



CONSULTANTS IN ENGINEERING,  
ENVIRONMENTAL SCIENCE &  
PLANNING

# ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED BARNADIVANE WIND FARM & SUBSTATION, COUNTY CORK

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## Volume 1 - Non-Technical Summary

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**Prepared for:**

Barna Wind Energy (B.W.E) Ltd. & Arran Windfarm Ltd.

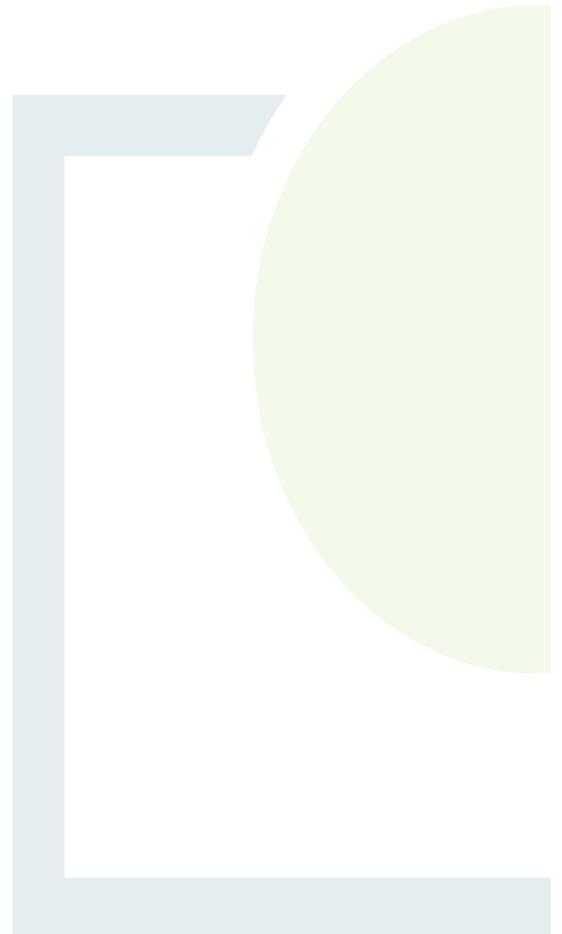
**Date:** March 2023

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# TABLE OF CONTENTS

<b>1. INTRODUCTION .....</b>	<b>1</b>
1.1 Applicant.....	2
1.2 The Need for the Project .....	2
1.3 Application and EIA Process .....	3
1.4 Environmental Impact Assessment Methodology .....	3
1.4.1 Environmental Impact Assessment Structure.....	3
1.4.2 Pre-Submission Consultations.....	4
1.5 Requirements for Non-Technical Summary .....	4
1.6 Permission Period.....	4
1.7 Difficulties Encountered .....	5
1.8 Viewing and Purchasing of the EIAR.....	5
<b>2. DESCRIPTION OF THE PROPOSED DEVELOPMENT .....</b>	<b>7</b>
2.1 Proposed Project .....	7
2.1.1 Summary of the Proposed Project Assessed in the EIAR .....	7
2.1.2 Summary of the Statutory Development Description for Proposed Wind Farm.....	8
2.1.3 Summary of Statutory Development Description for Proposed Substation.....	9
2.2 Site Selection and Alternative Layouts for the Proposed Development.....	11
<b>3. POLICY AND LEGISLATION .....</b>	<b>12</b>
3.1 Global Policy .....	12
3.2 EU Directives and Policies.....	12
3.3 Irish Energy & Environment Policies.....	13
<b>4. SUMMARY OF THE EXISTING ENVIRONMENT .....</b>	<b>15</b>
4.1 General .....	15
4.2 Air and Climate .....	16
4.2.1 Air .....	16
4.2.2 Climate .....	16
4.3 Noise and Vibration.....	16
4.4 Ecology.....	17
4.5 Geology, Hydrogeology and Slope Stability.....	20
4.6 Hydrology and Water Quality.....	21
4.7 Landscape and Visual Impact .....	22
4.8 Human Environment .....	22

4.8.1	Population .....	22
4.8.2	Socio-Economic, Employment and Economic Activity .....	23
4.8.3	Land Use .....	23
4.8.4	Recreation, Amenity and Tourism.....	24
4.8.5	Human Health and Safety .....	24
4.8.6	Shadow Flicker .....	25
4.8.7	Renewable, Non-Renewable Resources and Utility Infrastructure .....	25
4.9	Traffic and Transportation.....	26
4.10	Archaeology, Architecture and Cultural Heritage .....	27
4.11	Telecommunications and Aviation .....	28
4.11.1	Telecommunications & Television .....	28
4.11.2	Aviation .....	28

## 5. SUMMARY OF POTENTIAL IMPACTS ..... 29

5.1	Potential Impacts on Air and Climate Change.....	29
5.1.1	Air .....	29
5.1.2	Climate .....	29
5.2	Potential Impact on Noise and Vibration .....	30
5.3	Potential Impact on Biodiversity .....	31
5.4	Potential Impact on Geology, Hydrogeology and Slope Stability.....	32
5.5	Potential Impact on Hydrology and Water Quality .....	33
5.6	Potential Impacts on Human Environment .....	36
5.6.1	Population .....	36
5.6.2	Land Use .....	37
5.6.3	Socio-Economics, Employment and Economic Activity .....	38
5.6.4	Recreation, Amenity and Tourism.....	40
5.6.5	Human Health and Safety .....	40
5.6.6	Material Assets.....	41
5.7	Potential Impacts of Shadow Flicker .....	43
5.8	Potential Impacts on Traffic and Transportation .....	44
5.9	Potential Impacts on Archaeology, Architecture and Cultural Heritage .....	44
5.10	Potential Impact on Landscape and Visual.....	46
5.11	Potential Impacts on Telecommunications and Aviation.....	47
5.11.1	Telecommunications .....	47
5.11.2	Television and Radio .....	47

5.11.3 Aviation .....	47
<b>6. SUMMARY OF MITIGATION MEASURES.....</b>	<b>48</b>
6.1 Mitigation Measures for Air and Climate Change .....	48
6.1.1 Air .....	48
6.1.2 Climate .....	49
6.1.3 Cumulative Impacts.....	49
6.2 Mitigation Measures for Noise and Vibration.....	49
6.3 Mitigation Measures for Biodiversity.....	51
6.4 Mitigation Measures for Soils and Geology .....	55
6.5 Mitigation Measures for Hydrology and Water Quality.....	56
6.5.1 Proposed Mitigation Measures for the Construction Stage .....	56
6.5.2 Proposed Mitigation Measures for Operation and Maintenance Stage.....	57
6.5.3 Proposed Mitigation Measure for Decommissioning Stage.....	57
6.5.4 Proposed Mitigation Measures for Flooding .....	57
6.6 Mitigation Measures for Human Environment .....	58
6.6.1 Population .....	58
6.6.2 Socio-Economics, Employment and Economic Activity .....	58
6.6.3 Land Use .....	58
6.6.4 Recreation, Amenity and Tourism.....	59
6.6.5 Health and Safety .....	59
6.6.6 Material Assets.....	61
6.7 Mitigation Measures for Shadow Flicker.....	61
6.8 Mitigation Measures for Traffic and Transportation.....	62
6.9 Mitigation Measures for Archaeological, Architecture & Cultural Heritage.....	64
6.10 Mitigation Measures for Landscape and Visual .....	64
6.10.1 Mitigation by Avoidance and Design.....	65
6.11 Mitigation Measures for Telecommunications and Aviation .....	65
6.11.1 Telecommunications and Broadcasting .....	65
<b>7. SUMMARY OF RESIDUAL IMPACTS.....</b>	<b>67</b>
7.1 Residual Impacts on Air and Climate.....	67
7.2 Residual Impacts on Noise and Vibration.....	67
7.3 Residual Impacts on Ecology .....	67
7.4 Residual Impacts on Soils and Geology .....	67
7.5 Residual Impacts on Hydrology and Water Quality.....	67

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7.5.1	Residual Impacts during Construction Stage.....	67
7.5.2	Residual Impacts during Operation and Maintenance Stage.....	68
7.5.3	Residual Impacts during Decommissioning Stage.....	68
7.6	Residual Impacts on Human Environment .....	68
7.6.1	Population .....	68
7.6.2	Socio-Economics , Employment and Economic Activity.....	68
7.6.3	Land Use .....	68
7.6.4	Recreation, Amenity and Tourism.....	69
7.6.5	Human Health and Safety .....	69
7.6.6	Material Assets.....	69
7.7	Residual Impacts of Shadow Flicker .....	69
7.8	Residual Impacts on Traffic and Transportation .....	70
7.9	Residual Impacts on Archaeology, Architecture and Cultural Heritage .....	70
7.10	Residual Impacts on Landscape and Visual .....	70
7.10.1	Landscape Impacts .....	70
7.10.2	Visual Impacts .....	70
7.11	Residual Impacts on Telecommunications and Aviation.....	71
7.11.1	Telecommunications and Broadcasting .....	71
7.11.2	Aviation .....	71
7.12	Interaction of the Impacts.....	71

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## LIST OF FIGURES

	<u>Page</u>
Figure 1-1: Site Location .....	6
Figure 2-1: Site Layout .....	10

## LIST OF TABLES

	<u>Page</u>
Table 3-1: Extracts from the Cork County Development Plan 2022 - 2028 .....	14
Table 4-1: Prevailing Background Noise during Daytime Periods (72.5m hub height) .....	17
Table 4-2: Ecological evaluation of the bat species recorded during the bat survey (CIEEM Guidelines, 2018) and "Bat Risk" in relation to Wind Turbines (NatureScot 2021 and EC 2020) .....	19





## 1. INTRODUCTION

Barna Wind Energy (B.W.E) Limited. & Arran Windfarm Ltd. wish to construct the proposed Barnadivane Wind Farm and accompanying proposed 110 kV substation (the Proposed Development), near Macroom, Co. Cork. The Proposed Wind Farm and Proposed Substation are located in the townlands of Lackareagh, Garranereagh and Barnadivane (Kneeves), near Teerelton, Co. Cork.

