised area outside the SAC and will be completed within 2 days. Therefore, therefore potential impacts will be limited and short term and it is not anticipated that this will have any impact to the SAC. The Owenbaun forms part of the Blackwater River (Cork/Waterford) SAC approx. 30m over-land and 75m downstream of the proposed works area (i.e., 105m shortest total distance). Inappropriate site management of emissions could lead to loss of silt laden run-off and/or suspended solids, having potential to alter the physicochemical conditions of the River Owenbaun (Rathcool) with potential for similar effects in the downstream Blackwater River (Cork/Waterford) SAC. However, POI 44 will only be in use for the duration of the construction program 12-18 months therefore potential impacts will be limited and short term.	No receptor	No Potential for Significant Effects
Waste emissions The release of generated waste to watercourses of the Nad_010 and Glen (Banteer)_10 sub-catchments have potential to altering the levels of pH, nitrate, phosphate, total solid, total suspended solids, total dissolved solids, turbidity and biological oxygen demand within the watercourses.	Nadanuller Beg Stream and the Glen (Banteer) Stream The northeast of the Site drains ultimately into the Nadanuller Beg Stream and the Glen (Banteer) Stream which forms part of the Blackwater River (Cork/Waterford) SAC. Inappropriate site management of waste emissions within the northeast of the Site could have potential to alter the physicochemical conditions of the Nadanuller Beg Stream and Glen (Banteer) Stream with potential for similar effects in the downstream Blackwater River (Cork/Waterford) SAC.	Given that the impact pathway is a hydrological one, the qualifying interests of the Blackwater River (Cork/Waterford) SAC which may be vulnerable to such impact are the aquatic habitats and species. The aquatic qualifying interests of the Blackwater River (Cork/Waterford) SAC require particular environmental conditions such as physical habitat structure and water quality to support their conservation objectives within the SAC. The release of sediment or pollutants to the watercourse network could potentially impact the attributes needed to support the qualifying interests.	Potential for Significant Effects
Transportation Requirements The increase in traffic volumes fall below the screening criteria set out in the UK DMRB guidance (UK Highways Agency 2007).	No pathway	No receptor	No Potential for Significant Effects
Duration of construction, operation, decommissioning Potential for seasonal displacement of otter due to disturbance during key seasonal stages of the lifecycle during the construction and decommissioning stages of turbines 14, 15, 18, 19 and 20 along with associated works. Disturbance to otter can occur up to 150m from the proposed works area.	Disturbance to terrestrial species	Given that the impact pathway is a physical one, the qualifying interests of the Blackwater River (Cork/Waterford) SAC which may be vulnerable to such impact are otter.	Potential for Significant Effects

Source	Pathway	Receptor	Potential for Significant Effects
In-combination Cumulative effects could occur if felling and construction activities at the wind farm site are undertaken in parallel with other projects including off-site forestry activities (particularly harvesting) and agricultural activities (particularly manure spreading) within the same catchment, ultimately adding potential nutrients / spreading of invasive species to the watercourses of the Nad_010 and Glen (Banteer)_10 sub-catchments and further impacting the aquatic qualifying interests.	Nadanuller Beg Stream and the Glen (Banteer) Stream The northeast of the Site drains ultimately into the Nadanuller Beg Stream and the Glen (Banteer) Stream which forms part of the Blackwater River (Cork/Waterford) SAC. Site mis-management could lead to loss of sedimentation, pollution, nutrient, waste, etc (see above). If this were to occur in parallel with other projects in-combination effects will be cumulative on the Nadanuller Beg Stream and Glen (Banteer) Stream with potential for similar impacts in the downstream Blackwater River (Cork/Waterford) SAC.	Given that the impact pathway is a hydrological one, the qualifying interests of the Blackwater River (Cork/Waterford) SAC which may be vulnerable to such impact are the aquatic habitats and species. The aquatic qualifying interests of the Blackwater River (Cork/Waterford) SAC require particular environmental conditions such as physical habitat structure and water quality to support their conservation objectives within the SAC. The release of sediment or pollutants to the watercourse network could potentially impact the attributes needed to support the qualifying interests.	Potential for Significant Effects

Table 3-3: Potential for significant effects on the Mullaghanish to Musheramore Mountains SPA from the proposed project

Source	Pathway	Receptor	Potential for Significant Effects
Land-take / Excavations of the Site and BEMP The construction of the wind farm and BEMP Lands will result in the permanent removal of 88ha of plantation woodland (including recently planted 2nd rotation stock). Following construction, the development of the proposed windfarm will result in the long-term reduction in the density of forest cover within the site in order to accommodate the construction of the proposed 20 no. wind turbines.	QI species (hen harrier) Unmanaged areas of clear felling have the potential to create large areas of suitable habitat for the QI species (hen harrier) of the SPA.	The QI species (hen harrier) require suitable habitats to breed, forage and nest (including winter). There was no nesting or roosting observed for this species within the wind farm site.	Potential for Significant Effects
Land-take / Excavations of the Grid Connection Vegetation disturbance associated with the grid connection and TDR will be localised and temporary. The vegetation to be disturbed is marginal and of low ecological value.	No pathway The majority of the cable route will be within existing road, with limited requirement for vegetation removal. Where excavation is required within the road verge or road boundary to accommodate the installation of the grid cable, the vegetation will be reinstated.	No receptor	No Potential for Significant Effects
Physical changes to the environment / change in existing environmental pressures The construction of the wind farm and BEMP Lands will result in the permanent removal of 88ha of plantation woodland (including recently planted 2nd rotation stock) along with other habitats suitable for the QI species hen harrier within and around the wind farm infrastructure. The operation of the site will comprise 20 no. wind turbines which have the potential to have a barrier effect and collision risk for bird and bat species. The presence of the turbines will also have potential to displace the bird species.	QI species (hen harrier) There is potential for the disturbance/displacement of bird species during the lifetime of the project through habitat loss. The displacement of birds from areas within and surrounding developments can effectively amount to habitat loss (Drewitt, A. L. and Langston, R. H., 2006). If a habitat is therefore avoided as a result of the disturbance, then effective habitat loss can occur. As the turbines will be much greater in height than the surrounding landscape, there is potential for collision with turbine towers, blades (moving or stationary) and/or associated infrastructure; or a barrier effect to regular movements of the QI bird species within the area of the turbines.	The QI species (hen harrier) require suitable habitats to breed, forage and nest (including winter).	Potential for Significant Effects

Source	Pathway	Receptor	Potential for Significant Effects
Resource Requirements The proposed borrow pits (4 no.) are located within areas of the Site that comprise habitats that are not suited by the QI species hen harrier.	No pathway	No receptor	No Potential for Significant Effects
Emissions to Air Earth works and movement of materials during construction works and decommissioning of the Site will generate carbon dioxide (CO2), oxides of nitrogen (NOx), sulphur dioxide (SO2) and dust emissions. The guidance specifies that, for sensitive ecological receptors, sensitivity to dust is 'High' up to 20m from the source and reduces to 'Medium' over 50m from the source.	QI species (hen harrier) Indirect impact on QI species due to impacts on the species' broad habitat. However, there was no nesting or roosting observed for the QI species within the wind farm site. The impacts will be reversible once the works are completed, and emissions to air from construction cease.	No receptor	No Potential for Significant Effects
Noise Emissions **The proposed project will see an increase of human presence and activities which can cause abandonment of hen harrier roosts and nests.** Areas with wind turbines tend to be subject to higher levels of noise (from higher wind speeds or from turbine operation). Habitat selection by Hen Harriers is positively correlated with foraging success rates and they have been shown to actively select habitats where they experience the highest prey strike and capture rates. This would result in the avoidance of forested areas where vegetation-wind interactions produce higher noise levels and areas where turbine noise may influence acoustic cues used by hunting Hen Harriers (Wilson 2015).	QI species (hen harrier) During wind farm construction, displacement of hen harrier has been suggested potentially to occur up to 500 m around construction sites with some disruption up to 1 km, depending on line of visibility (Ruddock & Whitfield, 2007). The displacement of birds from areas within and surrounding developments can effectively amount to habitat loss. If a habitat is therefore avoided as a result of the disturbance, then effective habitat loss can occur.	The QI species (hen harrier) require suitable habitats to breed, forage and nest (including winter).	Potential for Significant Effects
Emissions to Water Sedimentation within runoff has potential to temporarily degrade the quality of watercourses within and connected to the proposed project and as such reduce the carrying capacity of the watercourses for aquatic species. The release of cement / concrete to an aquatic environment can have the effect of altering the levels of pH, nitrate, phosphate, total solids, total suspended solids, total dissolved solids, turbidity and biological oxygen demand in the water. Cement products are particularly harmful to aquatic life due to the associated change in alkalinity in the water, which can cause burns to fish skin. Hydrocarbons are toxic to flora and fauna, including fish, and these chemicals tend to be persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms. Machinery associated with tree felling could act as a vector for introducing or dispersing non-native invasive species, which may spread to watercourses (albeit no invasive species were recorded in the vicinity of watercourse crossings during surveys).	QI species (hen harrier) Indirect impacts via the loss of aquatic prey due to changes in water quality.	The QI species (hen harrier) require suitable foraging habitats.	Potential for Significant Effects

Source	Pathway	Receptor	Potential for Significant Effects
Waste emissions The release of generated waste to watercourses of the proposed project have potential to altering the levels of pH, nitrate, phosphate, total solid, total suspended solids, total dissolved solids, turbidity and biological oxygen demand within the watercourses.	QI species (hen harrier) Indirect impacts via the loss of aquatic prey due to changes in water quality.	The QI species (hen harrier) require suitable foraging habitats.	Potential for Significant Effects
Transportation Requirements The combined HGV and LGV average daily increase is 88 trips per day.	QI species (hen harrier) Increased traffic movements may impact the QI species directly through collision or indirectly though avoidance of the area.	The QI species (hen harrier) require suitable habitats to breed, forage and nest (including winter).	Potential for Significant Effects
Duration of construction, operation, decommissioning Potential for seasonal displacement of birds due to loss of suitable feeding and/or breeding/wintering habitat during each stage of the lifetime of the proposed project. The sensitivity of QI species hen harrier has been identified as being up to 2km (McGuiness et al 2015). Therefore, displacement equates to habitat loss for the lifetime of the wind farm for these species. Potential for displacement of bird species due to the barrier effect of active wind farms, impacting regular movements or migration routes for migratory bird species causing species to exert more energy going around the site and finding new suitable locations. Potential for collision as the turbines will be much greater in height than the existing surrounding landscape.	QI species (hen harrier) There is potential for the disturbance/displacement of bird species during the lifetime of the project through habitat loss. The displacement of birds from areas within and surrounding developments can effectively amount to habitat loss (Drewitt, A. L. and Langston, R. H., 2006). If a habitat is therefore avoided as a result of the disturbance, then effective habitat loss can occur. As the turbines will be much greater in height than the surrounding landscape, there is potential for collision with turbine towers, blades (moving or stationary) and/or associated infrastructure; or a barrier effect to regular movements of the QI bird species within the area of the turbines.	The QI species (hen harrier) require suitable habitats to breed, forage and nest (including winter).	Potential for Significant Effects
In-combination The construction phase of the proposed project has the potential to contribute suspended solids/pollutants to nearby watercourses due to excavation works and general construction works (see above). If the construction phase of the proposed project were to occur in parallel with other plans or projects, in-combinations impacts may occur on the watercourses within the same sub-catchments. Flight height or the flight heights which birds habitually use along either migration or local flight paths is an influencing factor in determining whether the proposed development will combine with additional wind farms to produce additive, synergistic or antagonistic effects. These effects include increased 'Barrier Effect' (potentially obstructing migratory flightpaths), increased 'collision risk' (through combined mortality in susceptible species) and increased 'disturbance' to birds utilising foraging grounds whilst on migration.	QI species (hen harrier) Site mis-management could lead to loss of sedimentation, pollution, nutrient, waste, etc (see above). If this were to occur in parallel with other projects in-combination effects will be cumulative on the watercourses within and connected to the proposed project. The increased number of turbines surrounding the SPA may have a cumulative impact on the migratory path or foraging habits of the QI species.	The QI species (hen harrier) require suitable habitats to breed, forage and nest (including winter).	Potential for Significant Effects

Table 3-4: Potential for significant effects on the Gearagh SPA from the proposed project

Source	Pathway	Receptor	Potential for Significant Effects
Land-take / Excavations of the Site and BEMP The construction of the wind farm will result in the permanent removal of wetland habitats suitable for the QI species wigeon, teal, mallard and coot within and around the wind farm infrastructure.	QI species Generally, birds can experience disturbance impacts if disturbance incident occurs within 500m of foraging, nesting, or roosting areas (Holloway 1997; Scarton 2018; Maarten & Henkensj 1997).	The QI species require suitable habitats to breed, forage and nesting (including winter). There was no nesting or roosting observed for these species within the wind farm site.	Potential for Significant Effects
Land-take / Excavations of the Grid Connection Vegetation disturbance associated with the grid connection and TDR will be localised and temporary. The vegetation to be disturbed is marginal and of low ecological value.	No pathway The majority of the cable route will be within existing road, with limited requirement for vegetation removal. Where excavation is required within the road verge or road boundary to accommodate the installation of the grid cable, the vegetation will be reinstated.		No Potential for Significant Effects
Physical changes to the environment / change in existing environmental pressures The operation of the site will comprise 20 no. wind turbines which have the potential to have a barrier effect and collision risk for bird and bat species. The presence of the turbines will also have potential to displace the bird / bat species.	QI species There is potential for the disturbance/displacement of bird species during the lifetime of the project through habitat loss. The displacement of birds from areas within and surrounding developments can effectively amount to habitat loss (Drewitt, A. L. and Langston, R. H., 2006). If a habitat is therefore avoided as a result of the disturbance, then effective habitat loss can occur. As the turbines will be much greater in height than the surrounding landscape, there is potential for collision with turbine towers, blades (moving or stationary) and/or associated infrastructure; or a barrier effect to regular movements of the QI bird species within the area of the turbines.	The QI species require suitable habitats to breed, forage and nesting (including winter).	Potential for Significant Effects
Resource Requirements The proposed borrow pits (4 no.) are located within areas of the Site that comprise habitats that are not suited by the QI species.	No pathway		No Potential for Significant Effects
Emissions to Air Earth works and movement of materials during construction works and decommissioning of the Site will generate carbon dioxide (CO2), oxides of nitrogen (NOx), sulphur dioxide (SO2) and dust emissions. The guidance specifies that, for sensitive ecological receptors, sensitivity to dust is 'High' up to 20m from the source and reduces to 'Medium' over 50m from the source.	QI species Indirect impact on QI species due to impacts on the species' broad habitat. However, there was no nesting or roosting observed for the QI species within the wind farm site. Impacts will be reversible once the works are completed, and emissions to air from construction cease.		No Potential for Significant Effects

Source	Pathway	Receptor	Potential for Significant Effects
Noise Emissions The proposed project will see an increase of human presence and activities which can cause displacement and abandonment of roosts and nests. Areas with wind turbines tend to be subject to higher levels of noise (from higher wind speeds or from turbine operation). Feed on both plants and animals, but mainly on plants.	QI species Generally, birds can experience disturbance impacts if disturbance incident occurs within 500m of foraging, nesting, or roosting areas (Holloway 1997; Scarton 2018; Maarten & Henkensj 1997). The displacement of birds from areas within and surrounding developments can effectively amount to habitat loss. If a habitat is therefore avoided as a result of the disturbance, then effective habitat loss can occur.	The QI species require suitable habitats to breed, forage and nesting (including winter).	Potential for Significant Effects
Emissions to Water Sedimentation within runoff has potential to temporarily degrade the quality of watercourses within and connected to the proposed project and as such reduce the carrying capacity of the watercourses for aquatic species. The release of cement / concrete to an aquatic environment can have the effect of altering the levels of pH, nitrate, phosphate, total solids, total suspended solids, total dissolved solids, turbidity and biological oxygen demand in the water. Cement products are particularly harmful to aquatic life due to the associated change in alkalinity in the water, which can cause burns to fish skin. Hydrocarbons are toxic to flora and fauna, including fish, and these chemicals tend to be persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms. Machinery associated with tree felling could act as a vector for introducing or dispersing non-native invasive species, which may spread to watercourses (albeit no invasive species were recorded in the vicinity of watercourse crossings during surveys).	QI species Indirect impacts via the loss of aquatic prey due to changes in water quality.	The QI species require suitable foraging habitats.	Potential for Significant Effects
Waste emissions The release of generated waste to watercourses of the proposed project have potential to altering the levels of pH, nitrate, phosphate, total solid, total suspended solids, total dissolved solids, turbidity and biological oxygen demand.	QI species Indirect impacts via the loss of aquatic prey due to changes in water quality.	The QI species require suitable foraging habitats.	Potential for Significant Effects
Transportation Requirements The combined HGV and LGV average daily increase is 88 trips per day.	QI species Increased traffic movements may impact the QI species directly through collision or indirectly though avoidance of the area. However, the QI species do not have a high collision rate with traffic due to their agile ability to move from the path of traffic.		No Potential for Significant Effects
Duration of construction, operation, decommissioning Potential for seasonal displacement of birds due to loss of suitable feeding and/or breeding/wintering habitat during each stage of the lifetime of the	QI species (hen harrier) There is potential for the disturbance/displacement of bird species during the lifetime of the project through habitat loss.	The QI species require suitable habitats to breed, forage and nest (including winter).	Potential for Significant Effects

Source	Pathway	Receptor	Potential for Significant Effects
proposed project. Generally, birds can experience disturbance impacts if disturbance incident occurs within 500m of foraging, nesting, or roosting areas (Holloway 1997; Scarton 2018; Maarten & Henkensj 1997). Potential for displacement of bird species due to the barrier effect of active wind farms, impacting regular movements or migration routes for migratory bird species causing species to exert more energy going around the site and finding new suitable locations. Potential for collision as the turbines will be much greater in height than the existing surrounding landscape.	The displacement of birds from areas within and surrounding developments can effectively amount to habitat loss (Drewitt, A. L. and Langston, R. H., 2006). If a habitat is therefore avoided as a result of the disturbance, then effective habitat loss can occur. As the turbines will be much greater in height than the surrounding landscape, there is potential for collision with turbine towers, blades (moving or stationary) and/or associated infrastructure; or a barrier effect to regular movements of the QI bird species within the area of the turbines.		
In-combination The construction phase of the proposed project has the greatest potential to contribute suspended solids/pollutants to nearby watercourses due to excavation works and general construction works (see above). If the construction phase of the proposed project were to occur in parallel with other plans or projects, in-combinations impacts may occur on the watercourses within the same sub-catchments. Flight height or the flight heights which birds habitually use along either migration or local flight paths is an influencing factor in determining whether the proposed development will combine with additional wind farms to produce additive, synergistic or antagonistic effects. These effects include increased 'Barrier Effect' (potentially obstructing migratory flightpaths), increased 'collision risk' (through combined mortality in susceptible species) and increased 'disturbance' to birds utilising foraging grounds whilst on migration.	QI species Site mis-management could lead to loss of sedimentation, pollution, nutrient, waste, etc (see above). If this were to occur in parallel with other projects in-combination effects will be cumulative on the watercourses within and connected to the proposed project. The increased number of turbines surrounding the SPA may have a cumulative impact on the migratory path or foraging habits of the QI species.	The QI species require suitable habitats to breed, forage and nest (including winter).	Potential for Significant Effects

3.4 Screening Conclusion Regarding Likely Significant Effects

There is the possibility that there could be negative effects on the Mullaghanish to Musheramore Mountains SPA, Blackwater River (Cork/Waterford) SAC, and the Gearagh SPA as a result of indirect effects from the proposed project either alone or in-combination with other plans and projects. In the absence of mitigation measures (which have not been considered at this screening stage), likely significant effects on the qualifying interests of the Mullaghanish to Musheramore Mountains SPA, Blackwater River (Cork/Waterford) SAC, and The Gearagh SPA cannot be excluded on the basis of objective scientific information. A Stage 2 Appropriate Assessment of the potential impact on the Mullaghanish to Musheramore Mountains SPA, Blackwater River (Cork/Waterford) SAC, and The Gearagh SPA will therefore be required.