Planning permission previously existed at this site for 14 turbines and associated infrastructure, including a 110kV substation. It is intended that the Proposed Wind Farm and Proposed Substation, if consented, would replace the Previously Consented Development.

Fehily Timoney and Company (FT) has prepared this environmental impact assessment report (EIAR) on behalf of Barna Wind Energy (B.W.E.) Limited and Arran Windfarm Ltd. in response to correspondence from An Bord Pleanála dated 13th May 2021 (see Appendix 1.3) requesting updated documentation to facilitate the determination of both the Proposed Substation and the Proposed Wind Farm after they were both individually remitted to the Board for re-determination following a Judicial Review of the original decisions granting permission for both the Proposed Wind Farm and the Proposed Substation by the Board.

As requested by An Bord Pleanála, the original Environmental Impact Statement (EIS), which was compiled by FT and submitted to Cork County Council in 2014, has now been updated to an Environmental Impact Assessment Report. Therefore, this EIAR has been carried out in accordance with the most up to date guidance and considers both the Proposed Wind Farm and the Proposed Substation, each of which were originally the subject of individual applications to Cork County Council and are both now with the Board for decision following their remittal by the High Court. Both of the remitted appeal cases are being processed by the Board at the same time and therefore this EIAR will be submitted to both case files.

The site of the Proposed Development is approximately 3 km northeast of Coppeen and 10 km south of Macroom. The nearest village is Teerelton, approximately 3 km to the north. The location of the site is shown in Figure 1.1.

The Proposed Development comprises of:

1. **Proposed Wind Farm:** A 6 turbine layout. The proposed 6 turbine wind farm will have a defined planning boundary which will include not only the turbines themselves but also ancillary infrastructure such as internal access roads, on-site underground cabling, a meteorological mast and borrow pit.
2. **Proposed Substation:** A new 110kV grid connection substation that meets current EirGrid standards. The Proposed Substation has a defined planning boundary which will include a 110kV grid connection substation compound with associated control buildings and electrical equipment as well as ancillary infrastructure such as internal access roads and security fencing. The substation location is within the EIAR boundary for the wind farm. Although the grid connection for the wind farm, via the proposed 110kV substation is subject to a separate planning application, the relevant environmental impacts have been appropriately assessed. The EIA processes followed are in accordance with the European Environmental Impact Assessment Directive and the transposing legislation in Ireland.

Both developments interact during their operation, as a result, both developments will be considered in the environmental assessment to evaluate any cumulative impacts that may arise. The site location for the Proposed Development is as shown in Figure 1.1.



In the event that the Proposed 110kV Substation is not permitted, an alternative underground grid connection route (AGCR) relating to the Carrigierk Windfarm (Cork County Council Ref. 15/730 & An Bord Pleanála Ref. PL04.246353) will be utilized. This alternative grid connection route will be assessed cumulatively as it relates to an existing permitted development.

In order to deliver the large turbine components to site there will be a requirement to carry out enabling works within the townlands of Barnadivane (Kneeves), Lackareagh & Garranereagh. The enabling Transport Delivery Route works will consist of construction of a private roadway, approximately 150 metres long, from the R585 to the L6008 and all associated works. These works have already been consented pursuant to Cork County Council Ref. 14/6803. And will be considered for cumulative effects.

## 1.1 Applicant

The applicant for the Proposed Development, Barna Wind Energy (B.W.E.) Limited & Arran Windfarm Ltd., are associated companies of Enerco Energy Ltd. (Enerco), an Irish-owned, Cork-based company with extensive experience in the design, construction and operation of wind energy developments throughout Ireland, with projects currently operating or in construction in Counties Cork, Kerry, Limerick, Clare, Galway, Mayo and Donegal.

By the end of 2022, Enerco associated companies had over 625 Megawatts (MW) of wind generating capacity in commercial operation, 200MW in construction, with a further 400MW of projects at various stages in its portfolio to assist in meeting Ireland's renewable energy targets.

## 1.2 The Need for the Project

The need for the Proposed Development is driven by the following:

- EU and Ireland's commitment to limit greenhouse gas emissions under the Kyoto protocol and the Paris Agreement
- Meeting national renewable energy targets
- Increasing national energy security
- Provision of cost-effective power production
- Increasing energy price stability
- National climate action requirements (including legislative requirements enacted by the Climate Action and Low Carbon Development (amendment) Act 2021).

The Climate Action and Low Carbon Development (amendment) Act 2021 commits Ireland to reach a legally binding target of net-zero emissions no later than 2050, and a cut off of 51% by 2030, transitioning Ireland to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy. The Climate Action Plan 2022 (CAP) identified the need to increase the share of electricity demand generated from renewable sources by up to 80% where achievable and cost effective, without compromising security of electricity supply, identifying a need for 9GW of onshore wind generation in order for Ireland to meet its 2030 targets.

As of September 2021, EirGrid estimate that 4.5 – 6.5 GW on-shore wind capacity would be required to meet the 2030 RES-E targets for Ireland. The production of renewable energy from the Proposed Wind Farm will assist in achieving the Government's and EU's stated goals.



### 1.3 Application and EIA Process

Under Section 172 of the Planning and Development Act (the Planning Act), as amended, a planning application for a development which comes within a class of development specified under Schedule 2 of Part 5 of the Planning and Development Regulations must be accompanied by an Environmental Impact Assessment Report. Accordingly, as the Proposed Development has more than 5 no. turbines and generating capacity of greater than 5MW this Proposed Development has been subject to impact assessment studies and an EIAR has been prepared in accordance with the Planning Act and Planning and Development Regulations 2001 as amended.

### 1.4 Environmental Impact Assessment Methodology

Pursuant to the provisions of EU and Irish law, when a proposed development is required to be the subject of an environmental impact assessment [EIA], the developer is required to present information to the competent authority in an environmental impact assessment report [EIAR] for examination by the competent authority.

Thus, an EIAR is required to provide information so as to ensure that the competent authority (in this instance, An Bord Pleanála) may make a reasoned conclusion on the significant effects of the project on the environment, taking into account of, inter alia, the information contained in the EIAR.

The EIAR for this project has been prepared in accordance with EIA-specific and other relevant environmental legislation, guidance and advice notes. As part of the preparation process for the EIAR, there has been significant consultation with the competent authority, prescribed bodies and the public and other interested parties.

This document is Volume 1 of the EIAR and comprises a Non-Technical Summary of the information contained in the main EIA report, which is contained in Volume 2, Volume 3 contains the Appendices and the photomontages.

The broad methodology framework used in the EIAR includes descriptions of:

- Introduction;
- Methodology;
- Existing Environment;
- Potential Impacts;
- Mitigation Measures;
- Residual Impacts.

#### 1.4.1 Environmental Impact Assessment Structure

The EIAR has been structured as described below. The detailed information in respect of each environmental aspect is provided in the main EIA report, Volume 2, and each of those sections is dealt with in summary form in this Non-Technical Summary as follows:

- Introduction;
- Description of the Proposed Development & Assessment of Alternatives;
- Policy & Legislation;
- EIA Scoping, Consultation and Key Issues;



- Noise and Vibration;
- Biodiversity;
- Geology, Hydrogeology and Slope Stability;
- Hydrology and Water Quality;
- Landscape and Visual Assessment;
- Population & Human Health & Material Assets;
- Traffic and Transportation;
- Cultural Heritage;
- Telecommunications and Aviation;
- Air and Climate;
- Interactions of the Foregoing.

#### 1.4.2 Pre-Submission Consultations

Prior to preparing this EIAR, a number of state and public agencies, individuals and telecommunications bodies were consulted to ensure that the most significant impacts were addressed during the EIA process.

Consultation through, meetings, public information events, letters, newspaper advertisements, information booklets, emails and telephone calls, with various statutory and non-statutory consultees, the local communities and other interested parties has been maintained throughout the EIA process. Full details of the EIA scoping and consultation are contained in Chapter 4 of the Main EIAR in Volume 2.

### 1.5 Requirements for Non-Technical Summary

In accordance with the provisions of the EIA Directive<sup>1</sup> and article 94 of and Schedule 6 to the Planning and Development Regulations 2001, as amended, this report is a summary in non-technical language of the information provided in the EIAR, in non-technical language.

### 1.6 Permission Period

A ten-year planning permission has been applied for in respect of this Proposed Development.

The expected physical lifetime of the turbines, once in operation, is approximately 25 years. In this respect, the applicant requests the grant of permission is on the basis of a 25 year operational period from the date of commissioning of the wind farm.

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<sup>1</sup> Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (codification). It should also be noted that certain amendments have been effected to the EIA Directive by Directive 2014/52/EU, which entered into force on 15 May 2014, to simplify the rules for assessing the potential effects of projects on the environment. Member States have until 16 May 2017 to transpose these obligations into national law.