A Natura Impact Statement has been completed (See Section 4) in respect of:

- Mullaghanish to Musheramore Mountains SPA (004162),
- Blackwater River (Cork/Waterford) SAC (002170), and
- The Gearagh SPA (004109).

No pathways for likely significant effects on any other European sites, were identified. Thus, it can be excluded beyond reasonable scientific doubt, in view of best scientific knowledge on the basis of objective information and in light of the conservation objectives of the relevant European sites, that the proposed project (main wind farm site, grid connection, TDR and biodiversity enhancement areas) individually or in combination with other plans and projects, will have a significant effect the following sites:

- The Gearagh SAC (000108)
- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (000365)
- Mullaghanish Bog SAC (001890)
- St. Gobnet's Wood SAC (000106)
- Lower River Shannon SAC (002165)
- Barrigone SAC (000432)
- Curraghchase Woods SAC (000174)
- Askeaton Fen Complex SAC (002279)
- River Shannon and River Fergus Estuaries SPA (004077)
- Cork Harbour SPA
- Great Island Channel SAC

Therefore, these sites have been ‘Screened Out’ at Stage One of the AA process.

4. NATURA IMPACT STATEMENT

4.1 Introduction

The screening assessment (Section 3 of this report) carried out to determine the likelihood of significance effects on European sites from the proposed project has concluded as follows:

There is the possibility that there could be negative effects on the Mullaghanish to Musheramore Mountains SPA, Blackwater River (Cork/Waterford) SAC, and the Gearagh SPA as a result of indirect effects from the proposed project either alone or in-combination with other plans and projects. In the absence of mitigation measures (which have not been considered at the screening stage), likely significant effects of the proposed project, individually or in combination with other plans or projects on the qualifying interests of the Mullaghanish to Musheramore Mountains SPA, Blackwater River (Cork/Waterford) SAC, and The Gearagh SPA cannot be excluded on the basis of objective scientific information.

The potential for significant effects result from:

- Blackwater River (Cork/Waterford) SAC,
    - Land-take / Excavations of the Site and BEMP
    - Physical changes to the environment / change in existing environmental pressures
    - Emissions to Air (dust)
    - Noise Emissions
    - Emissions to Water
    - Waste emissions
    - Duration of construction, operation, decommissioning
    - In-combination

- Mullaghanish to Musheramore Mountains SPA
    - Land-take / Excavations of the Site and BEMP
    - Physical changes to the environment / change in existing environmental pressures
    - Noise Emissions
    - Waste emissions
    - Transportation Requirements
    - Duration of construction, operation, decommissioning
    - In-combination

- The Gearagh SPA
    - Land-take / Excavations of the Site and BEMP
    - Physical changes to the environment / change in existing environmental pressures
    - Noise Emissions
    - Waste emissions
    - Duration of construction, operation, decommissioning
    - In-combination

It has further determined the TDR will not have likely significant effects on any European site and that the grid connection has no hydrological connectivity to the Blackwater River (Cork/Waterford) SAC. Therefore, the TDR will not be carried forward within the Natura Impact Statement.

Further consideration is given in this Natura Impact Statement (NIS) to the elements of the proposed project which might have adverse effects on the integrity of the aforementioned European sites with respect to each site's conservation objectives.

Refer to section 2 for the project description and baseline environment.

4.2 European Sites Description

4.2.1 Blackwater River (Cork/Waterford) SAC

The River Blackwater is one of the largest rivers in Ireland, draining a major part of Co. Cork and parts of Co's. Kerry, Limerick, Tipperary and Waterford. In total, the Blackwater is 169 km long and has a total catchment area of 3,324 km^2. The site consists of most of the freshwater stretches of the system as well as the estuarine component at Youghal. Tidal influence extends almost to Cappoquin. The Blackwater rises in the east Kerry uplands where Namurian grits and shales build the low heather-covered plateaux. In the lowlands in the Mallow district, it passes over limestone and later cuts through ridges of Old Red Sandstone to the south of Cappoquin. Main tributaries include the Rivers Lickey, Bride, Allow and Awbeg. A wide range of habitats associated with the rivers are included within the site, including substantial areas of woodland (deciduous, mixed), scrub, wet grassland, swamp and marsh vegetation, bog, salt marshes and intertidal sand and mud flats. Areas of improved grassland, arable land and coniferous plantations are included in the site for water quality reasons.

The site supports important examples of a range of Annex I habitats, notably estuaries, intertidal mudflats and sandflats, perennial vegetation of stony banks, salt meadows, floating river vegetation, alluvial forests and oak woodlands. Most of these are of good quality and extensive in area. The Blackwater system is an important salmonid fishery and is of high conservation value for Atlantic salmon. Also supports important populations of lamprey (Brook, river and sea) and Thwaid Shad. Substantial populations of Freshwater Pearl Mussel occur, while white-clawed crayfish is found in the Awbeg River. Otter is widespread throughout the site and has been subject to detailed surveys. Killarney Fern occurs at one location. (NPWS 2016)

The main threats and pressures which may impact the Blackwater River (Cork/Waterford) SAC are set out in the Natura 2000 Data Form and are presented in *Table 4-1: Threats, Pressures and Activities with Impacts on the Blackwater River (Cork/Waterford) SAC.*

The features of interest of the site include a number of Annex I habitats, priority habitats and Annex II species under the EU Habitats Directive as shown in Table 4-2: *Summary of the potential occurrence of qualifying interests of the Blackwater River (Cork/Waterford) SAC within the Blackwater[Munster]_SC_050 and Blackwater[Munster]_SC_070 sub-catchment survey area.*

Table 4-1: Threats, Pressures and Activities with Impacts on the Blackwater River (Cork/Waterford) SAC

High Level (inside site)	High Level (outside site)	Medium Level (inside site)	Medium Level (outside site)	Low Level (inside site)	Low Level (outside site)
A04: grazing	A04: grazing	F02.03: Leisure fishing	E02: Industrial or commercial areas	G01.01: motorized nautical sports	C01.01: Sand and gravel extraction
A08: fertilization	A08: fertilization	I01: fire and fire suppression	J02.01: Landfill, land reclamation and drying out, general	J02.01: Landfill, land reclamation and drying out, general	G02: Sport and leisure structures
A03: mowing / cutting of grassland			B: Sylviculture, forestry	D01.04: railway lines, TGV	
			E01: Urbanised areas, human habitation	D01.02: roads, motorways	
			I01: fire and fire suppression	B: Sylviculture, forestry	
				E03.01: disposal of household / recreational facility waste	
				K01.01: Erosion	

Source: Blackwater River (Cork/Waterford) SAC (002170) Natura 2000 Data Form, https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF002170.pdf

4.2.2 Aquatic Surveys

A suite of aquatic ecological surveys were undertaken by Triturus Environmental Ltd in September 2020 undertaken on a catchment-wide scale, this included:

- Habitat Assessment
    - 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.)
    - Flow type, listing percentage of riffle, glide and pool in the sampling area
    - An appraisal of the macrophyte and aquatic bryophyte community at each site
    - Riparian vegetation composition
- Catchment-wide electro-fishing
- White-clawed crayfish survey
- Freshwater pearl mussel survey
- Biological water quality (Q-sampling)
- Physiochemical water quality
- Otter survey

Refer to Appendix 2 for the Aquatic survey methodologies used to undertake surveys.

4.2.2.1 Selection of Watercourses for Assessment

All freshwater watercourses which could be affected directly or indirectly by the proposed project were considered as part of the assessment. This included watercourses draining the proposed wind farm site as well as those crossed by the proposed grid connection route and turbine delivery route (where any works had potential to cause impacts). A total of *n*=40 locations were selected for detailed aquatic assessment (see Table 4.2 and Plate 4.1 below). Sites were grouped according to survey clusters, i.e. A (north of proposed project), B (within project site) and C (downstream of project site). An additional *n*=5 surveys locations (i.e., sites N1, N2, N3, N4 & N5) were surveyed in June 2021 to reflect the updated site infrastructural layout. The nomenclature for the watercourses surveyed is as per the Environmental Protection Agency's (EPA) online map viewer.

A fisheries assessment (including electro-fishing and fisheries habitat appraisal) and white-clawed crayfish survey was undertaken at *n*=35 sites in June-July 2020 (Table 4.2 and Plate 4.1). A fisheries appraisal (no electro-fishing) was undertaken at an additional *n*=5 locations in June 2021 to reflect the updated site infrastructural layout (i.e., sites N1, N2, N3 & N4 and N5).

Biological water quality sampling (Q-sampling) was undertaken at a representative sub-set of these sites (i.e., *n*=21 sites; A1, A2, A5, B6, B7, B8, B9, B10, B11, C3, C5, C7, C11, C12, C13, C17, N1, N2, N3, N4 & N5).

Physiochemical water quality samples were taken from a total of *n*=15 sites (i.e., A1, A2, A5, B6, B7, B8, B9, B10, C7, C13, C17, N1, N2, N3 & N4). A freshwater pearl mussel survey was conducted on sections of the River Laney and Awboy River.

This holistic approach informed the overall aquatic ecological evaluation of each site in context of the proposed wind farm project.

Table 4-2: *n*=40 aquatic survey locations for the proposed project (watercourse names are according to the EPA)

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
A1	Nadanuller Beg Stream	18N05	Carrigagulla	536890	587246
A2	Nadanuller Beg Stream	18N05	Carrigagulla	537742	587571
A3	Unnamed stream	n/a	Crinnaloo South	538409	587668
A4	Unnamed stream	n/a	Crinnaloo South	538946	587720
A5	Glen River	18G04	Inchamay South	540517	587756
B1	Carrigagulla Stream	19C22	Carrigagulla	536626	585034
B2	Unnamed stream	n/a	Knocknagappal	534010	584604
B3	West Ballinagree Stream	19W12	Knocknagappal	534023	583798
B4	Knocknagappal 19 Stream	19K04	Knocknagappal	534644	583730
B5	River Laney	19L01	Ballynagree West	535126	584076
B6	River Laney	19L01	Ballynagree West	535248	583913
B7[3]	Unnamed stream	n/a	Ballynagree East	535968	584267
B8	River Laney	19L01	Ballynagree East	536600	583906
B9	Unnamed stream	n/a	Carrigagulla	538378	584701
B10	Ballynagree East Stream	19B21	Ballynagree East	536999	581849
B11	River Laney	19L01	Annagannihy	539060	582814
C1	Carrigthomas Stream	19C48	Knocknagappul	534443	582576
C2	Maulnahorna Stream	19M10	Rahalisk	533717	582074
C3	Carrigthomas Stream	19C48	Horsemount Bridge	534597	581268
C4	Rahalisk Stream	19R08	Knocknagappul	535030	580521
C5	Carrigthomas Stream	19C48	Coppeleenbawn Bridge	535286	579818
C6	Unnamed stream	n/a	Knocknagappul	536028	580673
C7	River Laney	19L01	Ballynagree West	536793	580028
C8	Lacknahaghny Stream	19L21	Lacknahaghny	536625	579348
C9	Unnamed stream	n/a	Carrigthomas	536313	579387
C10	Unnamed stream	n/a	Carrigthomas	535957	579674
C11	River Laney	19L01	Knocknagappul Bridge	535409	579769
C12	Awboy River	19A03	Awboy Bridge	534960	579216
C13	River Laney	19L01	Clonavrick Bridge	534605	578297
C14	Clonavrick Stream	19C74	Clonavrick	535048	577820
C15	Coolaniddane River	19C67	Caherbaroul	536466	577955
C16	Kilberrihert Stream	19K24	Derryroe	536269	577345

[3] Biological and physiochemical water quality sampling at this site was undertaken in May 2021

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
C17	Coolaniddane River	19C67	Caherbaroul	536005	577472
C18	Caherbaroul Stream	19C76	Caherbaroul	535712	577653
C19	Bealick Stream	19B45	Rockville	536620	577111
N1	West Ballynagree Stream	19W12	Knocknagappul	534473	583824
N2	River Laney	19L01	Knocknagappul	534962	584267
N3	Unnamed stream	n/a	Ballynagree East	535352	585631
N4	River Laney	19L01	d/s ford crossing at Carrigagulla	536666	583905
N5	Unnamed stream	n/a	Knocknagappul	534809	581860

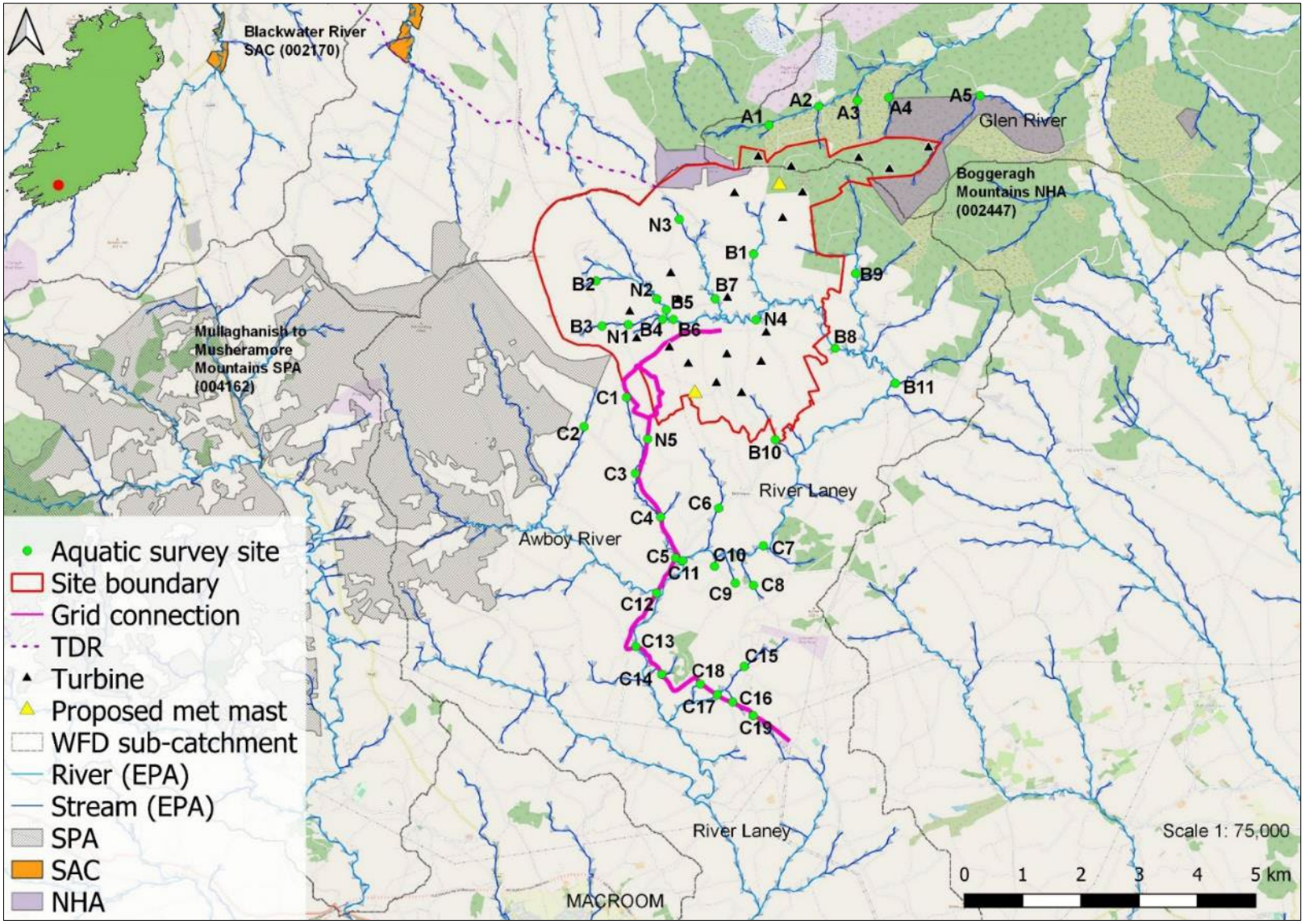


Plate 4-1: Overview of the n=40 aquatic surey locations for the proposed project

4.2.2.2 Desk Study

A sensitive species data request was submitted (9th November 2020) to the National Parks and Wildlife Service for the 10km grid squares containing and adjoining the proposed project (i.e., W28, W37, W38, W48 & W49) and was received on the 12th November 2020. Data held by the NDBC was also reviewed in November 2021. Records for a number of rare or protected species were available although none overlapped directly with the site boundary. However, several records overlapped with or shared hydrological connectivity with associated infrastructure (i.e., grid connection route, turbine delivery route).

A total of n=6 records for freshwater pearl mussel (*Margaritifera margaritifera*) were available for the River Laney, with multiple records also available for the River Blackwater downstream of Banteer. A single record overlapped with proposed wind farm infrastructure (grid connection route crossing) at survey site C13 at Clonavrick Bridge on the River Laney (record from 2007). Aside from this record, several other potential hydrological source-receptor pathways to known pearl mussel populations were identified. Refer to Appendix 2.

Otter (*lutra lutra*) records were widespread throughout the relevant grid squares. Otter records were available for the upper Awboy River, Carrigthomas Stream at Horsemount Bridge (survey site C3), Glen River at Glencaum Bridge and the Nad River in several locations. Otter were also previously recorded on the River Laney at Carrigagulla Bridge (near survey site B11), Clonavrick Bridge (survey site C11) and Morris's Bridge. The species is widespread on the River Blackwater. No otter records overlapped within the wind farm site boundary.

4.2.2.3 EPA data

EPA biological monitoring data was only available for the larger watercourses draining the site and grid connection (i.e., River Laney, Awboy River and Glen River), with no data available for the smaller watercourses. Whilst there was no water quality data available for the Nadanuller Beg Stream draining to the north-east of the wind farm site, the downstream-connecting Nad River (18N01) achieved Q4-5 (high status) at station RS18N010400 in 2019.