## 1.7 Difficulties Encountered

There were no technical difficulties encountered during the preparation of this environmental impact assessment report.

## 1.8 Viewing and Purchasing of the EIAR

Any member of the public can view the planning application and accompanying EIAR documentation, including the Non-Technical Summary, the Appropriate Assessment Screening Report and Natura Impact Statement, free of charge or can purchase on payment of a specified fee during normal office hours at the following location:

- An Bord Pleanála offices, 64 Marlborough Street, Dublin 1





- Legend**
-  Development Planning Boundary
  -  Lands in Control of Applicant
  -  Proposed Substation

<b>TITLE:</b>	Site Location		
<b>PROJECT:</b>	Barnadivane Wind Farm and Substation, Co. Cork		
<b>FIGURE NO:</b>	1-1		
<b>CLIENT:</b>	Barna Wind Energy Ltd. & Arran Windfarm Ltd.		
<b>SCALE:</b>	1:30000	<b>REVISION:</b>	0
<b>DATE:</b>	27/02/2023	<b>PAGE SIZE:</b>	A3







## 2. DESCRIPTION OF THE PROPOSED DEVELOPMENT

### 2.1 Proposed Project

As described in Section 2.1, the Proposed Project for EIA purposes is made up of the Proposed Development which includes 6 no. wind turbines (1) and a 110kV substation (2), for which planning consent is sought and, other elements of the project for which permission has already been granted which includes enabling works to facilitate the delivery of turbines to site (3) and if necessary, an alternative grid connection (4).

1. Proposed 6 no. turbine windfarm also referred to in this report as ‘the Proposed Wind Farm’ (pending under An Bord Pleanála planning ref. PL04.308208);
2. Proposed 110kV substation within the site of the Proposed Wind Farm, also referred to as ‘the Proposed Substation’ (pending under An Bord Pleanála planning ref. PL04.308210);

The in-combination effects of the following elements of the Proposed Project are include in the assessment.

3. Enabling works for the Turbine Delivery Route, also referred to in this report as ‘Enabling TDR Works’ (permitted under Cork County Council planning ref. 14/6803);
4. Potential alternative grid connection, also referred to in this report as the ‘the AGCR’ (permitted under Cork County Council planning ref. 15/730 & An Bord Pleanála Ref. PL04.246353).

#### 2.1.1 Summary of the Proposed Project Assessed in the EIAR

In summary the Proposed Project assessed will consist of the following:

- Erection of 6 no. wind turbines with a blade tip height of 131m, a hub height of 72.5m and a rotor diameter range of 117m;
- Construction of turbine foundations and crane pad hardstanding areas;
- Construction of approximately 2,346m of new site tracks and associated drainage infrastructure;
- Upgrading of approximately 1,381m of existing tracks and associated drainage infrastructure where necessary;
- Construction of new access junction and improvement to the public road;
- All associated drainage and sediment control;
- Construction of 1 no. permanent onsite 110kV electrical substation (which is under a separate planning application under consideration by An Bord Pleanála, reference PL04.308208) to ESBN specifications including:
  - Control Building with welfare facilities;
  - Electrical infrastructure;
  - Parking;
  - Wastewater holding tank;
  - Rainwater harvesting;
  - Security fencing;



- All associated infrastructure, services and site works.
- Consented temporary accommodation works associated with the Turbine Delivery Route to facilitate the delivery of turbine components (CCC PL Ref. 14/6803);
- 1 no. Temporary construction site compound and associated ancillary infrastructure including parking;
- Installation of underground medium voltage (20/33kV) and communication cabling between the proposed turbines and the proposed on-site substation and associated ancillary works;
- Erection of 1 no. permanent meteorological mast with a height of 90m above ground level and associated access track;
- Installation of a consented medium voltage (up to 38kV) underground cabling and associated ancillary works between the Carrigarierk and Proposed Barnadivane Wind Farms. The grid connection cable works are consented in accordance with CCC Ref. 15/730 and An Bord Pleanála Ref. 04.246353;
- 1 no. borrow pit;
- All associated site development works;
- A 10 year planning permission and 25 year operational life from the date of commissioning of the entire wind farm.

### 2.1.2 Summary of the Statutory Development Description for Proposed Wind Farm

The development description as per the statutory newspaper notice and the application form for which consent from the planning authority is being sought is as follows:

- Construction of 6 no. wind turbines with a blade tip height 131m, a hub height of 72.5m and a rotor diameter range of 117m;
- Construction of turbine foundations and crane pad hardstanding areas including associated drainage infrastructure;
- Construction of approximately 2,346m of new permanent site tracks and associated drainage infrastructure;
- Upgrading of approximately 1,381m of existing tracks and associated drainage infrastructure;
- Upgrade of 2 no. existing agricultural access junctions for construction and operational access from the local roads;
- 1 no. on site borrow pit and associated ancillary drainage within the townland of Barnadivane (Kneeves), Co. Cork;
- 1 no. temporary construction site compounds and associated ancillary infrastructure including parking;
- Installation of medium voltage underground electrical and communication cabling connecting the wind turbines to the proposed on-site substation and associated ancillary works;
- Erection of 1 no. permanent meteorological mast with a height of 90m above ground level and associated access track;
- All related site works and ancillary development including landscaping and drainage;
- A 25 year operational life from the date of commissioning of the entire wind farm is being sought.

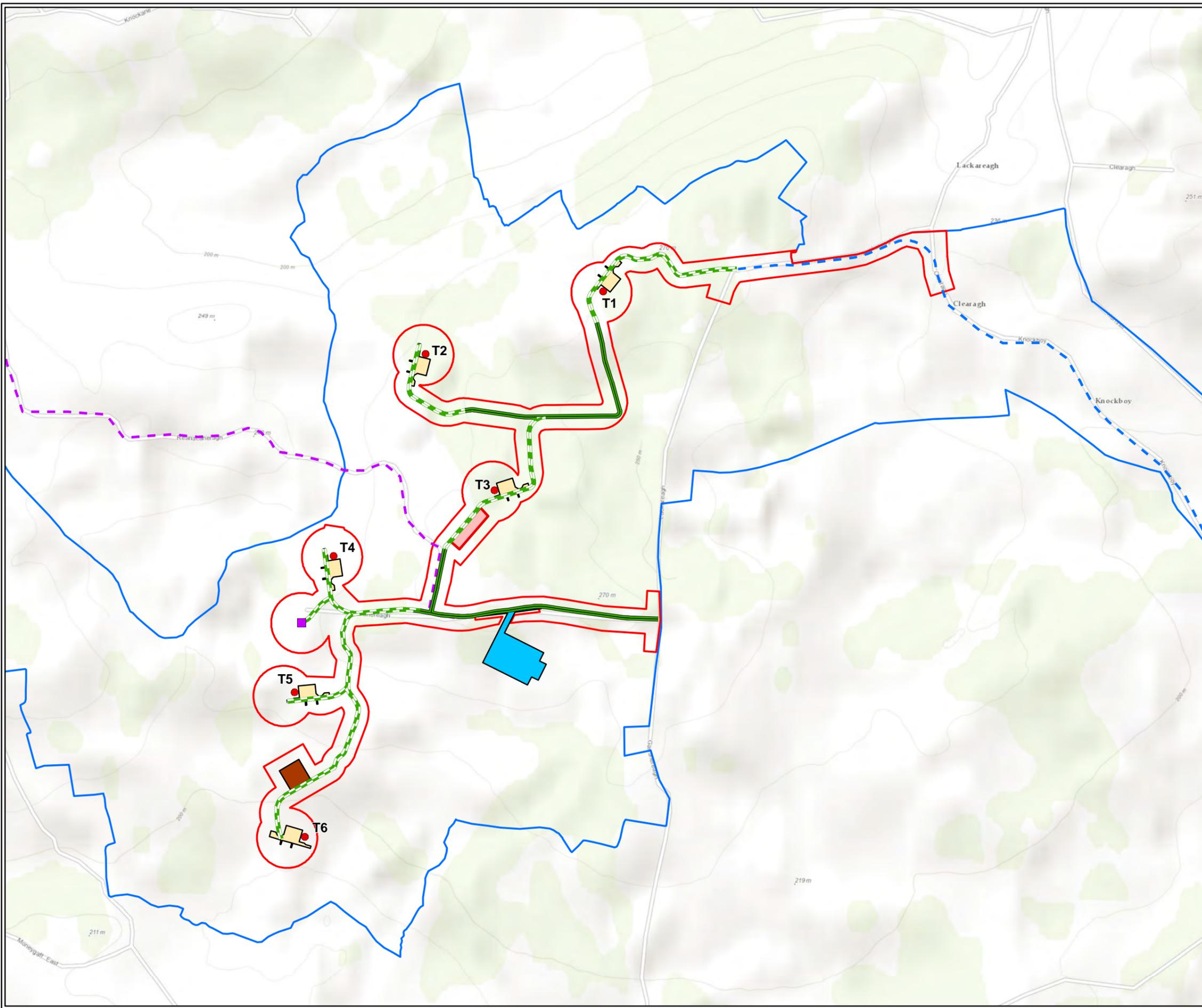


### 2.1.3 Summary of Statutory Development Description for Proposed Substation

- The development description as per the statutory newspaper notice and the application form for which consent from the planning authority is being sought is as follows:
- Construction of 1 no. permanent on-site 110kV electrical substation (which is under a separate planning application under consideration by An Bord Pleanála, reference PL04.308208) including:
- 3 no. single storey control buildings with dimensions as follows:
  - Control Building A & B with an approximate floor area of 195m<sup>2</sup> and a maximum height of approx. 6.2m above finished ground level; and
  - Control Building C with an approximate floor area of 223m<sup>2</sup> and a maximum height of approx. 6.5m above finished ground level.
- an access track approx. 200m in length;
- 2 no. steel lattice mast structures located directly underneath the existing overhead 110kV line, with a maximum height of approx. 18m;
- electrical plant and equipment;
- welfare facilities;
- carparking;
- water and wastewater holding tanks;
- security fencing;
- lightning protection and telecommunications masts;
- security cameras;
- external lighting; and
- all associated infrastructure;
- Installation of a grid connection point from the Proposed Substation to the existing 110kV Macroom to Dunmanway overhead line, the substation will be situated beneath this line.