River Laney

The River Laney (EPA code: 21F02, locally pronounced 'Lane') was the most significant watercourse draining the Site, adjoining the River Sullane near Ford's Mill, Macroom. There are four EPA biological monitoring stations which have been recently monitored on the river (i.e., since 2017). The uppermost of these (station code: RS19L010100) is located at Carrigagulla Bridge, c. 2km east of turbine 8 and achieved Q4-5 (high status) water quality in 2019. Station RS19L010200 at Knocknagappul Bridge c. 3km south of T5 also achieved Q4-5 (high status) water quality in 2017. Downstream of the survey area, stations RS12C010300(c. 4km south of T5) and RS19L010500 (c. 5km south of T5), also achieved Q4-5 (high status) water quality in 2019. The River Waterbodies Risk for the River Laney was 'not at risk' according to the EPA (although it was considered 'at risk' in the lower reaches, near Macroom).

Awboy River

One of the larger Laney tributaries, the Awboy River (19A03) (c.1.1km southwest of T2) joins the Laney approx. 75m downstream of Awboy Bridge on the L3418 road (c. 4km south of T5). There was a single EPA biological monitoring station on the river, which achieved Q5 (high status) water quality at Awboy Bridge (station RS19A030200) in 2019.

This equates to the highest possible water quality standard under the Water Framework Directive (i.e., pristine water quality). The River Waterbodies Risk for the Awboy River was 'at risk' according to the EPA.

Glen River

The Glen River (18G04) (c. 500m southeast of T19 and c. 200m east of T20) drains to the north of the wind farm boundary and adjoins the River Blackwater near Banteer. There were four biological monitoring stations with recent data on the river and all achieved Q4-5 (high status) in 2018 (the nearest of which was at Glencaum Bridge (station RS18G040100) c. 2.8km east of T20).

4.2.2.4 Survey Results

Fish Surveys

A total of *n*=14 survey locations (A2, B2, B3, C4, C8, C9, C10, C14, C15, C16, C17, C19, N1 & N3) (36% of total locations) did not support fish at the time of survey (i.e., non-perennial/seasonal channels). Where fish were present, brown trout (*Salmo trutta*) dominated across the survey area, with low abundances of European eel (*Anguilla anguilla*) also recorded. Lampetra sp. larvae (ammocoetes) were recorded at a single site only (C5, Carrigthomas Stream). A single Atlantic salmon (*Salmo salar*) was recorded via electro-fishing at site C11 on the River Laney at Knocknagappul Bridge.

Freshwater Pearl Mussel and White-clawed Crayfish

No freshwater pearl mussel or white-clawed crayfish were recorded during the aquatic surveys.

Annex I Habitat

Aquatic vegetation communities 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') were recorded at sites A5 (Glen River), C12 (Awboy River) and sites B8, B11, C7, C11, C13 (all on River Laney).

Non-native invasive species

No non-native invasive species were recorded during aquatic surveys.

Otter survey

Otter signs (spraint) were recorded at C13 (River Laney, Clonavrick Bridge) underneath the bridge structure (grid connection route). No other signs of otter were recorded during the surveys.

Biological water quality

A total of n=18 sites achieved ≥Q4 'good status'. Three unnamed River Laney tributaries (sites C7, B9 and N3), including one within c. 900m north of T12 achieved high status (Q4-5) water quality. Two sites (C5, Carrigthomas Stream and C17, Coolaniddane River) were of Q3 (poor status). Siltation and afforestation pressures (siltation, eutrophication etc.) were evident on numerous watercourses within the survey area which were not achieving good status.

Physiochemical water quality

The majority of survey sites featured low alkalinity, circum-neutral pH, low MRP and low to moderate total oxidised nitrogen (TON) levels. However, TON was particularly high at sites C17 on the Coolaniddane River and B10 Ballynagree East Stream (failed to meet EPA's threshold for good status).

Levels of Molybdate Reactive Phosphorus (MRP) were particularly high at site A1, with the site failing to meet the good status threshold set out under S.I. No. 77/2019 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. Refer to Appendix 2 for a summary of physiochemical water quality results.

Table 4-3: Summary of the potential occurrence of qualifying interests of the Blackwater River (Cork/Waterford) SAC (within the Blackwater[Munster]_SC_050 and Blackwater[Munster]_SC_070 sub-catchment survey area)

	Qualifying Interest Code	Item Description	Occurrence		
			Nadanuller Beg Stream (north-east of the wind farm site)	Unnamed stream (Crinaloo South) (north of the wind farm)	Glen River (north of the wind farm)
Habitats	91A0	Old sessile oak woods with *Ilex* and *Blechnum in* British Isles	The area of this designated habitat mapped by NPWS in Map 7 of the Conservation Objectives (NPWS, 2012) is located throughout the SAC, however the closest habitat identified is c.77km downstream of the study area. This designated habitat is not present along these watercourses in the Blackwater[Munster] sub-catchments.		
	91E0*	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	The area of this designated habitat mapped by NPWS in Map 7 of the Conservation Objectives (NPWS, 2012) is located throughout the SAC. However, the closest habitat identified is c. 31km downstream of the study area. This designated habitat is not present along these watercourses in the Blackwater[Munster] sub-catchments.		
	91J0	*Taxus baccata* woods of the British Isles	Only known to be present At Dromana, on the Lower Blackwater near Villierstown (NPWS 2012). This designated habitat is not present along these watercourses in the Blackwater[Munster] sub-catchments.		
	3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	The full distribution of this habitat in the SAC is not currently known (NPWS, 2012). This habitat occurs in areas of good water quality. Found present in the Glen River during surveys undertaken by Triturus in 2021 (Appendix 2).		
	1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	A coastal habitat – Only present in the lower reaches downstream of the Blackwater (NPWS, 2011). This habitat does not occur within the Blackwater[Munster] SC-50 and SC-70 sub-catchments as these are freshwater and not saltwater sub-catchments.		
	1410	Mediterranean salt meadows (*Juncetalia maritimi*)	A coastal habitat – Only present in the lower reaches downstream of the Blackwater (NPWS, 2011). This habitat does not occur within the Blackwater[Munster] SC-50 and SC-70 sub-catchments as these are freshwater and not saltwater sub-catchments.		
	1130	Estuaries	Only occurs in the lower tidal reaches. The inner boundary of the estuaries habitat in the SAC is at Capoquin (NPWS, 2012. This habitat therefore does not occur in the Blackwater[Munster] SC-50 and SC-70 sub-catchments as these are freshwater and not saltwater sub-catchments.		
	1140	Mudflats and sandflats not covered by seawater at low tide	This habitat type only occurs in the lower tidal reaches of the River Blackwater (NPWS, 2011), it does not occur further inland than Newport / Ballinaclash, therefore it is not present in any of the watercourses of the Blackwater[Munster] sub-catchments.		
	1310	Salicornia and other annuals colonizing mud and sand	A coastal habitat – Habitat not fully known, recorded at Foxhole, Black Bog and Tourig. However, extent is un-mapped (NPWS, 2012). This habitat does not occur within the Blackwater[Munster] sub-catchments.		
	1220	Perennial vegetation of stony banks	A coastal habitat - Current area unknown. Only recorded area is from Ferrypoint, however, extent was not mapped. NB further unsurveyed areas maybe present within the site (NPWS 2012). However, this habitat does not occur within the Blackwater[Munster] SC-50 and SC-70 sub-catchments as these are freshwater and not saltwater sub-catchments.		
Species	1095	Sea Lamprey *(Petromyzon marinus*)	Widely distributed throughout the SAC (NPWS 2012 and NBDC) including at the confluence of the Glen River and the Blackwater River (Blackwater[Munster] sub-catchment). Surveys undertaken in 2020/2021 (Appendix 2) recorded no lamprey species within the Nadanuller Beg Stream, unnamed stream nor the Glen River. Each watercourse was also deemed unsuitable for lamprey species.		
	1096	Brook Lamprey *(Lampetra planeri*			
	1099	River lamprey (*Lampetra fluviatilis)*			
	1106	Atlantic salmon (*Salmo salar*)	No Salmon recorded within the watercourse. Brown trout (*Salmo trutta*) recorded within the watercourse. The watercourse ranged from poor salmonid habitat to excellent trout nursery, with the recorded population dominated by juveniles. (Appendix 2).	No Salmon recorded within the watercourse. Brown trout recorded within the watercourse. The watercourse is considered as moderate value for salmonids.	No Salmon recorded within the watercourse. Brown trout recorded within the watercourse. The watercourse is considered as good quality for salmonids.
	1029	Twaite shad *(Alosa fallax*)	Impassable barriers (major weirs at Clondulane and Fermoy) on the Blackwater prevent this species from accessing the rivers of the Blackwater[Munster] sub-catchments. (NPWS, 2012). This species therefore does not occur in the Blackwater[Munster] sub-catchments.		
	1355	Otter *(Lutra lutra*)	Historical otter records are widespread throughout the SAC including the Nad River for which the stream	No otters (including evidence) were recorded during the surveys undertaken by Triturus (Appendix 2) on	Historical otter records are widespread throughout the SAC including the along the Glen River at

	Qualifying Interest Code	Item Description	Occurrence		
			Nadanuller Beg Stream (north-east of the wind farm site)	Unnamed stream (Crinaloo South) (north of the wind farm)	Glen River (north of the wind farm)
			is a tributary. No otter (including evidence) were recorded during the surveys undertaken by Triturus (Appendix 2) on the stream	the unnamed stream. Historical records, however, indicate that the species is present throughout the SAC including the Blackwater [Munster] sub-catchments.	Glencaum bridge. No otter (including evidence) were recorded during the surveys undertaken by Triturus (Appendix 2) along the Glen River.
	1092 *	White-clawed crayfish (*Austropotamobius pallipes*)	Within the Blackwater River system, white-clawed crayfish is present only on the Awbeg River. The main Blackwater is considered chemically unsuitable for the crayfish (NPWS 2012). This species is not present in the Blackwater[Munster] sub-catchments of the proposed project.		
	1029	Freshwater pearl mussel (*Margaritifera margaritifera*)	The freshwater pearl mussel is known from the main Blackwater River, two tributaries (Owentaraglin and Allow) and the Licky River, which discharges to the Upper Blackwater Estuary (S.I. No. 296/2009). This species is not present in the Blackwater[Munster] sub-catchments.		
	1421	Killarney Fern *(Trichomanes speciosum)*	Records in the SAC are from the lower reaches of the Blackwater according to Map 10 of Conservation Objectives (NPWS, 2012). This species is not expected to occur in the Blackwater[Munster] sub-catchments.		

Having regard to Table 4-2, the qualifying interests of the Blackwater River (Cork/Waterford) SAC which may potentially be within the zone of influence of the wind farm site, grid connection and BEMP Lands are:

- Atlantic salmon (*Salmo salar*) - Brown trout recorded within the watercourses of the wind farm site. The watercourses are considered as poor to good habitat suitability value for salmonids.
- Otter (*Lutra lutra*) - Historical otter records are widespread throughout the SAC including the Nad River (for which the Nadanuller Beg Stream is a tributary) and the Glen River
- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation - Found present in the Glen River

Atlantic salmon

The Atlantic salmon is listed under Annexes II and V of the EU Habitats Directive and Appendix III of the Bern Convention. The Atlantic salmon is an anadromous species. Atlantic salmon populations in Ireland have been recently assessed as being 'inadequate' by NPWS in the 2019 Article 17 Conservation Status Assessments (2019a). The Salmon Conservation Limit (CL) in any river is the number of spawning salmon required to maintain a sustainable population and is used to indicate the number of salmon in a river system above which a harvestable surplus can be considered.

The Munster Blackwater is famous for being one of the best salmon fishing rivers in Ireland (Igoe and Murphy 2015).

The conservation status of salmon in the Blackwater [Munster] sub-catchments is dependent on good water quality status; as this species requires clean water (Q4) for spawning and early life stages. The main threat to the salmon population is the pollution of surface water, which severely impacts spawning. NPWS (2013) notes the 'high importance' threats and pressures on the salmon population as being – Agricultural intensification, disposal of household/ recreational facility waste, poaching, diffuse pollution to surface waters due to agricultural and forestry activities diffuse pollution to surface waters due to household sewage and waste waters.

Otter

The otter is listed on Annex II and Annex IV of the EU Habitats Directive (Council Directive 92/43/EEC), thus making it a species of European importance. The Munster Blackwater is one of 44 SACs designated for the Otter in Ireland.

A survey was conducted by Smiddy in 2016 to determine the distribution of otter in the Munster River Blackwater catchment. This included the Awbeg River sub-catchment. Of the 275 sites surveyed 184 (66.9%) proved positive and 91 (31%) proved negative for otter presence. Otter was present across the catchment from the estuarine area extending into the foothills of the mountain ranges. Within the study it was found that there were fewer positive sites on streams of less than 4m in width. However, the author did note that otters make extensive use of small streams but leave no spraint evidence therefore, the importance of this habitat might be underestimated within the Smiddy survey. The results of the survey (Smiddy, 2016) found that there is no evidence that otter had withdrawn from any part of the Blackwater catchment during the last 25 years, and the overall distribution of positive sites is almost identical to that described by O'Sullivan (1991) for the period 1988-90.

Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

Watercourses of plain to montane zones with floating or submerged vegetation can be present in streams and rivers, backwaters with water through-flow, as well as near-natural drains. The structure of this habitat can be described as layered communities of mostly rooted plants. This habitat type is characterised by the abundance of water-crowfoots *Ranunculus* spp., subgenus Batrachium (*Ranunculus fluitans*, *R. penicillatus* ssp. *penicillatus*, *R. penicillatus* ssp. *pseudofluitans*, *R. peltatus* and its hybrids). Floating mats of these white-flowered species are characteristic of river channels in early to mid-summer. They may modify water flow, promote fine sediment deposition, and provide shelter and food for fish and invertebrate animals. Pressures mainly stem from human-related impacts such as modification of water courses and pollution. The same pressures affect key species of the habitat: the otter, river lamprey and Atlantic salmon.

4.2.3 Mullaghanish to Musheramore Mountains SPA

The site consists of a variety of upland habitats, though approximately one-third is afforested. The coniferous forests include first and second rotation plantations, with both pre-thicket and post-thicket stands present. The principal tree species present are Sitka spruce (*Picea sitchensis*) and lodgepole pine (*Pinus contorta*). Almost one-third of the site is unplanted blanket bog and heath, with both wet and dry heaths present. The vegetation is characterised by such species as ling heather (*Calluna vulgaris*), cross-leaved heath (*Erica tetralix*), billberry (*Vaccinium myrtillus*), common cottongrass (*Eriophorum angustifolium*), deergrass (*Scirpus cespitosus*) and purple moor grass (*Molinia caerulea*). The remainder of the site is largely rough grassland that is used for hill farming. This varies in composition, with some wet areas with rushes (*Juncus spp*.) and some areas subject to scrub encroachment.

This SPA is a stronghold for hen harriers (only qualifying interest for this site). The early stage of new and second-rotation conifer plantation are the most frequently used nesting sites, though some pairs may still nest in tall heather of unplanted bogs and heath. This site also supports a breeding population of Merlin (*Falco columbarius*).

The main threats and pressures which may impact the: Mullaghanish to Musheramore Mountains SPA are set out in the Natura 2000 Data Form and are presented in *Table 4-3: Threats, Pressures and Activities with Impacts on the Mullaghanish to Musheramore Mountains SPA.*

The features of interest of the site include a number of Annex I habitats, priority habitats and Annex II species under the EU Habitats Directive as shown in *Table 4-4: Summary of the potential occurrence of Species of Conservation Interests of Mullaghanish to Musheramore Mountains SPA within the area of the proposed project.*

Table 4-4: Threats, Pressures and Activities with Impacts on the Mullaghanish to Musheramore Mountains SPA

High Level (inside site)	High Level (outside site)	Medium Level (inside site)	Medium Level (outside site)	Low Level (inside site)
B: Sylviculture, forestry	B: Sylviculture, forestry	C01.03: Peat extraction	A04: Grazing	D01.01: paths, tracks, cycling tracks
		A04: Grazing		D01.02: roads, motorways
				E01.03: dispersed habitation

Source: Mullaghanish to Musheramore Mountains SPA (004162) Natura 2000 Data Form, https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF004162.pdf

4.2.4 Avifauna Surveys

A suite of ecological surveys (including avifauna) were undertaken by Ecology Ireland Wildlife Consultants Ltd as part of the application effort.

The field surveys comprised two main elements; vantage point (VP) watches and targeted distribution and abundance surveys which comprised:

- VP watches undertaken over two breeding seasons at 6 VPs (summer 2017 and summer 2018)
- VP watches undertaken over one breeding season at 8 VPs (summer 2019)
- VP watches undertaken over one breeding season at 10 VPs (summer 2020)

- VP watches undertaken over two winter seasons at 6 VPs (winter 2017/2018 and winter 2018/2019)
- VP watches undertaken over two winter seasons at 10 VPs (winter 2019/2020 and winter 2020/2021)
- Transect/point count surveys (winter 2017/2018, winter 2019/20, summer 2017, 2018, 2019 and 2020)
- Hinterland surveys were also completed in each of the four breeding season surveys
- Red Grouse survey (2019)

Refer to Appendix 3 for avifauna surveys and methodologies.

4.2.4.1 Desk Study

The search for historical records of bird species from NPWS and NBDC identified hen harrier present within a 10 km search radius of the site.

4.2.4.2 Survey Results

Breeding Season Vantage Point Survey Results

A total of four breeding season vantage point (VP) surveys were completed during 2017, 2018, 2018 & 2019 with a total of 44 hen harrier observations.

Hen harriers were recorded during all four breeding season vantage point surveys, with the number of flightlines recorded per season ranging from 4 to 13. Activity levels on site were relatively low (< 1.5% of the total survey time) during all VP surveys and primarily related to foraging and commuting, generally at heights <30m. A total of 79.5% of observations recorded were at heights below 25m (lowest rotor sweep height), 13.6% of observations recorded at heights greater than 25m and 6.8% (three) no height given (refer to Appendix 3). Individuals were recorded successfully catching and/or carrying prey on a number of occasions. No courtship/display behaviour was noted during the VP surveys and no nesting activity took place at the study area or within 2km of the study area boundary in any of the survey years. Activity was relatively widespread at the site, with no areas of high or focused activity noted. Relatively regular flightlines were noted in the Dooneen Hill area to the southeast of the site, outside of the terrestrial biodiversity study area boundary in association with a known nest site in the wider area. Male hen harrier accounted for the bulk of the flightline activity at the Site, although at least one ringtail hen harrier (female or immature) flightline was recorded each season. Hen harriers were generally present in all survey months, with no clear temporal pattern of activity noted. The predominant habitat where hen harriers were recorded was heath/bog, conifer plantation and grassland.

A comparison of hen harrier activity recorded on-site (i.e., within the study area boundary) and off-site (outside the study area boundary but within view of the vantage points) during the breeding season surveys is presented in Plate 4.2.