The layout for the Proposed Development is shown in Figure 2.1.





- Legend**
- Development Planning Boundary
  - Lands in Control of Applicant
  - Tracks-Proposed
  - Tracks-Existing
  - Proposed Substation
  - Turbine Hardstandings
  - Proposed Temporary Construction Compound
  - Proposed Borrow Pit
  - Proposed Met Mast
  - Proposed Turbine Layout
  - Alternative Grid Connection Route
  - Turbine Delivery Route

<b>TITLE:</b>	Site Layout
<b>PROJECT:</b>	Barnadivane Wind Farm and Substation, Co. Cork
<b>FIGURE NO:</b>	2-1
<b>CLIENT:</b>	Barna Wind Energy Ltd. & Arran Windfarm Ltd.
<b>SCALE:</b>	1:10000
<b>REVISION:</b>	0
<b>DATE:</b>	27/02/2023
<b>PAGE SIZE:</b>	A3







## 2.2 Site Selection and Alternative Layouts for the Proposed Development

Precedent for a wind farm at this location is established with the Previously Consented 14 turbine wind farm. It is proposed to optimise this layout, using modern turbine technologies, and reducing the number of turbines and associated infrastructure, with the number of turbines reduced from 14 to 6. The layout went through a number of iterations based on the constraints identified, which included:

- Availability of modern turbines and associated turbine spacing
- Setback from adjacent Garranereagh operational wind farm
- Minimum setback from dwellings inhabited by non-contributory landowners
- Landscape and Visual Impacts
- Ecology
- Archaeology, architectural and cultural heritage

In terms of turbine delivery routes, the route as outlined in Chapter 11 – Traffic and Transportation is the only viable delivery route, from the N22. No other suitable delivery routes are available.

For the grid connection route, two alternative connections are considered –

1. The 110kV substation loop in loop out to existing 10kV overhead lines; and
2. A tail fed underground grid connection utilising a permitted cable route connecting to the permitted Carrigarierk Windfarm.





## 3. POLICY AND LEGISLATION

### 3.1 Global Policy

Under the Kyoto Protocol, Ireland has a legally binding target to limit greenhouse gas emissions to 13% above 1990 levels. This is to be achieved in the period 2008 – 2012. Countries not fulfilling their obligations will be forced to purchase carbon credits from compliant countries. Furthermore, emissions are projected to increase between 2020 and 2030 (12% in total), with transport a key contributor to this trend, in the absence of additional policies and measures.

The greater urgency with which the world is required to address climate change through ambitious targets was recently reflected in the publication of the sixth Intergovernmental Panel on Climate Change ('IPCC') in August 2021. The overarching assertion is that, "It is unequivocal that human influence has warmed the atmosphere, ocean and land".

COP 26 was held in November 2021, where the Glasgow Climate Pact was agreed. The pact agrees to focus on the terms of the Paris Agreement and for the first time there was an explicit agreement to reduce use of fossil fuels including Coal.

### 3.2 EU Directives and Policies

The year 2020 was a significant milestone for renewable energy and emissions targets in Europe. The EU Directive on the Promotion of the Use of Energy from Renewable Sources (2009/28/EC)<sup>2</sup> sets a target of 20% of EU energy consumption from renewable sources by 2020 and a 20% cut in greenhouse gas emissions by 2020, the so-called 20:20:20 plan.

In 2008, the EU agreed a climate and energy package that included a target to reduce GHG emissions across the EU by 20% below 1990 levels by the year 2020. This resulted in two pieces of European legislation focusing on reduction in GHG emissions. Directive 2009/29/EC requiring ETS companies to reduce their emissions by 21% below 2005 levels by 2020; and Decision 406/2009/EC requiring Ireland to reduce non-ETS emissions by 20% below 2005 levels by 2020.

According to SEAI (2020a), Ireland achieved approximately 14.6% reduction in GHG emissions compared to 2005 levels. This included an approximate 23% reduction in GHG emissions in the energy sector, indicating renewable energy's significant contribution to the overall reduction in greenhouse gas emissions in Ireland.

The European Green Deal is a growth strategy for the EU which aims to transform the EU into a fair and prosperous society, improving quality of life with modern, resource-efficient, and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use. The EU aim to do this by becoming climate-neutral by 2050.

With regard to the supply of clean, affordable, and secure energy, the European Green Deal underlines the fact that in order to meet the EU's climate and sustainability goals, all sectors must increase their use of renewable energy and phase out fossil fuels.

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<sup>2</sup> EU Directive on Promotion of the Use of Energy from Renewable Sources,  
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF>



The EU aim to increase the greenhouse gas emission reduction targets for 2030 to at least 50% and towards 55%, compared to 1990 levels, in order to achieve net-zero greenhouse gas emissions by 2050. A key principle for achieving this will be to develop a power sector based largely on renewable resources.

A recent recommendation published by the EU Commission aims to streamline the permitting process for renewable energy projects across the EU, in light of the energy and climate crisis currently at play globally, and within the EU. The recommendation notes that permitting procedures are required for renewable energy developments, but “the complexity, variety and excessive duration of those procedures constitutes a major barrier to the swift necessary deployment of renewable energy and to achieving a more affordable, secure and sustainable Union energy system”.

This recommendation applies to Ireland as an EU Member state, and it is noted that efforts are underway to streamline the planning system in Ireland through legislative changes. However, the determination period for this application extends to approximately 8 years which does not align with the EU Commission’s recommendation to streamline renewable energy projects, in light of the energy and climate crisis.

### 3.3 Irish Energy & Environment Policies

National targets of climate change mitigation and reduction in greenhouse gas emissions are the focus of significant attention in the recent Climate Action and Low Carbon Development (Amendment) Act 2021. The ambitious new programme for government is prioritising carbon neutrality and renewable energy generation. In light of this, it is important for the nation to rely on proven technologies such as on shore wind in order to meet the near-term objectives, as well as long-term objectives. National Policies include:

- Climate Action and Low Carbon Development Act 2015
- Climate Action and Low Carbon Development (Amendment) Act 2021
- Climate Action Plan (2023)
- EU Governance Regulation and Ireland’s National Energy and Climate Plan (NECP)
- Project Ireland 2040: The National Planning Framework
- Project Ireland 2040: National Development Plan 2021 - 2030
- Ireland’s Greenhouse Gas Emission Projections, 2018 - 2040

Regional Policies include:

- Southern Regional Spatial & Economic Strategy
- Cork County Development Plan 2022-2028

Section 13 of the Cork County Development Plan 2022-2028 outlines policies and objectives relevant to renewable energy. These are outlined in Table 3.1.



**Table 3-1: Extracts from the Cork County Development Plan 2022 - 2028**

Policy	Description
Objective ET 13.1: Energy	Ensure that County Cork fulfils its potential in contributing to the sustainable delivery of a diverse and secure energy supply and to harness the potential of the county to assist in meeting renewable energy targets and managing overall energy demand.
Objective ET 13.2: Renewable Energy	<p>(a) Support Ireland’s renewable energy commitments as outlined in Government Energy and Climate Change policies by facilitating the development of renewable energy sources such as wind, solar, geothermal, hydro and bio-energy and energy storage at suitable locations within the county where such development has satisfactorily demonstrated that it will not have adverse impacts on the surrounding environment (including water quality), landscape, biodiversity or amenities.</p> <p>(b) Support and facilitate renewable energy proposals that bring about a direct socio-economic benefit to the local community. The Council will engage with local communities and stakeholders in energy and encourage developers to consult with local communities to identify how they can invest in/gain from significant renewable energy development.</p>
Objective ET 13.4: Wind Energy	In order to facilitate increased levels of renewable energy production consistent with national targets on renewable energy and climate change mitigation as set out in the National Energy and Climate Plan 2021-2030, the Climate Action Plan 2021, and any updates to these targets, and in accordance with Ministerial Guidelines on Wind Energy Development, the Council will support further development of on-shore wind energy projects including the upgrading, repowering or expansion of existing infrastructure, at appropriate locations within the county in line with the Wind Energy Strategy and objectives...

Section 13.6 of the County Development Plan details the Wind Energy Strategy for the County. The strategy remains in line with that of the County Development Plan 2014, including the wind zoning areas which places the proposed Barnadivane Wind Farm within an area ‘Acceptable in Principle’.





## 4. SUMMARY OF THE EXISTING ENVIRONMENT

### 4.1 General

The Proposed Development is located in the townlands of Lackareagh, Garranereagh and Barnadivane (Kneeves), near Teerelton, Co. Cork.