Data are presented as the percentage of total VP survey time that Hen Harrier were present on the site. Note that the number of vantage points used increased from six (in 2017 and 2018) to 10 in the 2019 and 2020 breeding seasons as a result in an expansion of the study area boundary. An increase in observations might therefore be expected as a result in the increase in area covered. No such trend is apparent however and an overall decline in hen harrier activity on the site was observed throughout the study period.

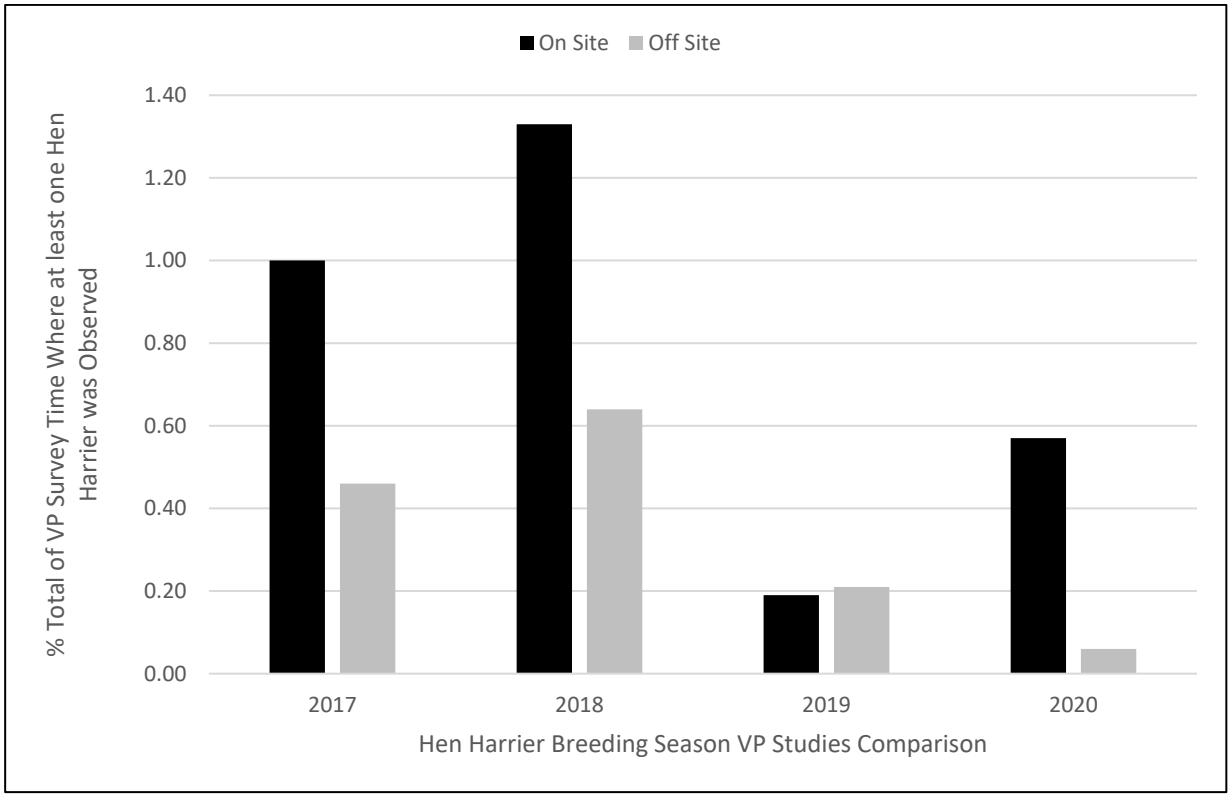


Plate 4-2: Comparison of percentage Hen Harrier activity recorded during the four breeding VP survey years (2017-2020)

Breeding Season Hen Harrier Hinterland Survey Results

Hinterland surveys were completed in all four breeding seasons (2017-2020). Details of nest site locations, which are known to NPWS, are not disclosed here due to the sensitive nature of this information.

In the 2017, 2018 and 2019 breeding seasons no nest site or evidence of breeding was recorded within the study area or within a 2km radius of the study area. Two active nest sites were recorded between 2.5 and 5km from the study area boundary, one to the southwest and one to the southeast. The same nest sites were used in all three breeding seasons. Both nest sites were recorded as successfully producing young in the 2017 and 2018 survey seasons, however in the 2019 survey season one of the nest sites (the south-eastern nest) appeared to have failed.

An increase in Hen Harrier nesting activity within the 5km hinterland area was confirmed during the 2020 breeding season. A total of five nest sites were recorded, including the two historically used nest sites (2017-2019) and three newly confirmed nest sites. Four of the five nests were recorded as successfully producing at least one chick.

In summary, the number of Hen Harrier nests sites in the 5km hinterland area of the study area has varied during the survey period from 1-2 and up-to 5 more recently, with no nest sites located at or within 2km of the study area. Overall, the Hen Harrier population in the Mullaghanish to Musheramore Mountains SPA has undergone serious decline in the last 10 years, however an increase in numbers of nesting pairs in the SPA was noted in 2020 (Hen Harrier Project 2020).

Winter Season Vantage Point Survey Results

A total of four winter season VP surveys (2017/2018, 2018/2019, 2019/2020 & 2020/2021) were undertaken with a total of 40 hen harrier observations.

Hen Harriers were recorded during all four winter season vantage point surveys with the number of flightlines ranging from 7 to 11. Activity levels on site were low (< 0.7% of the total survey time) during all VP surveys and related primarily to foraging and commuting, generally at heights of <25m. 77.5% of observations recorded at heights below 25m (lowest rotor sweep height), 12.5% of observations recorded at heights greater than 25m and 10% (four) no height given (refer to Appendix 3). Individuals were regularly recorded being mobbed by Corvids, particularly Hooded Crow and Raven. Activity was relatively widespread at the site, with no areas of high or focused activity noted. Male hen harrier accounted for the bulk of the flightline activity at the site, although at least two ringtail hen harrier (female or immature) flightlines were recorded in each season, apart from the winter of 2019/2020 when all observations comprised male hen harriers. During the 2018/2019 season a number of ringtail flightlines were noted in the Dooneen Hill area to the southeast of the site, outside of the study area boundary in association with a known nest site in the wider area. Hen harriers were generally present in all survey months, with no clear temporal pattern of activity noted. The predominant habitat where hen harriers were recorded was heath/bog, conifer plantation and grassland. No roosting activity was noted on/near the study area during the December and January 2017/2018 VP surveys that overlapped with the onset of the sunset/dusk period, where the study area supports limited areas of potentially suitable winter roosting habitat.

A comparison of Hen Harrier activity recorded on-site (i.e., within the study area boundary) during the winter season surveys is presented below in Plate 4.3, where data are presented as the percentage of total VP survey time that hen harrier were present on the site. Note that the number of vantage points used increased from six in 2017/2018 and 2018/2019 to 10 in the 2019/2020 and 2020/2021 winter seasons as a result of an expansion of the study area boundary. An increase in observations might therefore be expected as a result in the increase in area covered. Overall Hen Harrier winter season activity levels appeared to be relatively stable at the study area throughout the study period until a drop in on-site activity in 2020/2021. Note that the off-site activity was relatively high in the 2020/2021 season (i.e., almost 13 minutes recorded) however, indicating the hen harriers were still active in the wider area.

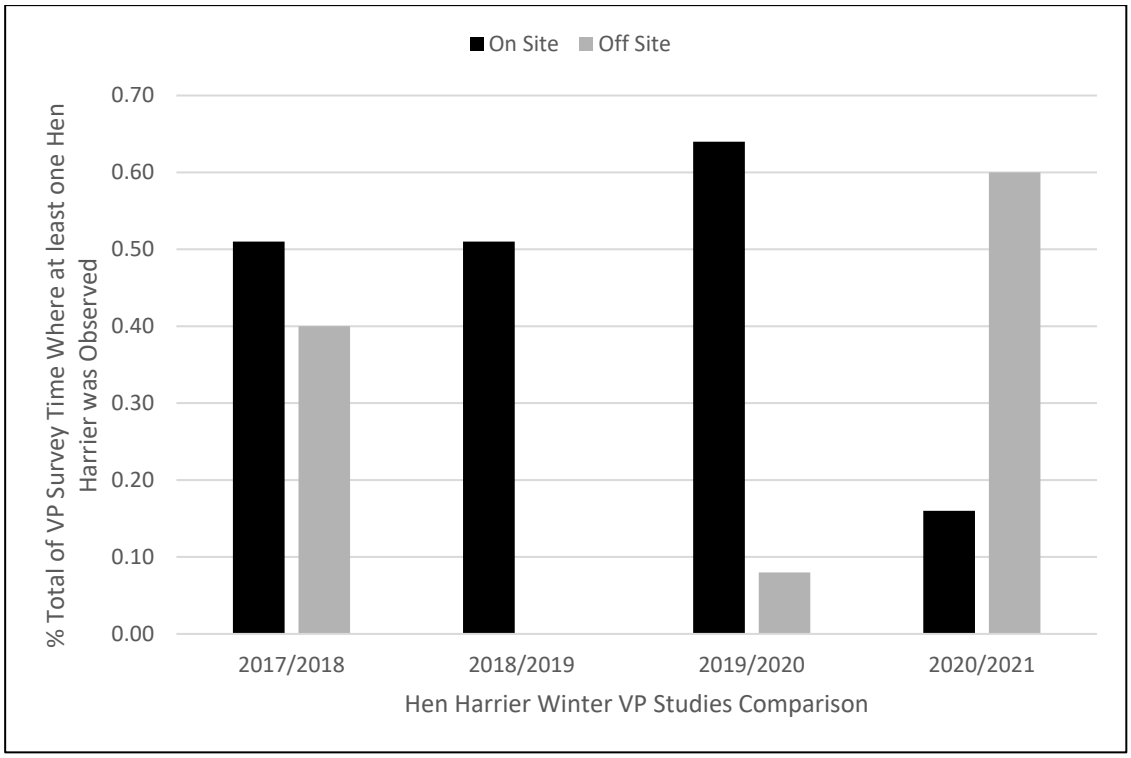


Plate 4-3: Comparison of percentage Hen Harrier activity recorded during the four winter VP survey seasons (2017/2018/ 2018/2019, 2019/2020 & 2020/2021)

Table 4-5: Summary of the potential occurrence of Species of Conservation Interests of Mullaghanish to Musheramore Mountains SPA within the area of the proposed project (including the Site, grid connection, TDR and BEMP Lands)

Natura Code	Item Description	Occurrence
A082	Hen Harrier (*Circus cyaneus*)	This species has been observed within and outside the site, generally present for all survey months. Nesting sites have been recorded between 2.5-5km of the site with no nesting recorded within the site.

Having regard to Table 4-4 the qualifying interests of the Mullaghanish to Musheramore Mountains SPA which may potentially be within the zone of influence of the wind farm site are:

- Hen harrier (*Circus cyaneus*) – Observed within the study area and nesting within 2.5-5km of the wind farm site

4.2.5 The Gearagh SPA

The site, located c. 2 km south-west of Macroom, comprises a stretch of the River Lee that was dammed in the 1950s as part of a hydroelectric scheme. The valley formerly held an extensive area of alluvial forest but only part of the forest now survives. The SPA extends from Annahala bridge westwards to Toon bridge. The principal habitat is now a shallow lake which is fringed by wet woodland, scrub and grassland that is prone to flooding. At times of low water, a diverse ephemeral pioneering plant community develops on the mud.

The site supports important populations of wintering waterfowl, including swans, dabbling duck, diving duck and some waders. Habitat quality is good and the site provides both feeding and roost sites for the birds. Six of the species have populations of national importance: Mute swan (*Cygnus olor*), wigeon, teal, shoveler (*Anas clypeata*), coot and golden plover (*Pluvialis apricaria*). Other species which occur regularly include whooper swan (*Cygnus cygnus*), tufted duck (*Aythya fuligula*) and lapwing (*Vanellus vanellus*). The site is a Nature Reserve, Ramsar site and Biogenetic Reserve.

The main threats and pressures which may impact The Gearagh SPA are set out in the Natura 2000 Data Form and are presented in *Table 4-5: Threats, Pressures and Activities with Impacts on The Gearagh SPA.*

The features of interest of the site include Annex I bird species under the EU Birds Directive as presented in *Table 4-6: Summary of the potential occurrence of Species of Conservation Interests of The Gearagh SPA within the area of the proposed project*.

Table 4-6: Threats, Pressures and Activities with Impacts on The Gearagh SPA

High Level (inside site)	High Level (outside site)	Medium Level (inside site)	Low Level (inside site)
J02: Human induced changes in hydraulic conditions	J02.04: Flooding modifications	A04: Grazing	F03.01: Hunting

Source: The Gearagh SPA (004109) Natura 2000 Data Form, https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF004109.pdf

Avifauna Surveys

A suite of ecological surveys (including avifauna) were undertaken by Ecology Ireland Wildlife Consultants Ltd as part of the application effort.

The field surveys comprised two main elements; vantage point (VP) watches and targeted distribution and abundance surveys which comprised:

- VP watches undertaken over two breeding seasons at 6 VPs (summer 2017 and summer 2018)
- VP watches undertaken over one breeding season at 8 VPs (summer 2019)
- VP watches undertaken over one breeding season at 10 VPs (summer 2020)
- VP watches undertaken over two winter seasons at 6 VPs (winter 2017/2018 and winter 2018/2019)
- VP watches undertaken over two winter seasons at 10 VPs (winter 2019/2020 and winter 2020/2021)

- Transect/point count surveys (winter 2017/2018, winter 2019/20, summer 2017, 2018, 2019 and 2020)
- Hinterland surveys were also completed in each of the four breeding season surveys
- Red Grouse survey (2019)

Refer to Appendix 3 for the methodologies used to undertake the avifauna surveys.

4.2.5.1 Desk Study

The search for historical records of bird species from NPWS and NBDC identified mallard present within a 10 km search radius of the site.

4.2.5.2 Survey Results

Breeding Season Transect & Point Count Results

A total of 44 avian species were recorded during the dedicated breeding season transect and point count surveys[4].

Although not recorded during the transect and point count surveys, mallard were recorded on a casual basis during other terrestrial biodiversity surveys during the 2017, 2018, 2019 and 2020 breeding seasons.

Winter Season Transect & Point Count Results

A total of 33 avian species were recorded during the dedicated winter season transect and point count surveys. The maximum abundance of mallard recorded during the transect and point count surveys during the two winter bird seasons (2017/2018 & 2019/2020) was 2 individuals recorded during the transects.

The remaining SCI bird species teal, wigeon and coot were not recorded during the surveys undertaken by Ecology Ireland Wildlife Consultants Ltd during the survey periods.

Table 4-7: Summary of the potential occurrence of Species of Conservation Interests of The Gearagh SPA within the area of the proposed project (including the Site, grid connection, TDR and BEMP Lands).

Natura Code	Item Description	Occurrence
A050	Wigeon *(Anas penelope)*	The proposed project is outside the core feeding range (a defined range according to SNH 2016 and Johnson et al 2014) of the SCI species Wigeon, identified as up to 2.8km (Johnson 2014).

[4] Important to note that the data do not include birds that were present more than 100m from the observer or birds flying over and not using the site during the transect/point count surveys

Natura Code	Item Description	Occurrence
A052	*Teal (Anas crecca)*	Although the grid connection and BEMP Lands are within the core feeding range (a defined range according to SNH 2016 and Johnson et al. 2014) of the SCI species Teal, identified as up to 8.4km (Johnson 2014), the species has not been identified as present within the Site during surveys undertaken by Ecology Ireland Wildlife Consultants Ltd, nor has the species been identified as present within the 10km search radius of the site for historical records.
A053	Mallard (*Anas platyrhynchos)*	The Site is within the core feeding range for Mallard identified as up to 15km (Johnson 2014). Mallard have also been identified as present on the site during surveys undertaken by Ecology Ireland Wildlife Consultants Ltd as part of the survey effort for the application.
A125	Coot (*Fulica atra)*	The species has not been identified as present within the Site during surveys undertaken by Ecology Ireland Wildlife Consultants Ltd, nor has the species been identified as present within the 10km search radius of the site for historical records. There is no identified core feeding range for this species.

Having regard to Table 4.6 the qualifying interests of The Gearagh SPA which may potentially be within the zone of influence of the wind farm site are:

- Mallard (*Anas platyrhynchos)* - identified as present within the wind farm site

4.3 Potential For Adverse Effects on Site Integrity

The potential for the proposed project (in the absence of mitigation) to have an adverse effect on the integrity / conservation objectives of the Blackwater River (Cork/Waterford) SAC (002170), Mullaghanish to Musheramore Mountains SPA (004162) and The Gearagh SPA (004109) are assessed hereunder.

The assessment is made relative to the potential for the effects to impact the maintenance or restoration of the favourable conservation conditions of the:

- qualifying interests within the zone of influence of the Blackwater River (Cork/Waterford) SAC
    - Atlantic salmon,
    - otter, and
    - watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

- qualifying interests within the zone of influence of the Mullaghanish to Musheramore Mountains SPA
    - hen harrier
- qualifying interests within the zone of influence of The Gearagh SPA
    - mallard

The conservation conditions required by these species are defined by attributes and targets set out in the Conservation Objectives Reports. No other qualifying interests of the aforementioned European sites were determined to be within the zone of influence of the proposed project having regard to the potential for the affected areas to support the qualifying features.

NPWS, in their Article 17 reporting (NPWS, 2019b) and Article 12 reporting (NPWS 2012) define the favourable conservation status of an Annex I habitat as achieved when:

- its natural range, and area it covers within that range, are stable or increasing,
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of an Annex II species (habitats Directive) and Annex I species (Birds Directive) is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

4.3.1 Potential Impacts

The elements of the proposed project which were identified as posing a pressure on the qualifying interests of the European designated sites within the ZoI as stated above are identified as:

Construction

Surface water runoff

Tree felling, new access tracks and upgrade of existing tracks, turbine hardstanding areas, stream crossings, the on-site substation and all other new hard surfaces have the potential to contribute to the increase in runoff

Suspended solids / nutrients

Potential sources of sediment laden water include:

- Standing water in excavations could contain an increased concentration of suspended solids as a result of the disturbance of the underlying soils.
- Haul roads passing close to watercourses could allow the migration of silt laden runoff into watercourses.
- Silt carried on the wheels of vehicles leaving the main wind farm site could be carried onto the public road.
- A blockage in the proposed roadside drains could allow a break out of silt laden runoff to reach adjacent watercourses or streams.
- Runoff from the borrow pit area could be silt laden, with the risk of draining into receiving watercourses, given the exposed nature of the borrow pit areas due to the excavation and haulage of stone from the area.
- Overland flow entering excavations could increase the quantity of surface water to be treated for sediment removal.
- Tree felling could lead to an increase in sediment and nutrients in the surface water runoff, if the brash is left in place in the riparian buffer zones.
- Runoff from felled areas and incorrect management of brash (if left in the riparian zone) could result in sediment release and nutrient (especially phosphorus) run-off
- Inappropriate management of excavations could lead to loss of suspended solids to surface waters.
- Inappropriate management of the excavated material could lead to loss of suspended solids to surface waters.
- Surface water inflows and minor groundwater seepages may occur in turbine base excavations. Pumped water from the excavations will most likely contain suspended solids.
- To accommodate the access to the locations of the proposed turbines, a total of 1 new crossing over the wind farm site watercourses will be constructed. During the construction there is a potential to release suspended solids into the watercourse. Works leading to erosion of the river banks/bed could result in the release of suspended solids.
- Exposure of soil and subsoil (particularly peaty soils) following felling vehicle tracking, skidding and extraction methods also has the potential to release nutrients to surface waters

Release of hydrocarbons

- Refuelling activities could result in fuel spillages which could pollute underground and surface water, especially during the construction of new culverts/bridges.
- There is the potential for fuel spill/leaks from storage tanks which will be stored on main wind farm site for plant machinery. Fuel spill/leaks could infiltrate underground and pollute underground water. Fuel spills/ leaks could be drained to watercourses and pollute them.
- Tree felling process require trafficking of heavy machinery which can lead to pollution of watercourses due to spillage of fuels and hydrocarbons

Contamination from Wastewater Disposal

Release of effluent from domestic wastewater treatment systems has the potential to impact surface. For low permeability of the subsoils at the site, surface waters are more vulnerable to impact rather than groundwater.