There is a good network of local roads accessing the site. The nearest national route, the N22, is the main arterial route for traffic commuting between Cork and Killarney and is located approximately 5 km to the north at its closest. The nearest regional route, the R585 between Cork and Bantry, passes 1 km to the south of the site. The R585 connects to the N22 at Crookstown, 5 km to the east of the site.

The Proposed Development is located on a ridgeline within the Bride River valley. The site ranges in elevation from 180 m on the southern boundary to 270 m to the north of the site. A site layout is shown in Figure 2.1.

The Proposed Development site is currently used for agricultural grazing. The field boundaries are defined both by the hedgerows and by sod and stone banks. There are a number of occupied dwellings within 1km of the site, with the closest being approximately 267m from the nearest turbine. This dwelling is occupied by a stakeholder. There are no hospitals, schools, hotels or guesthouses within 1 km of the site. There are no recreational activities associated with this site. The nearest watercourse is a tributary of the River Bride in the southwestern portion of the site.

The landform reflects the underlying geology of the region which is dominated by east-west anticlines and synclines. The anticlines form the hills with sandstone dominated bedrock and the synclines form the main river valleys (Lee, Bride and Bandon Rivers) which are underlain by limestone.

The proposed site does not lie within any Natura 2000 sites. There are three Natura 2000 sites (two cSACs<sup>3</sup> and one SPA) within a 10 km radius. The Gearagh cSAC (site code 000108) and the Gearagh SPA (004109) lie over 6.5 km to the north. The Bandon River cSAC (002171) lies over 9.5 km southwest of the Proposed Development site.

No recorded monuments are located within the Development Planning boundary. Three recorded monuments occur within the Proposed Wind Farm Study Area. The nearest monuments CO095-001----, CO083-078---- and CO094-036 ringforts and an enclosure are situated 225m, 251m and 347m from turbine 6 and 2, respectively.

Existing land use in the area surrounding the site is predominately agricultural, with some forestry nearby, particularly adjacent to Enabling TDR Works at the junction of the R585 and L6088 (subject to separate planning application). There are a number of existing and permitted wind farm developments nearby. There is an existing wind farm, namely Garranereagh Wind Farm with 4 operational turbines adjacent to the site. The nearest turbine at Garranereagh is over 900 m to the east of the nearest proposed turbine.

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<sup>3</sup>At present all SACs in Ireland are currently 'candidate' SACs, and referred to as cSACs. The relevant Statutory Instruments for the SACs in Ireland have not yet been put in place, though these sites must still be afforded protection in accordance with the EU Habitats Directive (92/43/EEC).



## 4.2 Air and Climate

### 4.2.1 Air

EU Directives and Irish legislation set out air quality standards for a wide variety of pollutants. There are four air quality zones defined for Ireland in the Air Quality Standards Regulations 2011. The Proposed Development site is located in Zone D (Rural Ireland) where air quality is good however there are localised issues across the country impacting negatively on the air quality.

### 4.2.2 Climate

The climatic conditions for the wider geographical area have been derived from historical meteorological measurements compiled by Met Éireann at Cork Airport synoptic station which is some 33 km east of the Proposed Development. The data indicates that the annual mean rainfall was 103 mm, and the mean wind speed was 5.4 m/s. Mean annual temperature at Cork Airport is 10 degrees Celsius.

## 4.3 Noise and Vibration

Although the source noise levels are fairly low, wind farms are generally situated in rural environments where there are few other sources of noise. When wind speeds are high this is not a problem since any noise is masked by wind induced noise effects, particularly that of the trees being blown. At lower wind speeds, however, or in particularly sheltered locations, the wind induced background noise may not be sufficient to mask any noise from the turbines. However, under these conditions, the generated noise levels may be so low as to generate very little impact.

Noise levels are normally expressed in decibels. Noise in the environment is measured using the dB(A) scale which includes a correction for the response of the human ear to noises with different frequency content. It is generally thought that, for noise of a similar character, a change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving and doubling the loudness of a sound.

In order to provide appropriate noise limits for all properties surrounding the Proposed Wind Farm, baseline noise measurements were undertaken at four sample locations geometrically spread around the site subject to access arrangements, which will be used as a basis to determine applicable noise limits for all residences neighbouring the site that have been considered in this report.

Background noise levels measured during the baseline survey include operational noise from the Garranereagh Wind Farm. Four locations surrounding the Proposed Developments have been assessed, based on their location, and their predicted noise level associated with the Proposed Development. These locations are considered to be representative of the 51 non-stakeholder dwellings identified within the operational noise Study Area.

Baseline noise levels measured at H-40 appear to have been the least affected by the operational wind farm noise due to its greater distance from that site and limits derived for this location have been used to assess the impact at all other locations. The background noise levels at H40 varied between c. 21.6 and 44 dB (A) during monitoring period.



Baseline noise monitoring was undertaken at four receptor locations surrounding the Proposed Development to establish the existing background noise levels in the vicinity of the Proposed Development. These locations comprise the original locations monitored before submission of the original 2014 EIAR. These represent the closest locations to the Proposed Development as well as representing different noise environments in the vicinity of the Proposed Development.

Baseline noise data was collected at the four locations. The baseline noise survey results ambient (free-field) noise levels were analysed. A correction of +3dB was added to the noise levels to convert free-field noise levels to façade noise levels. The ambient façade noise level when rounded to the nearest 5dB varies, but for the most part it is less than 60 dB  $L_{Aeq}$ . The nearest residential dwellings to the Proposed Development are afforded Category A designation (65 dB  $L_{Aeq,1hr}$  during daytime periods).

The prevailing daytime amenity noise levels at the four noise monitoring locations are presented in Table 4-1. The derived prevailing background noise polynomial curve was not extended beyond the range covered by adequate data points. Where a noise limit is required at higher wind speeds; it was restricted to the highest derived point.

**Table 4-1: Prevailing Background Noise during Daytime Periods (72.5m hub height)**

Location	Prevailing Background Noise LA90,10min (dB) at Standardised 10 m Height Wind Speed (m/s)									
	3	4	5	6	7	8	9	10	11	12
H1	27.3	29.8	32.8	36.1	39.9	44.1§	44.1§	44.1§	44.1§	44.1§
H40	21.6	26.9	31.9	36.5	40.7	44.5	48.0	51.1	53.8	56.1
H48	26.0	29.3	32.6	35.7	38.9	41.9	44.9	47.8	50.7	53.5
H71	25.7	29.0	32.1	35.2	38.1	40.9	43.6	46.2	48.7§	48.7§
§ - noise level restricted to the highest derived point										

#### 4.4 Ecology

The Proposed Development site does not lie within any designated nature conservation site. Four European Sites are located within a 15km radius of the proposed works. These are:

- The Gearagh cSAC (000108)
- The Gearagh SPA (004109)
- Bandon River cSAC (002171)
- Mullaghanish to Musheramore Mountains SPA (004162)

The nearest of these Natura 2000 sites is the Gearagh cSAC and pNHA, at a distance of 5.9 km to the closest turbine. There are no nationally designated sites within 5 km of the wind farm site.



The Study Area is largely dominated by improved agricultural grassland (GA1) which is predominantly used for cattle grazing and silage cutting. Pockets of wet grassland (GS4) are found on the wetter or poorly draining areas. There are also numerous hedgerows (WL1) present within the Study Area. Patches of scrub (WS1) are also found, with gorse dominating. Pockets of conifer plantation (WD4) with mature and semi-mature sitka spruce (*Picea sitchensis*) are located within the Study Area. This habitat type is largely comprised of single rows of sitka spruce trees (WL2) along farm tracks. Some sections of native hedgerows have grown into treelines, typically dominated by willows, with elder (*Sambucus nigra*), hawthorn, bramble and gorse.

Minor watercourses (eroding/upland river (FW1)) occur within the site. Other habitats present were buildings and artificial surfaces (BL3) and drainage ditches (FW4).

No habitats listed on Annex 1 of the EU Habitats Directive were recorded within the Study Area. Similarly, no botanical species on the Flora Protection Order 2022 or on the 'Ireland Red List No. 10: Vascular Plants' (Wyse et al., 2016) were recorded during field surveys.

Both wet grassland and scrub are of 'Local Importance (Higher Value)' according to the NRA guidelines (2009), and they provide cover for birds, mammals and other wildlife. Hedgerows are considered to be of 'Local Importance (Higher Value)', and they provide ecological corridors for wildlife between habitats in the surrounding landscape. Improved agricultural grassland, conifer plantations and the other habitats mentioned above are artificial habitats, and are considered to be of 'Local Importance (Lower Value)'.

Himalayan knotweed *Persicaria wallichii*, a Third Schedule medium impact invasive alien plant species, was recorded along the edge of the unnamed local road within the site at the north-eastern boundary near the entrance to farm buildings. Cherry laurel *Prunus laurocerasus* and Sycamore *Acer pseudoplatanus* were also recorded at this location.

Sitka spruce *Picea sitchensis* is present in treelines along farm tracks and field boundaries near T1 and T3 as well as small blocks of conifer plantation near T1.

*Fuchsia magellanica* and New Zealand holly *Olearia macrodonta* are also present in the hedgerow adjacent to T3.