Release of Cement-Based Products

Cement-based products could lead to contamination of receiving waters and groundwaters.

Spread of Invasive Non-native Species (INNS)

High impact invasive plant species Japanese Knotweed and Rhododendron have been recorded within the study area of the proposed project. Both species have also been identified as being present in the wider environment, therefore, a risk that machinery associated with tree felling could act as a vector for introducing or dispersing non-native invasive species within the proposed project working areas (including intersecting watercourses) and to adjacent lands / watercourses.

Collision Risk

Potential for collision with turbine towers, blades (moving or stationary) and/or associated infrastructure; and barrier to dispersal during the operational phase. The assessment has fully considered all combinations within the range of turbine specifications (refer to Section 2.2.1.).

Disturbance / Displacement

Potential displacement of birds due to loss of suitable feeding and/or breeding/wintering habitat.

Potential displacement of otters due to lie-up sites being disturbed

Habitat Loss

The displacement of birds from areas within and surrounding developments can effectively amount to habitat loss. If a habitat is therefore avoided as a result of the disturbance, then effective habitat loss can occur.

Indirect impacts

Reduction in prey due to impacts from emissions to water as identified above.

4.4 In-Combination Effects

Article 6(3) of the Habitats Directive requires that:

> *"Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives".*

It is therefore required that the potential significant effects of the different aspects of the proposed project (wind farm site, grid connection, TDR and BEMP) are considered in combination with any other plans or projects within the zone of influence.

4.4.1 Plans / Project with potential for potential in combination effects with the proposed project (Site, grid connection TDR and BEMP Lands)

4.4.1.1 Projects

The plans and projects outlined below have potential for in-combination effects with the proposed project due to the size, scale and/or potential connectivity (pathway) to the proposed project or European site's within the zone of influence (refer to Table 3.1) of the proposed project.

The following sources were referred:

- Cork County Council planning viewer https://www.corkcoco.ie/en/planning/planning-enquiry-online-submissions;
- Limerick County Council planning viewer https://www.limerick.ie/council/services/planning-and-property/apply-or-search-planning-application/search-planning
- Kerry County Council planning viewer https://www.kerrycoco.ie/planning/online-planning-enquiry/
- An Bord Pleanála website (Strategic infrastructure development (SID) applications, Strategic Housing Development (SHD) applications and project applications including wind farms and planning appeals) https://www.pleanala.ie/en-ie/home;
- Irish Wind Energy Association (IWEA) https://www.iwea.com/
- Department of Department of Housing, Local Government and Heritage's EIA Portal https://www.gov.ie/en/publication/9f9e7-eia-portal/.

If the construction phase of the proposed project were to occur in parallel with other plans or projects, in-combinations impacts may occur on the qualifying interests of the identified European sites (refer to *Table 4.2: Summary of the potential occurrence of qualifying interests of the Blackwater River (Cork/Waterford) SAC (within the Blackwater[Munster]_SC_050 and Blackwater[Munster]_SC_070 sub-catchment survey area)*, *Table 4.4: Summary of the potential occurrence of Species of Conservation Interests of Mullaghanish to Musheramore Mountains SPA within the area of the proposed project (including the Site, grid connection, TDR and BEMP Lands)* and *Table 4.6: Summary of the potential occurrence of Species of Conservation Interests of The Gearagh SPA within the area of the proposed project (including the Site, grid connection, TDR and BEMP Lands).*

Flight height or the flight heights which birds habitually use along either migration or local flight paths is an influencing factor in determining whether the proposed project will combine with additional wind farms to produce additive, synergistic or antagonistic effects. These effects include increased 'Barrier Effect' (potentially obstructing migratory flightpaths), increased 'collision risk' (through combined mortality in susceptible species) and increased 'disturbance' to birds utilising foraging grounds whilst on migration.

The following projects were identified for having potential for in-combination effects on the Blackwater River (Cork/Waterford) SAC, Mullaghanish to Musheramore Mountains SPA and The Gearagh SPA with the proposed project.

Projects with connectivity to the Blackwater River (Cork/Waterford) SAC:

Boggeragh wind farms 1 (planning references: 011248 / 085944) and 2 (planning reference: 108067) are already in operation, therefore, in combination effects to shared watercourses (Naduller beg stream and Glen River) are not likely to occur during the construction phase of the proposed project. The decommissioning phase of the wind farm will also occur at a different time to the proposed project, therefore, in combination effects to shared watercourses will not occur. Refer to Figure 4.1 which illustrates existing wind farms within 20km of the Site.

Construction at Esk wind farm (planning references: 115276 / 145602) is already complete therefore, in-combination effects to shared watercourses (Glen River) are not likely to occur during the construction phase of the proposed project. The decommissioning phase of the Esk wind farm will also occur at a different time to the proposed project, therefore, in combination effects to shared watercourses will not occur.

Carraigcannon Wind Farm (planning references: 034181 / 094564) is already in operation. The wind farm is also in different sub-catchments (Rathcool_20 and Glen (Banteer)_30) to the proposed project which joins the Blackwater River (Cork/Waterford) SAC c. 26km upstream of the Glen River confluence point. Therefore, no potential for significant in-combination / cumulative effects to occur with the proposed development.

The Gneeves Wind Farm (planning references: 990616, 036585, 041355, 040188, 05636, 134566) is already in operation. The wind farm is also in a different sub-catchment (Finnow (Blackwater)_10) to the proposed project which joins the Blackwater River (Cork/Waterford) SAC c. 25km upstream of the Glen River confluence point. Therefore, no potential for significant in-combination / cumulative effects to occur with the proposed development.

The construction of an extension to existing 110kv Boggeragh substation (planning reference: 184256) is within 150m of the Nadanuller Beg Stream, however the scale of proposed works involved with the substation extension are not deemed to be significant and potential impacts on the surrounding watercourses have been ruled out during an appropriate assessment screening as the potential for significant effects on any European site could be excluded. The application is already operational, therefore, no potential for significant in-combination / cumulative effects with the proposed development.

The upgrading/replacement and extending of the existing waste water treatment plant and installation of a new outfall pipe at Millstreet Waste Water Treatment Plant (WWTP) (planning reference: 174490), Station Road (Drominahilla and Coomlogane), Millstreet, Co. Cork. The project is c. 7km north of the proposed project. The WWTP is located on the Millstreet 18 stream which becomes part of the Blackwater River (Cork/Waterford) SAC c. 1km upstream. The steam is within a different sub-catchment (Blackwater[Munster]_SC_040) to the proposed project. The closest confluent point on the River Blackwater is the Glen River c. 16km downstream of the WWTP, therefore no potential for significant in-combination / cumulative effects to occur with the proposed development.

An extension to the existing limestone quarry and all associated site project and landscaping works in the townlands of Scart, Ballyclough, and Kilgilky South (planning reference: 195802). The proposed extension is 5ha. to the east of the existing quarry. The quarry is c. 17.2km north east of the proposed project within the Blackwater[Munster]_SC_090 sub-catchment. The closest watercourse to the project is the East Lohort stream c. 1.1km over land, which joins the Blackwater River (Cork/Waterford) SAC c. 15km downstream of the Glen River confluence point. Therefore, no potential for significant in-combination / cumulative effects to occur with the proposed development.

The project of 14 no. serviced sites for future employment uses comprising 4 no. enterprise sites, 4 no. general industry sites, 6 no. sites for warehousing/distribution and all associated ancillary project works (planning reference: 167121). The project is c. 17.8km east of the proposed project in the Blackwater[Munster]_SC_080 sub-catchment. Therefore, no potential for significant in-combination / cumulative effects to occur with the proposed development.

There are three permitted projects and one extension of duration for solar farms located within 20km of the north of the proposed wind farm site that have potential connectivity to the Blackwater River (Cork/Waterford) SAC:

1. Carragraigue, Rathcool, Co. Cork Solar Farm (Ref 165455 / 186562) (c. 5.5km north of the wind farm site) (NIS submitted)
2. Knocknacarracoosh, Meenskeha West, Cullen, Co. Cork Solar Farm (Ref 174308) (c. 11.2km north of the wind farm site) (Ecological assessment submitted)
3. Dromalour, Coolclogh, Kanturk, Co. Cork Solar Farm (Ref 164601) (c. 14km north of the wind farm site) (NIS submitted)
4. Gortnagross, Mallow, Co. Cork (Ref 214498) (c. 17.6km north east of the wind farm site) Extension of duration of permission granted under planning reference: 15/7003)

The Carragraigue, Rathcool application lies within the same sub-catchment as the proposed project, the Blackwater[Munster]_SC_050, however the emissions from the solar farm will enter the Rathcool_10 and not the Nadanuller Beg Stream or Glen (Banteer) River.

The Blackwater River confluence point for the Rathcool is c. 9km up-stream of the confluence point of the Glen River. As solar farms have no moving parts and installation of panels creates minimal disturbance to the ground, along with potential impacts from the solar farm having been mitigated for in the NIS. Therefore, no potential for significant in-combination / cumulative effects with the proposed development.

The remaining three applications are within different sub-catchments, Blackwater[Munster]_SC_030, Dalua_SC_020 and Blackwater[Munster]_SC_090, therefore no potential for significant in-combination / cumulative effects with the proposed development.

There are a further two applications subject to appeal with An Bord Pleanála for solar farms located within 20km of the south of the site. All applications lie within the Lee, Cork Harbour and Youghal Bay catchment (ID 19) catchment and therefore have no potential for cumulative effects on the Blackwater River (Cork/Waterford) SAC.

Projects with potential for impacts on SCI bird species of the Mullaghanish to Musheramore Mountains SPA and The Gearagh SPA

The nearest operational wind farm to the Site is the neighbouring Boggeragh Wind Farm (1 and 2) directly to the north. Boggeragh Wind Farm consists of 39 wind turbines with rotor diameters of 90m. The windfarm underwent an appropriate assessment which concluded that with the implementation of mitigation measures, the residual impacts on birds associated with the wind farm development at Boggeragh are not expected to be significant.' No significant residual impacts on hen harrier are identified. Therefore, potential effects during the operation of the Boggeragh wind farm in combination with the proposed project will not occur on the SCI bird species (hen harrier) of the Mullaghanish to Musheramore Mountains SPA.

The Esk windfarm underwent an appropriate assessment which concluded that with the implementation of mitigation measures, the residual impacts on birds associated with the proposed six turbine wind farm development at Esk are not expected to be significant.' No significant residual impacts on hen harrier are identified. Therefore, potential effects during the operation of the Esk wind farm in combination with the proposed project will not occur on the SCI bird species (hen harrier) of the Mullaghanish to Musheramore Mountains SPA.

Carraigcannon Wind Farm is c. 6km north of the Site and consists of 10 wind turbines already in operation. The infrastructure has been in place for a number of years allowing ample time for bird species to acclimatise (alter, if needed, their breeding, foraging and commuting habits due to the presence of the wind farm). Although the wind farm is within the core foraging range (Core range of 2km, with maximum range of 10km) of the SCI bird species (hen harrier) of the Mullaghanish to Musheramore Mountains SPA, hen harriers typically fly below the height of wind turbine rotor blade sweep at heights of less than 25 m (Smallwood & Thelander, 2004, Drewitt & Langston, 2006, Whitfield & Madders, 2006). This low flight height coupled with the small-scale avoidance of wind turbines shown by Hen Harriers, suggests that collision risk will be low for this species (Whitfield & Madders, 2006). Therefore, potential effects during the operation of the wind farm in combination with the proposed project will not occur on the SCI bird species of the Mullaghanish to Musheramore Mountains SPA.

Carriganimmy Wind Farm is c. 5km west of the Site and consists of 6 wind turbines already in operation. Gneeves Wind Farm is c. 9.5km west of the Site and consists of 18 wind turbines already in operation. There is appropriate distance and habitats (including the Mullaghanish to Musheramore Mountains SPA) between the developments and the proposed project to prevent a cumulative effect of potentially obstructing migratory flightpaths and 'disturbance' to birds utilising foraging grounds whilst on migration.

Therefore, potential effects during the operation of the wind farm in combination with the proposed project will not occur on the SCI bird species (hen harrier) of the Mullaghanish to Musheramore Mountains SPA.

Bawnmore Wind Farm is c. 5km south of the Site and consists of 7 wind turbines already in operation. The only potential impact pathway with regards to the wind farm and The Gearagh SPA was identified to be via a hydrological pathway. As there is no hydrological pathway between the proposed project and the SPA, cumulative effects on the SCI bird species of The Gearagh SPA via a migratory species pathway will not occur with the proposed project.

Continuance of use for existing 30m telecommunications structure c. 1.1km south of the site. Structure has been in place for a number of years, allowing ample time for bird species to acclimatise to the structure. No potential for significant in-combination / cumulative effects with the proposed development will occur on the SCI's of the Mullaghanish to Musheramore Mountains SPA and The Gearagh SPA.

Permission for the development associated with the uprate of a section of the existing Clashavoon to Tarbert 220kV overhead line (planning reference: 167216). The proposed project pertains to the length of existing overhead line between mast structure number 63 (south-east of the Knockanure 220kV substation, Co. Kerry) and mast structure number 233 (north of the existing Ballyvouskill 220kV substation, Co. Cork). The overall length of this section of overhead line is approximately 60.4 km, of which 21.2 km is located in Co. Cork and 39.2 km is located in Co. Kerry. The application underwent an appropriate assessment which highlighted there would be no risk of collision with towers or cables as Hen harriers are adept at flying and highly unlikely to collide with static structures. Furthermore, the uprating involves the existing powerlines that have been in place for over 40 years. Therefore, no potential for significant in-combination / cumulative effects with the proposed development will occur with the proposed project on the SCI of the Mullaghanish to Musheramore Mountains SPA. There will be no potential for significant in-combination / cumulative effects with the proposed development on the SCI's of The Grearagh SPA as it is greater than the foraging range of all the SCI species.

Retention of existing 20 metre high telecommunications support structure carrying telecommunications equipment together with existing equipment container and associated equipment within a fenced compound as previously granted under local authority reference 12/06523 (planning reference: 185230). Structure has been in place for a number of years, allowing ample time for bird species to acclimatise to the structure. As no new works are proposed within the development, no potential for significant in-combination / cumulative effects to occur with the proposed development.

Construction of a battery storage compound including 2 no. battery storage buildings with associated plant and equipment, an ancillary 110kV electricity substation with 2 no. control buildings, associated electrical plant & equipment and fencing, underground electricity cabling, surface water drainage, site entrance and access track, security fencing and all ancillary site works (planning reference: 185686). The location of the development is c. 5.6km west of the proposed project. The development has undergone an appropriate assessment which concluded there will be no significant impacts to the hen harrier population of the Mullaghanish to Musheramore Mountains SPA. There is appropriate distance and habitats (including the Mullaghanish to Musheramore Mountains SPA) between the development and the proposed project to prevent a cumulative effect of potentially obstructing migratory flightpaths and 'disturbance' to birds utilising foraging grounds whilst on migration. Hen harriers are also adept at flying and highly unlikely to collide with static structures. Therefore, no potential for significant in-combination / cumulative effects with the proposed development.

The development of an extension to the existing Ballyvouskill ESB substation and the overall site area (within the planning application boundary) of 0.73ha c. 5.8km west of the proposed project.

The development will comprise the construction of one (1) no. ± 100 Mvar STATCOM transformer, one (1) no. auxiliary transformer, three (3) no. reactors, one (1) no. outdoor cooling bank, control and valve building (268m²), underground connection to existing ESB substation. It further includes security fencing, security gate, four (4) no. 25m high lightning masts, permeable surfacing, and an internal access road (planning reference: 186438). The development underwent an appropriate assessment screening which concluded 'The assessment based on the source, pathway, receptor model has shown that there is no potential for likely significant effect to breeding hen harrier or the habitats upon which it depends as they pertain to the Mullaghanish to Musheramore Mountains SPA.' The development is also c. 5.8km west of the proposed project with an appropriate distance and habitats (including the Mullaghanish to Musheramore Mountains SPA) between the development and the proposed project and hen harriers are also adept at flying and highly unlikely to collide with static structures. Therefore, no potential for significant in-combination / cumulative effects with the proposed development.

A battery energy storage facility which will comprise of rechargeable battery units contained within up to 39 No. 40 foot containers on site and the associated development of unit substations, a 110 kV substation, security fencing, security cameras, lightning mast, new site roads and the upgrading of the existing vehicular access. The facility will connect into the adjoining Ballyvouskill ESB substation via underground cable. All associated site development, landscaping and boundary treatment works above and below ground (planning reference: 184182). The project underwent an appropriate assessment screening which concluded that there is no potential for significant effects from the development with regards to the Mullaghanish to Musheramore Mountains SPA. Therefore, no potential for significant in-combination / cumulative effects with the proposed development.

Permission for the development of a small-scale quarry with the extraction of rock using ripping and rock breaker and the on-site crushing and screening with mobile plant, and open storage of crushed rock. The development is located c. 9.1km south of the site. No appropriate assessment has been undertaken at the site, however, due to the distance from the Mullaghanish to Musheramore Mountains SPA and no records of SCI species from The Grearagh SPA, no potential for significant in-combination / cumulative effects with the proposed development.

All Other Developments

The majority of consent applications pertain to one-off residential dwelling or farm buildings/structures along the regional roads. The applications to the south of the site are within the Lee, Cork Harbour and Youghal Bay catchment (ID 19) catchment, therefore, no direct or indirect connectivity to the Blackwater River (Cork/Waterford) SAC and its tributaries for in combination effects. The scale of these applications will not have an effect on the Mullaghanish to Musheramore Mountains SPA and The Gearagh SPA, therefore no potential for significant in-combination / cumulative effects with the proposed development.

The applications to the north have no connectivity to the Nadanuller Beg Stream and Glen (Banteer) River, therefore, no direct or indirect connectivity to the Blackwater River (Cork/Waterford) SAC and its tributaries for in combination effects with the proposed project. The scale of these applications will not have an effect on the Mullaghanish to Musheramore Mountains SPA and The Gearagh SPA, therefore no potential for significant in-combination / cumulative effects with the proposed development.

Silviculture and Agriculture

The proposed wind farm site and grid connection are predominantly located within forestry and agricultural land. As outlined in *Table 2-2: Potential Impacts of the Proposed Project* potential impacts could arise if previously fertilised land were to be disturbed and mismanaged allowing nutrients / sediment to escape the site. Cumulative effects could occur if felling and construction activities at the wind farm site are undertaken in parallel with off-site forestry activities (particularly harvesting) and agricultural activities (particularly manure spreading) within the same catchment, ultimately adding potential nutrients to the Blackwater River (Cork/Waterford) SAC and further impacting the aquatic qualifying interests.

Replant Lands

For the purposes of the proposed project, the developer commits that the location of any replanting (alternative afforestation) associated with the project will be greater than 10km from the wind farm site and also outside any potential hydrological pathways of connectivity i.e. outside the catchment within which the proposed project is located. On this basis, it is reasonable to conclude that there will be no more than imperceptible indirect or in-combination effects associated with this replanting. Refer to Appendix 9 *Consideration of Afforestation* for full details pertaining to the locating of replant lands.

4.4.1.2 Plans

Cork County Development Plan

The County Development Plan is currently under review. The Draft Cork County Development Plan 2022-2028 has recently been published which will ultimately replace the Cork County Development Plan 2014 once adopted.

The current plan includes several policies for the protection of wildlife and European sites, encouraging the appropriate assessment of potential effects from future development. The implementation of the policies and objectives of the County Development Plan in-combination with the design of the proposed project would have a positive effect for biodiversity in the local area.

Limerick County Development Plan

The County Development Plan is currently under review. The Draft Limerick County Development Plan 2022-2028 is currently entering the final stages of development and will ultimately replace the Limerick City Development Plan 2010-2016 (as extended) and Limerick County Development Plan 2010-2016 (as extended) once adopted.

The current plan includes several policies for the protection of wildlife and European sites, encouraging the appropriate assessment of potential effects from future development. The implementation of the policies and objectives of the County Development Plan in-combination with the design of the proposed project would have a positive effect for biodiversity in the local area.

Kerry County Development Plan

The County Development Plan is currently under review. The Draft Kerry County Development Plan 2022-2028 is currently at the stage of receiving submissions and will ultimately replace the Kerry County Development Plan 2015-2021 once adopted.

The current plan includes several policies for the protection of wildlife and European sites, encouraging the appropriate assessment of potential effects from future development. The implementation of the policies and objectives of the County Development Plan in-combination with the design of the proposed project would have a positive effect for biodiversity in the local area.

Blarney Macroom Municipal District Local Area Plan (2017)

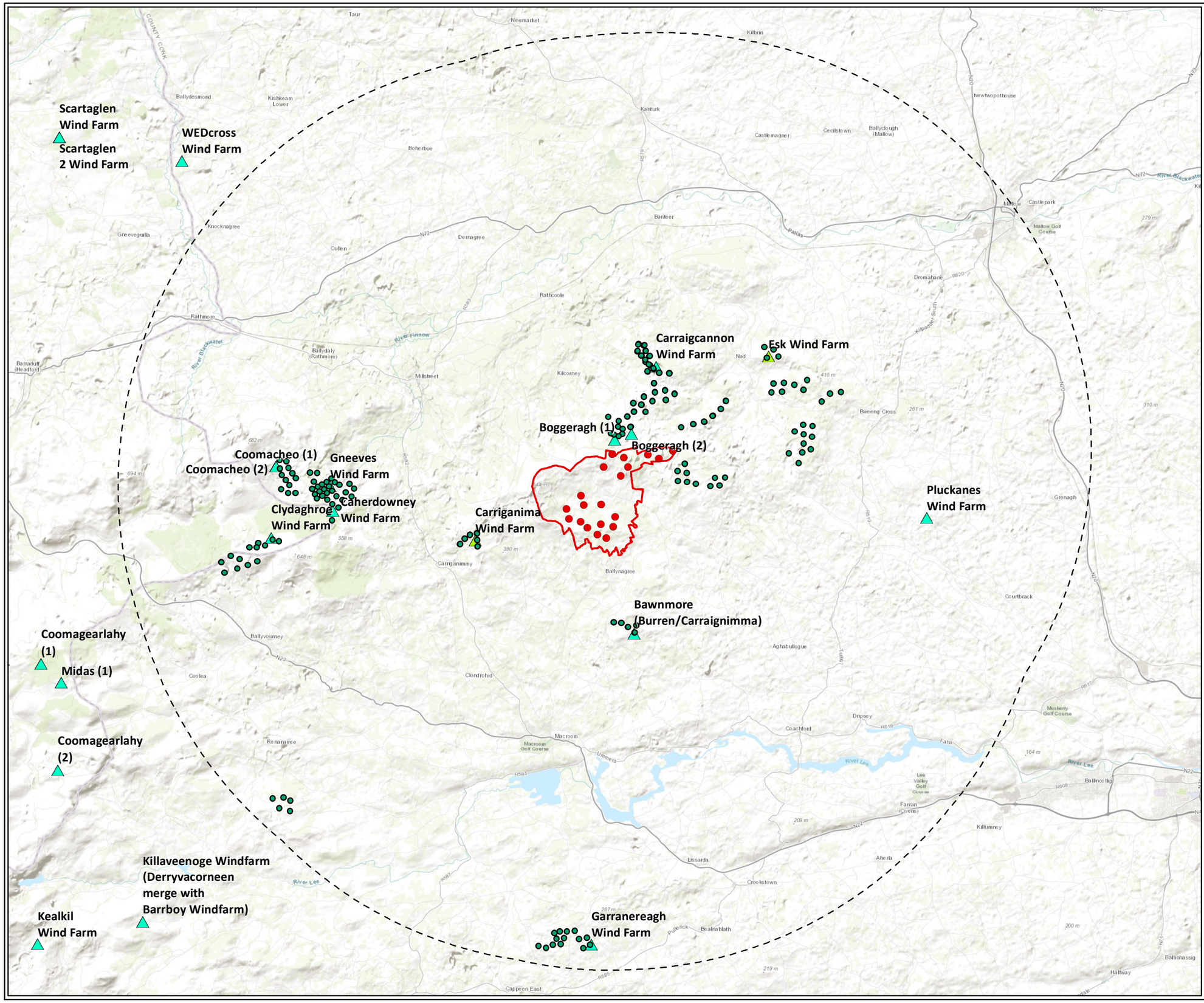
The Local Area Plan focuses on development within towns only. It defines the village of Ballinagree as a 'Village Nuclei' where 'a limited range of services is provided supplying a very local need'. It does not provide any information regarding the proposed project location.

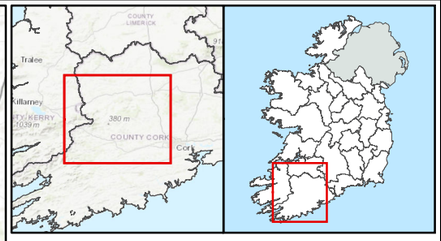
River Basin Management Plan for Ireland 2018 – 2021

The implementation of the River Basin Management Plan and achievement or maintenance of environmental objectives which will be set for the receiving water bodies will have a positive impact on water dependent habitats and species within European sites.

Inland Fisheries Ireland Corporate Plan 2016 -2020

The implementation of this corporate plan will have a positive impact for biodiversity of inland fisheries and ecosystems. It will not contribute to in-combination or cumulative impacts with the proposed project.





Legend

- Wind Farm Site
- 20km Buffer of Wind Farm Site
- Wind Turbine
- Existing Turbine
- SEAI Wind Farms (2018)
- Other Wind Farms

N W E S

0 2.5 5 10 Kilometers

TITLE: Existing Wind Farms within the 20km search radius of the Site

PROJECT: Ballinagree Wind Farm

FIGURE NO:	4.1		
CLIENT:	Coillte and Ørsted		
SCALE:	1:180000	**REVISION:**	0
DATE:	17/01/2022	**PAGE SIZE:**	A3

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4.5 Potential for Adverse Effects

An assessment of potential for the proposed project to have adverse effects on the integrity of the identified European sites is presented hereunder with respect to the aquatic qualifying interests and SCI bird species which have been identified to be within the likely zone of influence of the project.

Table 4-8: Conservation Objectives and Structure and Functions for Relevant Qualifying Interests / Species of Conservation Interest with Potential For Adverse Effects on Site Integrity from the Main Site.

	Species	Conservation Objective	Attribute	Measure	Target	Potential For Adverse Effects on Site Integrity from proposed Project	Potential effect in-combination with other plans or projects	Duration of Effect in the absence of mitigation	Conclusion
Blackwater River (Cork/Waterford) SAC	*Salmo salar* (Salmon) [1106]	To restore the favourable conservation condition	Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary	**Potential for Adverse Effects** In general, salmonid habitat in the vicinity Blackwater[Munster] sub-catchments was poor to excellent in the Nadanuller Beg Stream, moderate in the unnamed stream and good in the Glen River. Brown trout were recorded within each of the watercourses with a juvenile population present and excellent nursery habitat within the Nadanuller Beg Stream. Although no EPA records are available for the watercourses, surveys undertaken by Triturus identified the biological water quality, based on Q-sampling for the Nadanuller Beg Stream and Glen River as Q4 (good status). The unnamed stream was not assessed. In the event of emissions to water via the pathways as explained in section 4.3.1, a potential negative effect resulting in in a	Yes potential to affect this target by contributing to a cumulative reduction in distribution exists.	Permanent due to the project infrastructure within watercourses being left in place even after decommissioning	Yes, potential for the project to affect this target either alone or in-combination with other plans or projects exists
			Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded		Yes potential to affect this target by contributing to a cumulative reduction in availability of spawning habitat for adult salmon exists.	Temporary due to the duration of a runoff event	
			Salmon fry abundance	Number of fry/5minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling		Yes potential to affect this target by contributing to a cumulative reduction in salmon fry abundance exists.		
			Out-migrating smolt abundance	Number	No significant decline		Yes potential to affect this target by contributing to a cumulative reduction in smolt abundance exists.		
			Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes		Yes potential to affect this target by contributing to a cumulative reduction in the number and distribution of redds quality exists.		
			Water quality	EPA Q value	At least Q4 at all sites sampled by EPA		Yes potential to affect this target by contributing to a cumulative deterioration in water quality exists.		

	Species	Conservation Objective	Attribute	Measure	Target	Potential For Adverse Effects on Site Integrity from proposed Project	Potential effect in-combination with other plans or projects	Duration of Effect in the absence of mitigation	Conclusion
						degradation of water quality and habitat heterogeneity of the watercourses within the catchment of the proposed project, thereby reducing the carrying capacity of the watercourses for salmonids in the absence of appropriate mitigation.			
	Lutra lutra (otter) [1355]	To restore the favourable conservation condition	Distribution	Percentage positive survey sites	No significant decline	**Potential for Adverse Effects** Otter signs (e.g., spraint) were not recorded at the watercourses within the Blackwater[Munster] sub-catchments. However, were recorded on the River Laney, Clonavrick Bridge underneath the bridge structure. There are also historic records in the Glen River and Nad River (which the Nadanuller Beg Stream is a tributary). As the species are mobile and will build holts etc throughout the territory, there is potential for the species to potentially be using the watercourses on and adjacent to the wind farm site.	Yes potential to affect this target by contributing to a cumulative increase in works taking place exists.	Temporary due to the duration of the proposed project.	Yes, potential for the project to affect this target either alone or in-combination with other plans or projects exists
			Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 103ha above high water mark (HWM); 1165.7ha along river banks/ around ponds		Yes potential to affect this target by contributing to a reduction in terrestrial habitat exists.	Temporary due to the duration of the construction phase of the proposed project.	Yes, potential for the project to affect this target either alone or in-combination with other plans or projects exists
			Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 647.2ha		No, as the marine extent of the objective does not include the Blackwater[Munster] sub-catchments.	N/A	No potential for the project to affect this target either alone or in-combination with other plans or projects exists
			Extent of freshwater (river) habitat	Kilometers	No significant decline. Length mapped and calculated as 599.54km		Yes potential to affect this target by contributing to a reduction in	Temporary due to the duration of the construction phase of the proposed project.	Yes, potential for the project to affect this target either alone or in-combination with other plans or projects exists

	Species	Conservation Objective	Attribute	Measure	Target	Potential For Adverse Effects on Site Integrity from proposed Project	Potential effect in-combination with other plans or projects	Duration of Effect in the absence of mitigation	Conclusion
							freshwater habitat exists.		
			Extent of freshwater (lake/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 25.06ha	In the event of disturbance/ displacement of species present a decline in positive survey sites may occur in the absence of mitigation. Furthermore, in the event of emissions to water via the pathways as explained in section 4.3.1, a potential negative effect resulting in potential reduction in fish biomass availability may occur in the absence of appropriate mitigation.	No as there are no lakes/lagoons within the project footprint	N/A	No potential for the project to affect this target either alone or in-combination with other plans or projects exists
			Couching sites and holts	Number	No significant decline		No as no couching site or holts were identified within the study area	N/A	No potential for the project to affect this target either alone or in-combination with other plans or projects exists
			Fish biomass available	Kilograms	No significant decline		Yes potential to affect this target by contributing to a cumulative reduction of fish numbers exists.	Temporary due to the duration of a runoff event	Yes, potential for the project to affect this target either alone or in-combination with other plans or projects exists
			Barriers to connectivity	Number	No significant increase		Yes potential to affect this target by contributing to barriers in the form of fences during the construction phase.	Temporary due to the duration of the construction phase	Yes, potential for the project to affect this target either alone or in-combination with other plans or projects exists
	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]	To maintain the favourable conservation condition	Habitat distribution	Occurrence	No decline, subject to natural processes	**Potential for Adverse Effects** This habitat type was recorded in the Glen River during surveys conducted by Triturus in 2020/2021.	Yes potential to affect this target by contributing to a cumulative reduction in habitat exists.	Temporary due to the duration of the proposed project.	Yes, potential for the project to affect this target either alone or in-combination with other plans or projects exists
			Habitat area	Kilometres	Area stable or increasing, subject to natural processes				
			Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes		Yes potential to affect this target by	Temporary due to the duration of the proposed project.	Yes, potential for the project to affect this target either alone or

	Species	Conservation Objective	Attribute	Measure	Target	Potential For Adverse Effects on Site Integrity from proposed Project	Potential effect in-combination with other plans or projects	Duration of Effect in the absence of mitigation	Conclusion
						In the event of emissions to water via the pathways as explained in section 4.3.1 to the Glen River resulting in a degradation of water quality and habitat heterogeneity due to sedimentation, thereby reducing the quality of the watercourse for this habitat type in the absence of appropriate mitigation.	contributing to a deterioration on river flow exists.		in-combination with other plans or projects exists
			Hydrological regime: tidal influence	Daily water level fluctuations- metres	Maintain natural tidal regime		No, as the tidal extent of the objective does not include the Blackwater[Munster] sub-catchments.	N/A	No potential for the project to affect this target either alone or in-combination with other plans or projects exists
			Substratum composition: particle size range	Millimetres	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (typically sands, gravels and cobbles		Yes potential to affect this target by contributing to an altered substratum composition exists.	Temporary due to the duration of the proposed project.	Yes, potential for the project to affect this target either alone or in-combination with other plans or projects exists
			Water quality: nutrients	Milligrammes per litre	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition		Yes potential to affect this target by contributing to a cumulative increase in nutrients exists.	Temporary due to the duration of the proposed project.	Yes, potential for the project to affect this target either alone or in-combination with other plans or projects exists
			Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition		Yes potential to affect this target by contributing to a cumulative reduction in species type and condition exists.	Temporary due to the duration of the proposed project.	Yes, potential for the project to affect this target either alone or in-combination with other plans or projects exists
			Floodplain connectivity: area	Hectares	The area of active floodplain at and upstream of the habitat should be maintained		Yes potential to affect this target by contributing to a cumulative alteration to floodplain area exists.	Temporary due to the duration of the proposed project.	Yes, potential for the project to affect this target either alone or in-combination with other plans or projects exists
Mullaghanish to Musheramore Mountains SPA	*Circus cyaneus* (Hen harrier) [A082]	Generic conservation objectives To maintain or restore the				**No Potential for Adverse Effects** Hen harriers are traditionally	No, potential for in-combination effects with other plans and	N/A	No potential for the project to affect this target species alone or in-combination

	Species	Conservation Objective	Attribute	Measure	Target	Potential For Adverse Effects on Site Integrity from proposed Project	Potential effect in-combination with other plans or projects	Duration of Effect in the absence of mitigation	Conclusion
		favourable conservation condition of the bird species				associated with open upland bog/heath habitats as well as rough/wet grassland and scrub (and more recently pre-thicket forestry) during the breeding season. Hen harriers were recorded during all four breeding season vantage point surveys (2017, 2018, 2019 & 2020) and during breeding hinterland surveys (2017-2020) conducted by Ecology Ireland Wildlife Consultants Ltd. Activity levels were consistently low on site however (< 1.5% of the total survey time in the breeding season and < 0.7% in the winter) and related to foraging and commuting flights, with no nest sites recorded at the site or within 2km of the site boundary in any of the survey years. Hen harrier activity was recorded widely at the site, with no areas of high or focused activity noted. Relatively regular flightlines were noted in the Dooneen Hill area to the southeast of the site, outside of the study site boundary, in association with a	projects on the SPA have been ruled out in Section 4.4.1.		with other plans or projects exists

	Species	Conservation Objective	Attribute	Measure	Target	Potential For Adverse Effects on Site Integrity from proposed Project	Potential effect in-combination with other plans or projects	Duration of Effect in the absence of mitigation	Conclusion
						known nest site in the wider area to the south. There will be no impacts to this area as a result of the proposed wind farm development. In relation to winter activity, there are no known historical Hen Harrier roost sites in the area of County Cork where the proposed development site is located (see O'Donoghue 2010). Given the absence of any nest sites within 2km of the study site and the low levels of activity at the site - where the proposed turbine locations under consideration here are not located along regular hen harrier flightpaths or any area of preferential use by this species, the loss of wet grassland/cutover bog/heath habitat associated with four turbines (T2, T3, T13 & T17) and associated access tracks is considered likely to have an imperceptible impact on hen harrier. The grid connection will be underground within existing forestry tracks and			