The Proposed Development site is within the Southwestern River Basin District and within hydrometric area 19 (Lee, Cork Harbour and Youghal Bay) within the Lee[Cork]\_SC\_030 and Lee[Cork]\_SC\_050 river sub-catchments. The Proposed Development site is drained by the Cummer River (EPA code: 19C02) to the north and the Moneygaff East Stream (19F09), Barnadivane Stream (19B22) and River Bride (EPA code: 19B04) to the south. No mussels were found in any of the survey sites in either the Cummer or the Bride and there are no records of FPM anywhere in either of these rivers on the NPWS database. Composite water samples collected from the Cummer River and the River Bride returned a negative result for freshwater pearl mussel.

A total of two mammal species were recorded during surveys at the Proposed Wind Farm site (including the Proposed Substation). Fox (*Vulpes vulpes*) are common and widespread in the surrounding landscape. A dead fox was observed along the farm track to the south of the site. Fox scat was observed throughout the site along with a den along a hedgerow to the south of the site. Fox were also recorded during trail camera surveys. Rabbit (*Oryctolagus cuniculus*) were also recorded frequently in the Study Area and surrounding landscape. Fox and Rabbit are of 'least concern' in Ireland (Marnell et al., 2019) and are not protected under the Wildlife Acts (1976–2023).



Other mammal species historically recorded in the area of the Study Area (NBDC records) but not observed during surveys may also occur; badger, pygmy shrew, red squirrel, otter, hedgehog and hare. Red squirrel could potentially forage and/or breed within the woodlands in the Study Area and use hedgerows and treelines to commute between dispersed blocks of woodland, however no dreys or feeding signs were recorded during the surveys. While no setts or forms were recorded within the Proposed Development site, badger and hare and could potentially use habitats within the Study Area for foraging. Pygmy shrew and hedgehog could occur where sufficient vegetated ground cover is available. The adjacent streams and onsite drainage ditches onsite could provide commuting habitat for surrounding otter populations, however they provide negligible foraging habitat.

Nine species of bat were recorded during the 2021 and 2022 bat surveys at Barnadivane. The table below provides an ecological valuation of each bat species and the collision risk factor in relation to wind farms. Four of the bat species recorded are considered to be High risk.

**Table 4-2: Ecological evaluation of the bat species recorded during the bat survey (CIEEM Guidelines, 2018) and "Bat Risk" in relation to Wind Turbines (NatureScot 2021 and EC 2020)**

Ecological Value	Geographical Scale of Importance	Bat Risk
International	Leisler's bat	High
	Lesser horseshoe bat	Low
Regional	Brown long-eared bat	Low
	Natterer's bat	Low
	Nathusius' pipistrelle	High
County	-	-
Local	Soprano pipistrelle	High
	Common pipistrelle	High
	Whiskered bat	Low
	Daubenton's bat	Low
Negligible	-	-

Transect surveys for all species were recorded during surveys of the Proposed Development over two winters and two summers. This survey captured the baseline of avian species using the site as well as their abundance and includes seasonal visitors of the winter (i.e., redwing) and summer months (i.e., swallow). Over the entire survey period, a total of 38 bird species were recorded. No Annex I listed species were recorded, while four are red-listed (grey wagtail, kestrel, meadow pipit and redwing) and eight are amber-listed (goldcrest, greenfinch, house sparrow, lesser black-backed gull, starling, swallow and willow warbler).

The passerine species recorded during the transects are among the most common and widespread breeding birds in Ireland (Balmer et al., 2013; Crowe et al., 2014). As per NRA (2009) guidance, the majority of the passerine species recorded are not key environmental receptors. Most species recorded are of 'local importance (lower value)', as per NRA (2009) guidance, i.e. assemblages on site comprise less than 1% of the local population. Meadow Pipit are red-listed on the most recent BoCCI list due to short-term (13-year) declines of more than 50% in their breeding populations, coincident with the prolonged cold weather experienced during the winters of 2009/10 and 2010/11 (Colhoun & Cummins, 2013).



A winter bird Vantage Point (VP) survey following SNH (2017) guidelines, was undertaken over two years at two VPs (winter 2020/21, winter 2021/22, summer 2021, summer 2022). The overall aim of these surveys was to quantify the level of flight activity and distribution over the flight activity survey area and to determine bird usage of the site.

During the winter 2020/2021 season, ten target species were recorded. Of these, three species were red-listed (golden plover, kestrel and snipe), three species were amber-listed (hen harrier, lesser black-backed gull and mallard), and four were green-listed (buzzard, grey heron, and peregrine falcon and sparrowhawk). Hen harrier, golden plover and peregrine falcon are also listed under Annex I of the EU Birds Directive.

During the winter 2021/2022 season, nine target species were recorded. Of these, three species were red-listed (golden plover, kestrel and snipe), two species were amber-listed (lesser black-backed gull and mallard) and four were green-listed (buzzard, grey heron, peregrine falcon and sparrowhawk). Golden plover and peregrine falcon are also listed under Annex I of the EU Birds Directive.

During the summer 2021 season, nine target species were recorded. Of these, three species were red-listed (golden plover, kestrel, and swift), two species were amber-listed (herring gull and lesser black-backed gull), and four were green-listed (buzzard, grey heron, peregrine falcon and sparrowhawk). Golden plover and peregrine falcon are also listed under Annex I of the EU Birds Directive.

During the summer 2022 season, nine target species were recorded. Of these, two species were red-listed (kestrel and snipe), three species were amber-listed (herring gull, lesser black-backed gull and mallard), and four were green-listed (buzzard, great spotted woodpecker, peregrine falcon and sparrowhawk). Peregrine falcon is also listed under Annex I of the EU Birds Directive.

#### **4.5 Geology, Hydrogeology and Slope Stability**

GSI 1:50,000 Quaternary Subsoil mapping indicates the Proposed Development site is predominantly underlain by Glacial Till deposits derived from sandstone and siltstone. Frequent areas of 'bedrock outcrop or subcrop' are also mapped throughout the site. Isolated albeit relatively large (up to 12 hectares) deposits of Blanket Peat can be found along the western and southern margins of the site.

The majority of the Proposed Development site is underlain by The Toe Head Formation, comprising cross-bedded sandstone and minor mudstone. This formation is mapped across the central portion of the Proposed Development site and underlies all of the proposed turbines with the exception of turbine T6 to the south.

The southern extent and portions of the northern extent of the Proposed Development site is underlain by the Castlehaven Formation, comprising purple mudstone and siltstone. This formation underlies turbine T6.

The Gunpoint Formation can be found underlying the northern margin of the site and comprises green-grey sandstone and purple siltstone.

Rock outcrops are mapped across much of the site. During the site walkover outcrops were observed at several locations, particularly within the southern part of the site between turbines T5 and T6 including the location of the proposed borrow pit. The exposed rock has near vertical bedding and extremely closely spaced vertical fractures and is likely part of the Toe Head and Castlehaven Formations.

During the October 2022 site walkover, hand-held probes were undertaken at proposed turbine locations and at other targeted locations around the Proposed Development site in order to determine the presence or absence of peat/soft ground. No peat was recorded across the Proposed Development site.



Based on the findings from the site walkover and desk study, the sub-soil thickness on the site is considered to be generally less than 5 m, hence the assessed groundwater vulnerability for the site is 'High' to 'Extreme'. This suggests that any contamination will encounter limited attenuation prior to reaching bedrock.

In general, site slopes can be categorised as gentle to moderate generally sloping down the south. However, slope gradients increase along the northern and north-eastern margins of the Proposed Development site where they become steep to extremely steep sloping down towards the north and northwest. Slope angles measured during the October 2022 site walkover range from 2 to 10 degrees with a mean value of 6 degrees. Elevations range from 180m AOD in the south to 270m AOD in the north.

#### 4.6 Hydrology and Water Quality

The Study Area is located within Hydrometric Area No. 19 (HA 19) (Lee, Cork Harbour and Youghal Bay) of the Irish River Network System and is situated in the South Western River Basin District (SWRBD). The site is located within two waterbody catchments. These waterbody catchments are known as:

- SW\_Lee228Bride\_Bride\_Bride\_3 Upper
- SW\_Lee228Main\_1Buingea

An area of approximately 198 ha within the site boundary drains into the River Bride waterbody, which rises to the southwest of the site, then flows in an easterly direction along the southern boundary of the site, before turning in a south easterly direction, flowing away from the site, through Beal na Blath and Crookstown, before joining the River Lee north east of Ovens. Four turbines, along with the proposed borrow pit, the met mast and approximately 3.55 km of new tracks are proposed within this catchment, of which 2 km will follow the route of an existing track, which is proposed to be upgraded.

An area of approximately 76 ha within the site boundary drains into the River Cumber waterbody, which rises between Barnadivane and Knockane to the north of the site, flowing in a north easterly direction before joining the Buingea River at Carrigdarrery, then continuing north before entering the Lee Reservoir. Two turbines, along with approximately 0.65 km of new tracks are proposed within this catchment, of which 0.35 km will follow the route of an existing track, which is proposed to be upgraded.

In terms of existing drainage, a number of existing tracks (which will be utilised for the Proposed Development) run through the site. Some of these tracks are agricultural tracks and are approximately 2-3 m wide. The existing track drainage consists of 'over the edge' drainage to roadside drains. There are existing agricultural drains on site which drain towards the River Bride to the south and the River Cumber to the north of the site.