	Species	Conservation Objective	Attribute	Measure	Target	Potential For Adverse Effects on Site Integrity from proposed Project	Potential effect in-combination with other plans or projects	Duration of Effect in the absence of mitigation	Conclusion
						public roads to the south of the study site, where the dominant habitat is buildings and artificial surfaces. The proposed grid connection route does not pass through any areas identified as being of ecological importance for the Annex I species under consideration here. The installation works shall be undertaken on a rolling basis with short sections of road closed for short periods before moving onto the next section. Given the short duration of the phased installation works, the location of the works areas within already-disturbed environments (i.e., public roads) and the absence of any important bird habitats along the route, the installation of the GCR is expected to have a negligible disturbance impact on hen harrier. The TDR does not impact any areas of ecological importance for the Annex I species under consideration here. Given the short duration the TDR will			

	Species	Conservation Objective	Attribute	Measure	Target	Potential For Adverse Effects on Site Integrity from proposed Project	Potential effect in-combination with other plans or projects	Duration of Effect in the absence of mitigation	Conclusion
						be used, it being on existing public roads, and the absence of any areas of ecological importance for this species, the TCD is expected to have a negligible disturbance impact on hen harrier. Published research on disturbance and displacement impacts of wind farms on hen harriers (e.g. Pearce-Higgins et al. 2012) has reported significant declines in the population densities of certain species at wind-farm sites from pre- to post-construction and there are indications from other research that the presence of turbines may result in lower nest success for hen harrier, although this impact was only evident for nest sites located within 1 km of wind turbines (Fernández-Bellon et al. 2015). There are no hen harrier nests within 2km of the study site and no impact on hen harrier nest success is therefore considered likely as a result of the proposed development. Furthermore, a review of available literature on wind			

	Species	Conservation Objective	Attribute	Measure	Target	Potential For Adverse Effects on Site Integrity from proposed Project	Potential effect in-combination with other plans or projects	Duration of Effect in the absence of mitigation	Conclusion
						turbine avoidance by hen harriers from wind farm sites across their range (Madders & Whitfield, 2006) ranked this species' sensitivity to displacement as low-medium. The majority of the studies included in this review showed no indication of hen harrier displacement at wind farm sites across Europe and North America (loc cit.). Collisions with wind turbines are most likely to occur where birds fly regularly at turbine blade height and do not demonstrate an effective avoidance response. Hen harriers typically fly below the height of wind turbine rotor blade sweep at heights of less than 25m (Smallwood & Thelander, 2004, Drewitt & Langston, 2006, Whitfield & Madders, 2006). 25m has been assessed as the lowest rotor blade sweep height for the range of turbine specifications outlined in Section 2.2.1. 79.5% of observations recorded during the breeding season			

	Species	Conservation Objective	Attribute	Measure	Target	Potential For Adverse Effects on Site Integrity from proposed Project	Potential effect in-combination with other plans or projects	Duration of Effect in the absence of mitigation	Conclusion
						vantage point surveys were identified at heights below 25m (lowest rotor sweep height), 13.6% of observations recorded at heights greater than 25m and 6.8% (three) no height given (refer to Appendix 3). 77.5% of observations recorded during the winter season vantage point surveys were identified at heights below 25m (lowest rotor sweep height), 12.5% of observations recorded at heights greater than 25m and 10% (four) no height given (refer to Appendix 3). This low flight height coupled with the small-scale avoidance of wind turbines shown by hen harriers, suggests that collision risk will be low for this species (Whitfield & Madders, 2006). The overflying rate of the proposed wind farm area by hen harrier species, was found to be consistently low throughout the eight-season survey period (<1.5 % of the total survey time). The			

	Species	Conservation Objective	Attribute	Measure	Target	Potential For Adverse Effects on Site Integrity from proposed Project	Potential effect in-combination with other plans or projects	Duration of Effect in the absence of mitigation	Conclusion
						potential collision risk at the proposed wind farm is therefore very low. Wind farms can also cause displacement of birds by creating a barrier effect to migration or local flight paths, which could result in disruption of ecological links between feeding, breeding and roosting areas (e.g. Drewitt & Langston 2006, Kingsley & Whittam 2005). In Ireland, this potential problem is more likely to occur with migrating wildfowl populations (Percival, 2003). As only 11 of the observations recorded during the breeding season and winter season vantage point surveys (13% of total observations) showed hen harrier within the sweep path of the proposed turbines coupled with the small-scale avoidance of wind turbines shown by hen harriers, the potential barrier effect at the proposed wind farm is very low.			

	Species	Conservation Objective	Attribute	Measure	Target	Potential For Adverse Effects on Site Integrity from proposed Project	Potential effect in-combination with other plans or projects	Duration of Effect in the absence of mitigation	Conclusion
The Gearagh SPA	Mallard (*Anas platyrhynchos*) [A053]	Generic conservation objectives To maintain or restore the favourable conservation condition of the bird species				**No Potential for Adverse Effects** Although the Site is within the core foraging range of The Gearagh SPA for this species. Mallard were infrequently observed in very low numbers (<5 individuals, typically 1-2 at any one time) and the study area does not support foraging, loafing or roosting features of significance for this species due to the absence of suitable habitats (e.g., wetlands, lakes). The potential impact to the species will be negligible and will not affect the conservation status. The species confirmed or expected on or near the study area are predicted to persist during the lifetime of the proposed project.	No, potential for in-combination effects with other plans and projects on the SPA have been ruled out in Section 4.4.1.	N/A	No potential for the project to affect this target species alone or in-combination with other plans or projects exists

Potential for adverse effects due to the proposed project have been identified on the following QI's/SCI's of the European sites. These are:

- Blackwater River (Cork/Waterford) SAC
    - Salmon
    - Otter
    - Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]

4.6 Mitigation

4.6.1 Mitigation by Avoidance and Design

The following measures are incorporated into the proposed wind farm design to reduce impacts on designated sites, flora and fauna through avoidance and design:

- The hard-standing area of the wind farm has been kept to the minimum necessary for the maximum turbine envelope proposed, including all site clearance works to minimise land take of habitats and flora.
- Site design and layout deliberately avoided direct impacts on designated sites as recommended by statutory bodies as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006).
- All cabling for the project will be placed underground; this significantly reduces collision risk to birds over the lifetime of the wind farm and is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006).
- The grid connection routes have been selected to minimise land take of potentially sensitive habitats by following the site access tracks and public roads as much as possible.
- Care has been taken to ensure that sufficient buffers are in place between wind farm infrastructure (75m for turbines and 50m for everything else) and hydrological features such as rivers and streams with the exception of crossings, works associated with the improvement to the access track and works associated with the undergrounding of the cable route.
- The design was also carried out with cognisance to ecological features. Cables are to be placed underneath public roads where possible to avoid impact to roadside vegetation.

Further mitigation measures prescribed to avoid or reduce potential for the proposed project to have an adverse effect on the integrity / conservation objectives of the Blackwater River (Cork/Waterford) SAC (002170) are prescribed hereunder.

4.6.2 Mitigation Measures

Table 4-9: Details of Mitigation Measures to be Implemented for Proposed Project

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		Mitigation Measures to be Implemented Prior to Construction		
1	The Construction and Environment Management Plan (CEMP) (located in Appendix 4)	The CEMP sets out the key environmental management measures associated with the construction, operation and decommissioning of the proposed wind farm, to ensure that during these phases of the development, the environment is protected, and any potential impacts are minimised. The contractor is not permitted to omit or alter mitigation measures set out in the CEMP. The CEMP and all management plans within, will reduce the risk of impacts from the proposed project including the potential impacts to the conservation objectives outlined in Table 4-8.	Mitigation measures will be implemented in full by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures outlined below and in the CEMP will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works. High probability of success.	The Project Manager, Environmental Manager and Qualified Ecologist will monitor the implementation of the mitigation measures outlined in the CEMP. Further mitigation measures (not already detailed below) pertaining to the proposed project are outlined in the CEMP in Appendix 4 including detailed management plans that form part of the whole document.
2	A Project Ecologist/Ecological Clerk of Works (ECoW) The Project Ecologist/ECoW will ensure successful implementation of all mitigation measures for biodiversity management.	A Project Ecologist/Ecological Clerk of Works (ECoW) with appropriate experience and expertise (in implementing ecological mitigation measures for wind farm developments) will be employed for the duration of the construction and decommissioning phases to ensure that all the mitigation measures outlined in relation to the environment are implemented. The Project Ecologist/ECoW will be awarded the authority to stop construction activity if there is potential for adverse ecological effects to occur.	A Project Ecologist/Ecological Clerk of Works (ECoW) will be employed by the Developer through the Contractor awarded the contract to construct the wind farm. All mitigation will be implemented in full. High probability of success.	The Project Ecologist/ECoW will monitor the implementation of the mitigation measures detailed below and in accordance with the relevant management plans within the CEMP. Regular reporting to developer and contractor as per each management plan.
3	Communication with IFI	A line of communication with IFI will be established by the ECoW and fisheries officers will be invited to inspect mitigation measures at the site. This will ensure transparency, encourage proactive culture around implementation of measures and facilitate input from key stakeholders if required.	ECoW will open a line of communication upon appointment. Mitigation measure will be implemented in full. High probability of success.	ECoW to provide reports of communication and/or site visit findings to update the developer and contractor of input from key stakeholders.
4	Water baseline and monitoring Establish baseline biological water quality in order to detect change throughout the lifetime of the proposed project.	Biological sampling (SSRS or Q sampling as applicable)and physico-chemical sampling will be carried out at the established baseline sampling points as determined within the aquatic ecology report (Appendix 2). Commencement will occur prior to construction to provide an updated baseline and will continue for the duration of the construction and operational phases of the project. Establish baseline biological water quality so regular monitoring can detect any long-term changes in water and aquatic habitat quality which could be missed by grab sampling for physico-chemical parameters only.	Mitigation measure will be implemented in full by the Developer. High probability of success.	Monitoring program will be bi-weekly for the duration of construction and decommissioning and will be yearly for the duration of the operation of the proposed project. Regular reporting to developer, contractor and consenting authority.
5	Invasive Species Eradication of invasive species will be completed prior to construction. Measures shall be in accordance with the invasive species management plan (ISMP) (Appendix 5) and Regulation 49 of	Prior to works commencing an invasive species survey will be undertaken in the previously identified locations within the study area of the project to reconfirm the extend of the non-native invasive species (Japanese knotweed and Rhododendron) and to ensure they have not spread to any new areas within the footprint of the proposed project. This will also ensure no new species have migrated to areas within the footprint of the proposed project. The invasive species management plan in Appendix 5 will be adhered to for all works in areas confirmed as containing non-native invasive species.	Mitigation measure will be implemented in full by the Developer. High probability of success.	The plan will be updated and implemented prior to construction and then updated through all stages of the project lifecycle. Following construction, the plan will be updated for the operational phase, taking into account the results of the detailed construction invasive species

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
	the EC (Birds & Natural Habitats) Regulations (2011).	The plan is intended to be a working document and will be updated during the construction, operational and decommissioning phases. The main objective of the invasive species management strategy are containment, treatment and eradication. Maintaining site hygiene at all times in an area where invasive non-native species are present is essential to prevent further spread. The following site hygiene measures will be implemented onsite during the construction and/or for maintenance works during the operational stage where applicable: • Fence off the infested areas prior to and during construction works where possible in order to avoid spreading seeds or plant fragments around or off the construction site. • Clearly identify and mark out infested areas. Erect signs to inform Contractors of the risk. • Avoid if possible using machinery with tracks in infested areas. • Clearly identify and mark out areas where contaminated soil is to be stockpiled on site and cannot be within buffers (refer to section 4.6.1) of any watercourse or within a flood zone. • If soil is imported to the site for landscaping, infilling or embankments, the contractor will gain documentation from suppliers stating that it is free from invasive species. • Ensure all site users are aware of measures to be taken and alert them to the presence of the Invasive Species Management Plan. • Erection of adequate site hygiene signage in relation to the management of non-native invasive material as appropriate.		management plan and operational maintenance requirements. During decommissioning it will be updated if new areas are identified to have been within the footprint of the works.
6	Environmental Manager The Environmental Manager will ensure successful implementation of all mitigation measures for water control and management.	A suitably qualified Environmental Manager (competent in the implementation and management of environmental mitigation measures for wind farms) will be appointed to ensure the effective operation and maintenance of drainage and other mitigation measures associated with water control and management during the construction process. The operations management of the proposed project will include regular monitoring of the drainage system and maintenance in line with all management plans within the CEMP (Appendix 4). The Environmental Manager will be awarded the authority to stop construction activity if there is potential for adverse effects to water control and/or management.	An environmental manager will be employed by the Developer through the Contractor awarded the contract to construct the wind farm and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed below and in accordance with the relevant management plans within the CEMP ensuring successful implementation. Regular reporting to developer and contractor as per each management plan.
7	Silt traps and silt fencing The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time, and allow settling of silt in a controlled manner.	Silt traps and silt fencing measures for the proposed wind farm site are provided at outfalls from roadside swales to silting ponds, at the end of the drainage channels, at the outside of the tree felling buffer zone and strategically placed down-gradient within forestry drains near streams. The traps and fences will be maintained regularly ensuring that they are clear of sediment build-up and are not severely eroded. Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off.	Mitigation measures will be implemented in full by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures as detailed and in accordance with the relevant management plans within the CEMP. Regular reporting to developer and contractor as per each management plan.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		This measure will reduce the risk of sediment runoff reaching waterways within the catchment of the main wind farm site. This in turn will avoid adverse effects on the surrounding water courses and aforementioned SAC.		
8	Settlement ponds The main purpose of the settlement ponds is to increase residence time and prevent sediment reaching the watercourses.	Settlement ponds as detailed in the surface water management plan within the CEMP, will be put in place in advance of works as construction progresses across the site. The settlement ponds have a diffuse outflow and will mitigate any increase in surface water run-off and treat suspended solids in the surface water runoff. This will prevent sediment reaching the waterways within the catchment of the main wind farm site This in turn will avoid adverse effects on the watercourse network.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor. High probability of success	The Environmental Manager will monitor the implementation of the mitigation measures as detailed and in accordance with the relevant management plans within the CEMP. Regular reporting to developer and contractor as per each management plan. Settlement ponds are to be cleared of deposits regularly and when requested by the ECoW and/or the Environmental Manager to ensure their ongoing functioning and maintenance of excess capacity.
		Construction Phase Mitigation Measures		
9	Habitats or flora	The area of the proposed works will be kept to the minimum necessary, including all site clearance works, to minimise disturbance to habitats and flora. In this case, the footprint of the proposed development has been kept to the minimum necessary, including the use of layout design methods (e.g., existing roads and stream crossings to minimise excavation works). No disturbance to habitats or flora outside the proposed project area will occur. All works will be restricted to the immediate footprint of the development, which will be wholly within the development site boundary and kept separate from any key areas for biodiversity. Machinery, and equipment will be stored within the site compound. Designated access points will be established within the site and all construction traffic will be restricted to these locations. Access to the site will be via the five access points stated in Section 2.2.2.5. Exclusion zones will be demarcated and no site traffic will enter the area.	A Project Ecologist/Ecological Clerk of Works (ECoW) will be employed by the Developer through the Contractor awarded the contract to construct the wind farm. All mitigation will be implemented in full. High probability of success.	The Project Ecologist/ECoW will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP. Regular reporting to developer and contractor as per each management plan.
10	Avifauna	• Construction operations will take place during the hours of daylight for the most part to minimise disturbances to roosting birds or any active crepuscular/nocturnal bird species. • A Toolbox Talk will be prepared and incorporated as part of the construction phase site induction. A wildlife register will be maintained by the environmental site staff during the construction phase. Site staff will be encouraged to report any bird sightings of note made during the construction phase and this information will be logged by the environmental site staff. The site manager will continue to maintain a wildlife register throughout the operational phase. • The construction compound, substation and wind farm will not be lit at night (with the exception of aviation warning lights and low-level switchable safety lighting). All lighting systems will be designed to minimise nuisance through light spillage. Shielded, downward directed lighting will be used wherever possible and all non-essential lighting will be switched off during the hours of darkness.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Project Ecologist/ECoW will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP. Regular reporting to developer and contractor.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		• All edible and putrescible wastes will be stored and disposed of in an appropriate manner. Similarly, all construction materials will be stored and stockpiled at prescribed locations and all waste materials will be disposed of at licensed facilities. • Tree-felling and removal of mature vegetation will be carried out outside of the bird breeding season (March 1st – August 31st). Where this is not possible due to construction program constraints the appointed ECoW will inspect the area to be felled no more that 48hrs in advance of the felling / clearance works and advise if bird species are present and if so, on a suitable exclusion buffer needed until the species has fledged. Hedgerows and mature trees will be retained insofar as possible along the TDR and grid access route. Standard Vantage Point Monitoring in accordance with the Survey Methods for Use in Assessing the Impacts of Onshore Wind farms on Bird Communities (Scottish Natural Heritage. 2017) will be carried out during the construction period by a competent experienced ornithologist. A VP survey will be carried out between mid-March and mid-August (6 visits during breeding season) and October to March (6 visits during winter season to monitor the occurrence of waders, wildfowl and raptors. The survey shall cover the development footprint and all areas within 500m of the works. In the unlikely event that a nest is discovered a species specific buffer (exclusion zone for all works) will be put in place until the birds have fledged. This will be in line with the latest guidance for example Willams et al., 2013 and Pearce-Higgins *et al.,* 2009.		
11	Lighting	Construction operations will take place during the hours of daylight to minimise disturbances to active nocturnal species. This is in line with best practice recommendations for mitigation measures in regard to nocturnal species (birds, bats, otters) and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006). Limited operations such as concrete pours, turbine erection and installation of the grid connection require night-time operating hours; full consideration of BCT guidance note 08/18 will be implemented when determining appropriate lighting for works to take place during night-time hours. Works will be supervised by the project ecologist/ECoW.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Project Ecologist/ECoW will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP. Regular reporting to developer and contractor.
12	Toolbox talk Will ensure all personnel present receive the relevant information for the areas they are working on each given day.	Toolbox talks will be undertaken with construction staff on disturbance to key species during construction. This will help minimise disturbance.	Toolbox talks will be provided to all staff by the ECoW daily before the start of any works.	The ECoW will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
13	Plant and vehicles Will prevent contamination within the site.	All site plant will be inspected at the beginning of each day prior to use. Defective plant shall not be used until the defect is satisfactorily fixed. All major repair and maintenance operations will take place off site. Vehicles entering the site will be in good working order, free from leakage of fuel or hydraulic fluid.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	Inspection of plant on site will be maintained throughout the lifetime of the project.

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14	Pollution incident control response Will ensure appropriate training to all personnel and knowledge of emergency response plans	All personnel working on site will be trained in pollution incident control response. An emergency response plan (refer to the CEMP) will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt. A regular review of weather forecasts of heavy rainfall (>10mm/hour) is required. A record will be kept of daily visual inspections of drains, silt ponds, etc on site and weekly inspections of streams which receive flows from the main wind farm site, during the construction phase.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor as per each management plan.
15	Surface water	A self-imposed buffer zone of 50m will be maintained for all watercourses with the exception of existing road upgrades and stream crossings. Felling buffer zone will involve a 10m exclusion zone along the edge of all aquatic zones. Please note this exclusion zone has nothing to do with a 50m buffer zone defined for the construction of the wind farm. The exclusion zone refers to machinery associated with tree felling. No machinery is allowed to enter this area. However, they can fell in the exclusion zone if a tree felling machinery has a long arm. Trees that can't be reached will be felled with a chainsaw. The site drainage has been designed to complement existing overland flow and existing onsite drainage. A three-stage treatment train (swale – settlement pond – diffuse outflow) is required to retain and treat the discharges from all hard surface areas. Settlement ponds are required to be cleared of deposits generated by aggregate used for access tracks or other sediment regularly. Cleared material shall be interred securely to prevent ingress into the drainage network. This measure will reduce the risk of sediment runoff or pollutants reaching waterways within the catchment of the proposed project. This in turn will avoid adverse effects on the surrounding water courses and the aforementioned SAC.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP. Daily visual inspections of drains, silt ponds, etc on site and weekly inspections of streams will be performed during the construction period. This will ensure suspended solids are not entering the streams and rivers alongside the work area. These inspections will identify any obstructions to channels and allow for appropriate maintenance of the existing roadside drainage regime. If suspended solids in water courses exceed the baseline levels construction work will be stopped, and remediation measures will be put in place immediately.
16	Felling schedule (License)	Tree felling will be the subject of a felling license from the Forest Service and to the conditions of such a license. A Felling License will be in place prior to works commencing on site. To ensure a tree clearance method that reduces the potential for sediment and nutrient run-off, the construction methodology will follow the specifications set out in the following guidance documents: • DAFM (2019). Standards for Felling and Reforestation; • Forestry Service (2000a). Forest Service Forestry and Water Quality Guidelines; • Forestry Service (2000b). Forest Harvesting and Environmental Guidelines; • DAFM (2018). Draft Plan for Forestry and Freshwater Pearl Mussel in Ireland	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with permitted license. Regular reporting to developer and contractor and in line with any license requirement.
17	Felling schedule (aquatic zone of main wind farm site)	In accordance with the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zone (Forestry Service, 2000a, 2000b). Given the close proximity of felling areas to receiving watercourses and potential source-receptor pathways (i.e., drainage channels), a minimum buffer zone for felling areas of 15-20m will be applied. Silt fences will be required within the drainage channels. These will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with permitted license and in accordance with the relevant management plans detailed in the CEMP.

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			High probability of success.	Regular reporting to developer and contractor and in line with any license requirement.
18	Felling schedule (timber extraction rack)	Where damage or serious rutting has started to occur, timber extraction will be suspended immediately. Relocation of the extraction rack will be used to remedy the situation. This will avoid timber extraction routes acting as conduits for surface water flows. This in turn will avoid adverse effects on the surrounding water courses via emissions to water.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with permitted license and in accordance with the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with any license requirement.
19	Felling schedule (felling)	Felling will be undertaken in the spring to facilitate the sowing of grass seeds post-harvest to aid sediment filtration and nutrient absorption, using native grass species e.g., *Holcus lanatus and Agrostris capilaris* (DAFM, 2018).	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with permitted license and in accordance with the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with any license requirement.
20	Felling schedule (machine operations)	Machine operations will not take place in the 48 hour period before predicated heavy rainfall (>10mm/hour), during heavy rainfall or in the 48 hour period following heavy rainfall (DAFM, 2018). Weather forecasts will be checked at least 24 hours in advance of works.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with permitted license and in accordance with the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with any license requirement.
21	Felling schedule (removal of debris)	Removal of branch lop-and-top and other debris (brash) from felling areas within 20m of forestry drains (i.e., up-slope of active pathways to larger downstream watercourses) will be carried out to reduce nutrient seepage immediately post-felling and in the proceeding years after felling has occurred (DAFM, 2019). Brash mats will be used to support vehicles on soft ground and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place before they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall. Brash mats must not be left within 20m of a watercourse.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with permitted license and in accordance with the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with any license requirement.

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22	Road / access track construction	It is proposed to construct approximately 14.4km of new internal access tracks and carry out upgrades to 11.1km of existing tracks (including bend widening) to facilitate site access and construction activities. All track widening will be undertaken using clean uncrushable stone with a minimum of fines to reduce the risk of suspended solid releases to receiving watercourses. Still traps will be placed in the new roadside swales. Proposed new tracks will be drained as via roadside swales with stilling ponds at the end of the swale. These grassed swales will serve to detain flow and reduce the velocities of surface water flows. The swales will be 0.3 m deep with a bottom width of 0.5 m and side slope of 1 in 3. The swales will be constructed in accordance with CIRIA C698 Site Handbook for the Construction of SuDS which can be used in conjunction with CIRIA C753 The SuDS Manual. Where roadside drains are laid at slopes greater than 2%, check dams will be provided. Site drainage, including silt traps and settlement ponds, will be put in place in parallel with or ahead of construction, such that excavation for new infrastructure will have functional drainage system in place. The settlement ponds will remain in place during construction phase. The settlement ponds will drain diffusely overland, over existing vegetated areas, within the site boundary. Tracks will be capped as soon as practicably possible to cover exposed subsoils and as such reduce the concentration of suspended solids in the run-off.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
23	Main wind farm drainage	Of the 13no. water crossings within the site boundary to be crossed during the construction phase three 10 are existing structures that will be crossed either above or below the existing pipe drains. One crossing will involve the upgrading of the existing bridge. Three proposed new crossings will be via precast box culverts and one will involve the construction of a new bridge. Silt Protection Controls (SPCs) are proposed at the location of the drain crossings. The SPCs will consist of a minimum of silt traps containing filter stone and filter material staked across the width of the swales and upstream of the outfall to any watercourse. Drains around hard-standing areas will be shallow to minimise the disturbance to sub-soils. Permanent roadside drainage will be installed as part of the construction stage. This will include the use of interceptor drains, swales, check dams and stilling ponds. These measures will buffer site run-off during periods of high rainfall by retaining the water until the storm hydrograph has receded. Site drainage, including silt traps and stilling ponds, will be put in place in parallel with or ahead of construction, such that excavation for new infrastructure will have functional drainage system in place. The stilling ponds will remain in place during construction phase. The stilling ponds will drain diffusely overland, over existing vegetated areas, within the site boundary. The stilling ponds will be back-filled and the swales that were connected to them will be re-connected to the outfall once construction is completed. The routes for the proposed access tracks are laid out to follow existing tracks.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		Site access roads have been laid out to reduce the longitudinal slope of roadside drains and to follow natural flow paths. Where roadside drains are laid at slopes greater than 2%, check dams will be provided. Where existing tracks will be used to access the site, roadside drains alongside these tracks will be cleared of obstructions only where strictly necessary (i.e., if flooding occurs). Vegetation and other obstructions provide sediment arrest and flow attenuation functions and as such will not be interfered with unless absolutely necessary.		
24	Wheel wash facilities	Wheel wash facilities will be located at site entrances 1 and 2 to reduce construction traffic fouling public roads. The wheel wash will come with an additional water tank which will be filled regularly. These units will be self-contained and will filter the waste for ease of disposal. Waste will be removed from each unit and from site by a permitted contractor to a licensed facility. Measures will be in accordance with the invasive species management plan (ISMP) (Appendix 5) and Regulation 49 of the EC (Birds & Natural Habitats) Regulations (2011).	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
25	Concrete	Major construction works including concrete pours onsite will be timed to occur outside periods where heavy rainfall (>10mm/hour) would be expected. A regular review of weather forecasts (weather forecasts will be checked at least 24 hours in advance of works.) of heavy rainfall is required, and the site contingency plan will be updated in accordingly before and after such events. Concrete washout will be carried out in a dedicated area of the temporary compound. Only the washing of chutes will be permitted. Every concrete truck delivering concrete to the site must use the concrete washout facility prior to leaving the site. Chutes will be washed out at the designated area with a settlement lagoon provided to receive all run-off. During construction concrete will be kept out of all watercourses and drains.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
26	Management of hydrocarbons	Any diesel, fuel or hydraulic oils stored at the temporary site compound will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity. Fuels, lubricants and hydraulic fluids for equipment used on the site will be carefully handled to avoid spillage. Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of; Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling; and Appropriate spill control equipment, such as oil soakage pads, will be kept within the refuelling areas and in each item of plant to deal with any accidental spillage.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
27	Refuelling	Refuelling of plant and fuel bowsers during construction will be carried out at the primary refuelling station which will be located at the main temporary site compound. The station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. In addition to the above, onsite refuelling of machinery will be carried out 100m from watercourses using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site or at the primary refuelling station at the main site	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		compound and will be towed by a 4x4 jeep to designated refuelling areas near to where machinery is located but at distances of greater than 100m from watercourses. Drip trays and spill kits will be kept available on site, to ensure that any spills from vehicles are contained and removed off site.		
28	Spill control	Appropriate spill control equipment, such as oil soakage pads, will be kept within the construction area and in each item of plant to deal with any accidental spillage. All staff will be trained in appropriate spill control measures. See Emergency spill plan within the CEMP.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
29	Welfare utilities	Portaloos and / or containerised toilets and welfare units will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licensed waste disposal contractor.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
30	Minor water course crossing – dry conditions	Duct installation will only take place during dry periods to ensure no in-stream works and an environmental manager shall supervise the works.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
31	Standing water	Standing water, which could arise during excavations, has the potential to contain a high concentration of suspended solids as a result of the disturbance to soils. This water will be pumped into the site drainage system which will be constructed at site clearance stage, in advance of excavations for the turbine bases. In situations where space for drainage infrastructure or suitable treatment measures are not available (e.g., during grid cable installation) excess water from excavations will be required to be removed by tanker for disposal at licensed facility).	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
32	Cross-drains	Suitably sized cross-drains will be provided for drainage crossings to convey flows from agricultural drains and forestry drains across the access tracks, to prevent a risk of clogging.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
33	Flooding	Settlement ponds are to be provided as part of the drainage system for the development. The settlement ponds, together with the swales, will serve to reduce velocities in the surface water runoff draining from the access tracks and hardstanding areas and will provide retention of the flows. These have been designed for both pre and post-construction scenarios for 1 in 100 year storm events with a 20% allowance for Climate Change and will mitigate any increase in the risk of flooding. No construction personnel, operation or maintenance personnel will be permitted on site during extreme flood events.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
34	Excavated material	Excavated material will be re-used on-site where possible for berms etc. Surplus material will be removed from the site to an appropriately licensed or permitted facility.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full.	The Environmental Manager will monitor the implementation of the mitigation measures

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		Surplus soil, peat or rock excavated during the course of the works will be used on site in the form of landscaping including low berms, where appropriate. Borrow pits will be reinstated using excavated peat and spoil. A setback distance of at least 100m from watercourses will be adhered to when storing temporary spoil. Temporary spoil heaps will be compacted and covered to minimise sediment-laden runoff. No spoil stockpiles will be left on site after construction. Temporary stockpiles of sand/stone and other materials will be covered with sheeting when not in use to prevent washout of fines during rainfall. All stockpile material will be bunded adequately and protected from heavy rainfall to reduce silt runoff, where necessary. Adequate security will be provided to prevent spillage as a result of vandalism.	High probability of success.	detailed and in accordance with the relevant management plans within the CEMP.
35	Contaminated material	Contaminated soils will be handled, removed and disposed of in accordance with statutory requirements for the handling, transportation and disposal of waste. In particular, the following measure will be implemented: Contaminated material will be left in-situ and covered, where possible until such time as WAC (Waste Acceptance Criteria) testing is undertaken in accordance with recommended standards and in-line with the acceptance criteria to a suitably licenced landfill or treatment facility as detailed in the waste treatment management plan within the CEMP. This will determine firstly the nature of the contamination and secondly the materials classification i.e., inert, non-hazardous or hazardous.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
36	Traffic management	All traffic will adhere to the traffic management plan within the CEMP.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	Monitoring will be in accordance with the traffic management plan within the CEMP.
Operational Phase Mitigation Measures				
37	Inspections	Quarterly inspections of the erosion and sediment control measures on site (i.e., drains, swales, outfalls to field drains) will be undertaken for the first year following construction and annually thereafter to ensure operational efficiency.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the license and relevant management plans within the CEMP.
38	Management of hydrocarbons	Oil used in transformers (at the substation and within each turbine) and storage of oils in tanks at the substation could leak during the operational phase and impact on groundwater quality. The substation transformer and oil storage tanks will be in a concrete bund capable of holding 110% of the oil in the transformer and storage tanks. Turbine transformers are located within the turbines, so any leaks will be contained. Further management of hydrocarbons will be as detailed in the item 26 above.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the license and relevant management plans within the CEMP.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
39	Invasive Species Management Plan (Appendix 5)	Invasive species will continue to be treated within the project area according to the invasive species management plan for as long as they persist within the site.	Mitigation measure will be implemented in full by the Developer. High probability of success.	The plan will be updated and implemented prior to construction and then updated through all stages of the project lifecycle. During construction, it will be updated by the contractor to form the detailed invasive species management plan which will form part of the detailed CEMP. Following construction, the plan will be updated for the operational phase, taking into account the results of the detailed construction invasive species management plan and operational maintenance requirements. During decommissioning it will be updated if new areas are identified to have been within the footprint of the works.
40	Lighting on turbines	Turbines identified during the design process will be illuminated with medium intensity fixed red obstacle lights of 2000 candelas as determined by the IAA. Lighting will be fitted with baffles to ensure that the light is directed skywards and will not be discernible from the ground.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	Monitoring will be in line with Fatality monitoring program. See section 4.6.2.2 below.
41	Vegetation-free buffer zones	The vegetation-free buffer zones around all turbines will be managed and maintained during the operational life of the development. These will be kept clear by mechanical means only; no chemical methods will be used.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the license and relevant management plans within the CEMP.
Decommissioning Phase Mitigation Measures				
All prior to and construction phase mitigation will be implemented during the decommissioning phase.				

4.6.2.1 Water Quality Monitoring Plan

A monitoring programme will be established to ensure that the water quality is maintained. This programme will ensure that designed measures are working to ensure water quality is not affected. The details of this programme are outlined below.

Daily visual inspections of drains and outfalls will be performed during the construction period to ensure suspended solids are not entering the streams and rivers of the site, to identify any obstructions to channels, and to allow for appropriate maintenance of the drainage regime. If excessive suspended solids are noted, construction work will be stopped, and remediation measures will be put in place immediately.

Visual inspections will be continued during the operational period until vegetation is established on site.

A detailed water quality monitoring programme will be undertaken during the construction phase of the proposed development, in addition to the visual inspections outlined above, so as to ensure the effective implementation of the proposed mitigation measures. Field measurements and grab samples will be undertaken at the established baseline sampling points as determined within the aquatic ecology report. Commencement will occur prior to construction to provide an updated baseline and will continue for the duration of the construction and operational phases of the project. The field measurements will be recorded at the site and will include measurement undertaken as part of the initial physiochemical water quality testing (refer to Appendix 2) The field measurements will be taken on a weekly basis during the site clearance and earthworks stage of the construction period.

An ECOW will continuously compare the results with the pre work levels and ensure that designed mitigation measures are working.

4.6.2.2 Avifauna Monitoring program

A post-construction monitoring programme is to be implemented at the subject site in order to confirm the efficacy of the mitigation measures above; the results of this will be submitted annually to the competent authority and NPWS. As stated through the assessment the main species requiring monitoring are hen harrier and mallard. Published guidance on assessing the impacts of wind farms on birds from English Nature and the Royal Society for the protection of birds recommends the implementation of an agreed post development monitoring programme as a best practice mitigation measure (Drewitt and Langston, 2006).

In addition, published recommendations on swans and wind farms (Rees, 2012) suggests that systematic post construction monitoring; adapted to quantify collision, barrier and displacement, be conducted over a period of sufficient duration to allow for annual variation or in combination effects. The following individual components are proposed for this project.

1) Fatality Monitoring (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction)- A comprehensive fatality monitoring programme is to be undertaken following published best practices as stated below; the primary components are as follows:

    a. Initial carcass removal trials to establish levels of predator removal of possible fatalities. This is to be done following best recommended practice and with due cognisance to published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results (Shawn *et al*., 2010). No turbines which are used for carcass removal trials are to be used for subsequent fatality monitoring. Carcass removal trials shall be continued for the duration of fatality searches.

b. Turbine searches for fatalities are to be undertaken following best practice (Fijn *et al.*, 2012 and Grunkorn, 2011) in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates based on carcass removal rates (e.g., 1 per month). To be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring to be agreed with NPWS.

c. A standardised approach with a possible control group and/or variation in search techniques such as straight line transects/ randomly selected spiral transects/ dog searches will be undertaken. This will provide a means of robustly estimating the post construction collision fatality impact (if any).

d. Recorded fatalities to be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

Reports will be submitted to the competent authority and NPWS following each round of surveys.

2) Flight Activity Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction) - A flight activity survey is to be undertaken during the summer and winter months to include both Vantage Point and hinterland surveys as Per SNH (2017) guidance:

a. Record any barrier effect i.e., the degree of avoidance exhibited by species approaching or within the wind farm (Drewitt and Langston, 2006). Target species to be all raptors and owls, all wild goose and duck species, all swan species and all wader species.

b. Record changes in flight heights of key receptors post construction.

Reports will be submitted to the competent authority and NPWS following each round of surveys. This survey is to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS.

3) Monthly Wildfowl survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A monthly wildfowl census, following the methods utilised for the baseline survey, is to be repeated on a monthly basis during the winter period.

This aims to:

a. Assess displacement levels (if any) of wildfowl such as swans post construction

b. Assess overall habitat usage changes within the vicinity of the Ballinagree Wind Farm Development post construction.

This survey is to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS. Reports will be submitted to the competent authority and NPWS following each round of surveys.

4) Breeding Bird Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A breeding bird survey (moorland breeding bird and Common Bird Census), following methods used in the baseline survey to be repeated yearly between early April to early July.

4.7 Residual Effects on the Integrity of the Sites within the Potential Zone of Influence of the Proposed Project

Taking cognisance of measures incorporated into the project design and mitigation measures to avoid effects which are considered in the preceding section, the proposed project will not have any adverse effect on the integrity of the Mullaghanish to Musheramore Mountains SPA, Blackwater River (Cork/Waterford) SAC, and the Gearagh SPA in light of the site's conservation objectives and status.

4.8 Conclusion

For the reasons set out in detail in this NIS, in the light of the best scientific knowledge in the field, all aspects of the proposed project which, by itself, or in combination with other plans or projects, may affect the relevant European Sites have been considered.

The NIS contains information which the competent authority, may consider in making its own complete, precise and definitive findings and conclusions and upon which it is capable of determining that all reasonable scientific doubt has been removed as to the effects of the proposed project on the integrity of the relevant European sites.

In the light of the conclusions of the assessment which it shall conduct on the implications for the European sites concerned, the competent authority is enabled to ascertain that the proposed project will not adversely affect the integrity of any European site.

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