There is no record of flooding on the site, nor has any area in the vicinity been identified as either 'benefitting lands' or a 'drainage district' by OPW. The nearest recorded flood incident is over 2.5 km north of the site, at Teereveen, Poulanargid. The OPW as part of its PFRA (preliminary flood risk assessment mapping) does not show the site within any indicative floodplains, nor is pluvial flooding indicated as being a potential issue at the site.

There is no evidence of alluvium (another indicator of past flooding) in the tributaries running through the site, with the nearest evidence of alluvium being in the main channel of the River Bride, approximately 0.5 km to the south of the site boundary.

The Biological Water Quality Rating of the River Bride is considered to be mostly satisfactory with Good Ecological Quality. This is supported by the Q4 (good) biological status in the stations nearest the site at Barnadivane.



The Biological Water Quality Rating of the River Cumber, is considered to be mostly satisfactory with Good Ecological Quality. Again, this is supported by the Q4 (good) biological status in the stations nearest the site at Barnadivane.

## 4.7 Landscape and Visual Impact

On a broad scale, the Proposed Development is located along a broad plateau of hills and ridges oriented in an east-west direction throughout County Cork. The site itself is located along a crest of hills that peak around c. 230m AOD, located to the north of the River Bride and south of the Cumber River. Whilst the terrain of the central Study Area is not highly distinctive and mimics the rolling hills that contain the site, some more distinctive landscape features are located within the wider Study Area and include the River Lee valley, which traverses the Study Area in a general westerly direction and is just over c. 5km north of the site at its nearest point. The Lee Valley comprises some highly distinctive waterbodies within the Study Area, including the Inniscarra Reservoir, the Carrigadrohid Reservoir, The Gearagh Nature Reserve and Lough Allua. The Bandon River flows through the Study Area in a similar direction but in the southern half of the Study Area and is located some c.8km south of the site at its nearest point. The landform of the Study Area is relatively consistent throughout, comprising rolling hills and ridges intersected by river valleys. Nonetheless, the land begins to rise swiftly in the northern and western periphery of the Study Area towards the Boggeragh Mountain foothills and towards more elevated uplands further west of the Study Area.

The principal land use within the central and wider Study Area is agricultural farmland bound by a network of mixed hedgerow vegetation. The site is contained in a mix of agricultural farmland and low scrubby vegetation. Small blocks of conifer forest are located immediately west and north of the site, whilst more extensive areas of commercial conifer forestry are evident throughout the central and wider Study Area, especially in the wider western half of the Study Area where the terrain rises towards more distant uplands. The elevated transitional lands in the wider western and northern extents of the Study Area also encompass broad areas of mountain moorland. Some notable linear swathes of riparian vegetation also cloak the meandering river valleys throughout the Study Area. The River Lee valley comprises some notable areas of riparian vegetation, especially in the surroundings of the Gearagh Nature Reserve in the northern half of the Study Area. The settlements of Macroom, Bandon and Dunmanway, whilst other anthropogenic landscape features include the linear transport corridors of the N22 and N71, are situated in the northern and southern half of the Study Area, respectively. Several active quarries are also located throughout the wider Study Area, whilst several industrial and commercial land uses are also located on the outskirts of the larger settlements throughout the Study Area. Existing wind farm developments are also notable land uses within the central and wider Study Area. The nearest existing wind farm development is located immediately east of the site in an almost identical landscape context.

## 4.8 Human Environment

### 4.8.1 Population

The Study Area of the Proposed Development is a rural area, with low population numbers and low population density when compared to the averages of the State and County Cork. Overall, the Study Area has a low population density associated with its rural nature. The baseline population statistics do not show any substantial rise or fall in population trends and therefore the Study Area is considered stable with respect to population growth and population density.



#### 4.8.2 Socio-Economic, Employment and Economic Activity

Between 2019 and 2022 unemployment trends in County Cork and the State as a whole experienced a reduction, where numbers recorded on the live register dropped by 3% throughout the State and 2% in County Cork. Likely part-due to the negative economic impact associated with COVID-19, numbers of people on the live register increased from 2019 to 2020 by 15% across the State and by 10% across County Cork. These numbers have since decreased by 23% across the State and by 19% across County Cork between September 2020 and September 2021.

Taking account of 2016 Census population figures as detailed in section 10.3.1 of Chapter 10, this represents an unemployment rate of 3.8% across the State, and an unemployment rate of 3.5% across County Cork, indicating a greater average unemployment for the State as a whole compared to County Cork.

The Census (2016) has published figures of Ireland's working population aged 15 to 64 for Electoral Divisions, allowing for a greater insight into the Study Area's socio-economic profile.

The basic indicator for employment is the proportion of the working-age population aged 15-64 who are employed. Overall, the principal employment status in 2016 across the State, County Cork and the Study Area is 'at work' with between 53% and 56% at work across the State, County Cork and the Study Area. The Study Area has the same percentage of persons 'at work' compared to County Cork, while the percentage of persons 'at work' within the Study Area is slightly higher than the State with 3 percentage point difference. Unemployed persons within the Study Area is lower than that of the State and County while the Study Area has similar percentage of retired persons compared to the State and County.

The Census (2016) also indicates the employment composition of Electoral Divisions, an important element of the socio-economic profile of an area. The employment sectors for each of the areas show similarities with professional services and commerce and trade being the largest share across the State, County and Study Area. The Study Area has a higher percentage of employment from the Manufacturing Industry compared to the State and County.

Overall, the economic profile of the Study Area does not show any major disparities when compared to the National and County-wide average socio-economic statistics. County Cork has a slightly lower unemployment rate compared to the State. This is reflected in the unemployment numbers recorded in the 2016 Census for the Study Area which are on average lower than the State. In general, the baseline conditions of the Study Area shows healthy socio-economic characteristics.

Employment activities within the Study Area consists mainly of agriculture and forestry as detailed in Section 10.5: Land Use., Manufacturing industries, commences and trades and professional services, of Chapter 10.

#### 4.8.3 Land Use

The Proposed Development site is located in an area of private agricultural lands. The lands of the site are accessed by existing agricultural entrances. The site has existing agricultural tracks currently used for farming activities. The primary agricultural activity at the site is pasture farming. The greater area of the site consists of pastoral lands, one-off housing and farmsteads. There are 113 dwellings located within 1.5km of the proposed turbines. There are thirteen wind farms located within 20km of the site



#### 4.8.4 Recreation, Amenity and Tourism

Tourism statistics for 2019 as published by Fáilte Ireland (March 2021) state that overseas tourism grew by 0.7% on 2018 figures with over 9.7 million visitors. Expenditure from overseas tourism was estimated to be down by -0.8% remaining strong at €5.1 billion. Fáilte Ireland's 2019 survey results indicate the top 5 most popular recreation activity for tourists in Ireland: Hiking and cross-country walking, Cycling, Golf, Equestrian and Angling.

Overall, the most significant recreation activity/attractions in proximity to the Proposed Development is trail walking, historical areas, equestrian activity and sports grounds. The Proposed Development situated in proximity to an area of historical significance with Michael Collins Memorial located c.12.4km from the site.

Community facilities and services in proximity to the Proposed Development are centred on towns and villages in the area. The closest settlement to the Proposed Development is the village of Kilmurry, located 9km to the east, Crookstown, located 12km to the east, Macroom, located 15km to the north and Newcestown located 12km to the southeast. Facilities and services within the settlements include food places, public houses, convenience stores, guest houses, national schools, churches, GAA Clubs, nursing home, and a golf club etc.

#### 4.8.5 Human Health and Safety

Human health in relation to this assessment refers to the nature and possibility for adverse health effects on humans. In the context of existing human health, The Department of Health (2019) has published a report entitled 'Health in Ireland, Key Trends 2019' which provides statistics relating to human health in Ireland over a 10 year period (2009 to 2019). Generally speaking, Ireland's population has a high level of good health as demonstrated in self-evaluation statistics included in Census data.

From analysis of the health statistics, the general health of the Study Area is recorded as very good or good. This is in line with State and County-wide averages. The Study Area has approximately the same averages, as County Cork with 88% and 91% of respondents of the 2016 Census indicating that their health was 'good' or 'very good' and 1% indicating their health was 'bad'. Less than 0.5% of respondents indicated their health was 'very bad' for these areas. This shows a slight greater percentage of persons 'very good' general health when compared to the State which has 7 percentage points lower than that of the Study Area. Overall, the Census data indicates that the population of the Study Area is generally in good health.

With regard to the control of major accident hazards involving dangerous substances, on examination of upper and lower tier Seveso Establishments in the surrounding region of the Proposed Development, no Seveso Establishments were identified in proximity to the site. The closest Seveso site is located approx. 15km south at Carberry Food Ingredients Balineen, Co. Cork.

From a review of the GSI Landslide Susceptibility database, the Proposed Development and infrastructure locations are mainly located within areas of 'Low' susceptibility with some areas to the west located in areas of 'Moderately Low' and 'Moderately High' susceptibility. No historical records of landslide activity have been identified within or close to the site, according to the GSI database. According to the OPW (floodinfo.ie), no major flood incidents are recorded at the site.

There is no record of wildfires at the Proposed Development.



#### 4.8.6 Shadow Flicker

Under certain combinations of geographical position, wind direction, weather conditions and times of day and year, the sun may pass behind the rotors of a wind turbine and cast a shadow over the windows of nearby buildings. When the blades rotate and the shadow passes across a window, to a person within that room the shadow appears to 'flick' on and off; this effect is known as 'shadow flicker'. The phenomenon occurs only within buildings where shadows are cast across a window aperture, and the effects are typically considered up to a maximum distance of 10 times the rotor diameter from each wind turbine.

The 10 times rotor diameter criterion, which effectively sets the size of the Study Area, is detailed in several international publications including the German 'Guideline for Identification and Evaluation of the Optical Emissions of Wind Turbines' (2002), the UK's 'Update of UK Shadow Flicker Evidence Base' (Parsons Brinkerhoff for DECC, 2011) and Ireland's own 'Wind Energy Development Guidelines' (WEDG 2006).

Specifically, the WEDG 2006 states "At distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low".

The Proposed Development consists of 6 turbines, each with a maximum rotor diameter of 117 m. Accordingly, a Study Area of 1,170 m from each of the turbines was selected for this assessment i.e. ten times the maximum rotor diameter.

The assessment considers all potential shadow flicker sensitive receptors identified within the Study Area, which includes habitable residential buildings and buildings that are mixed residential and commercial. The identified receptor locations are detailed on Figure 10.5 of Chapter 10 and presented in tabulated format in Appendix 10.1.

#### 4.8.7 Renewable, Non-Renewable Resources and Utility Infrastructure

A number of active and historic quarries and mineral occurrences are located within 20km of the Proposed Development, as detailed in the GSI Online Minerals database shows no mineral (metallic and non-metallic) occurrences within the site. An iron deposit has been recorded within the Castlehaven Formation approximately 1km west of the site (ITM coordinates E 532335, N 562365).

The GSI Aggregates database indicates that there is predominantly a low crushed rock aggregate potential across most of the site (Chapter 6, Figure 6-8). Localised extents of 'moderate' to 'high' crushed rock potential can be found throughout the site with an area of 'very high potential' mapped along the northernmost extent of the site.

Wind resource is average at the site location. The 2013 Sustainable Energy Authority of Ireland (SEAI) Wind Speed Atlas identifies the site as having an average wind speed of between 7.4 m/s and 7.5 m/s at 100m above ground level.

An existing Wind Farm (Garranereagh Wind Farm) is located to the east of the Proposed Wind Farm. This existing Wind Farm consists of 4 no. turbines and has an overall output of 9.2MW.

As part of the scoping and consultation process for the Proposed Development, searches of existing utility services were carried out to identify areas where major assets exist such as high voltage electricity cables or gas mains. Private utility and telecommunications companies were also consulted during this period. The only major utility infrastructure that was identified at the Proposed Development site was the existing 110 kV Macroom to Dunmanway overhead line that traverses the site and which is proposed to loop into via the Proposed Substation.



## 4.9 Traffic and Transportation

The site is located in the townlands of Lackareagh, Garranereagh and Barnadivane (Kneevies). The site is accessed by the local road L6007 and is situated approximately 500m west of the local L6008 Road at its eastern boundary, 1.5kms north of the R585 Regional Road at its southern boundary and approximately 7 km west of Crookstown and the N22 National Road.

Traffic and transportation impacts will arise primarily during the construction stage of the project, due to the need to deliver the necessary materials for construction and the oversized loads necessary for the delivery of turbine components. The proposed point of arrival for the wind farm plant is the port of Ringaskiddy in County Cork. A detailed assessment of the transport route was made from a point at which the route turns off the N22 national primary road at Castlemore.

The extent of the route assessment is therefore confined to the access route comprising of;

- Location 1 - N22 / R585 Junction at Castlemore,
- Location 2 – Right turn on R585 at Crookstown,
- Location 3 – Left turn at R585 / R590 junction at Crookstown,
- Location 4 – Bend on R585 south of Crookstown,
- Location 5 – Series of bends in the R585,
- Location 6 – R585 through Bealnablath,
- Location 7 – R585 / L6008 junction at Gortadinnaghboght,
- Locations 8 and 9 – The local road network through Lackereagh,
- Locations 10 – The access junction
- Locations 11, 12 and 13 are on the internal road network through the site.

It should be noted that traffic volumes are discussed in terms of either vehicles or passenger car units (pcus), where each vehicle is expressed in terms of its demand on the network relative to the equivalent number of cars. For example, a typical articulated HGV is allocated a factor of 2.4 passenger car units (as per TII Project Appraisal Guidelines for National Roads Unit 5.2), while one of the extended loaders required to transport the wind turbine equipment was assigned a value of 10.

Traffic volumes on the delivery route were obtained from a combination of data available from automatic count sites maintained by TII and link and junction counts undertaken for the purpose of this EIA.

A continuous traffic counter is maintained by TII on the N22 at Ballyvourney which provided base year all day traffic flows for the N22 (Link count location 1).

The following traffic count surveys were undertaken by Traffinomics Ltd on Tuesday 25th October 2022 in order to provide traffic counts for the remaining locations;

- A 24 hour classified automatic traffic count (ATC) on the R585 to the east of Crookstown (Link count location 2), and,
- A peak period (07:00 to 10:00 and 16:00 to 19:00) classified turning counts at the R585 / L6008 junction (Link count locations 3, 4 and 5),



For link count locations 3, 4, 5, the 6 hours of peak period traffic counts were expanded to 24 hours using an expansion factor determined from the 24 hour data collected on the R585, which was determined to be as follows;

$$24 \text{ hours} = 1.84 \times (07:00 \text{ to } 10:00) + (16:00 \text{ to } 19:00)$$

In the base year 2022 traffic volumes on the delivery route range from 12,742 vehicles day on the N22 at Castlemore, to 4,475 vehicles on the R585 to the east of Crookstown, reducing to 3,057 vehicles on the R585 adjacent to the junction with the L-6008. Traffic volumes on the L-6008 approaching the site were observed to be low with a daily volume of 92 vehicles observed.

The TII Data used from the ATC site in the N22 for link count location 1 is included as Appendix 11.1 while a full listing of the traffic count surveys undertaken at link count locations 2 to 5 is included as Appendix 11.2.

It is noted that the Covid-19 pandemic was still having a minor impact on travel demand and traffic volumes in Ireland in the base year for the traffic counts, 2022. A comparison of the traffic volumes recorded at the TII ATC site on the N22 was made for the base year for the traffic assessment, 2022, and the year 2019, prior to any impacts of Covid-19. All day traffic volumes of 13,570 were recorded in 2019 prior to the pandemic, compared to 12,742 recorded in the base year of 2022. A Covid-19 correction factor of 1.065 was therefore applied to the traffic counts observed in 2022, which were then used as the base 2022 traffic volumes.

Updated guidelines for forecasting annual growth in traffic volumes were produced by TII in October 2021, as set out by region in the Project Appraisal Guidelines (Unit 5.3 – Travel Demand Projections). The annual growth rates for the southwest of Ireland are applicable to the Study Area. Traffic volumes are forecast to increase during the period from 2022 to 2028 (the assumed construction year) by 11.9%, assuming a medium growth scenario.

The traffic count data was also used to determine the existing percentage of HGVs on the delivery routes. The observed percentage of HGVs was observed to range from 4.6% on the R585 to the east of Crookstown to 5.5% on the N22, to 14.0% on the L6008 leading to the site.

#### 4.10 Archaeology, Architecture and Cultural Heritage

Two recorded archaeological monuments are located approximately 225m and 251m from turbine 6 and 2, but are not located within the Proposed Development boundary.

##### *CO083-078 Ringfort*

This ringfort is located in the northern section of the Study Area although is not located adjacent to the Proposed Development. Despite the apparent proximity of the monument to T2, it is unlikely that the turbines will be visible from the monument as it is located in lower ground with intervening high ground. The worst-case scenario is that the blade tips of T2 would be visible. The ringfort is located in a green field approximately 282m to the north of proposed turbine T2. The monument is currently fenced off and whilst well defined, the banks are significantly eroded from burrowing animals.



### CO094-036 Enclosure

This enclosure is located in a small mature forestry plantation in the south-western corner of the Study Area. The site now appears to be planted over with no trace or outline of the site visible from aerial photographs. No access to this monument is now possible. The enclosure is located 265m from proposed turbine T6. It is described in the Archaeological Inventory of County Cork as follows: 'In bogland, in wide shallow valley. Shown on 1842 OS 6-inch map as hachured circular area (diam. C. 30m); as circular field on 1904 OS 6-inch map. Roughly circular area (37m N-S; 46m E-W) formed by natural rise and enclosed by low earthen bank (H 1m). Interior slopes noticeably from W to E'

## 4.11 Telecommunications and Aviation

### 4.11.1 Telecommunications & Television

The rotating blades of a wind turbine can occasionally cause interference to electro-magnetically-propagated signals. Such interference could, in theory, affect all forms of electromagnetic communications including:

- Satellite communications
- RADAR
- Cellular radio communications
- Aircraft instrument landing systems
- Air traffic control
- Terrestrial microwave links
- Television broadcasts

In addition, it is possible that houses in the immediate vicinity of the turbines could require some remedial measures in relation to television reception.

A data gathering exercise was carried out to establish the locations of all known telecommunications services in the vicinity of the wind farm. A number of telecommunications providers were contacted to assess any potential impacts.

### 4.11.2 Aviation

Wind turbines within 30 km of a radio navigation aid have the potential to lead to electro-magnetic interference with these signals. The Proposed Development is located approximately 32 km west of Cork Airport.

Cork Airport, the Department of the Defence and the Irish Aviation Authority were all consulted in relation to the Proposed Development.



## 5. SUMMARY OF POTENTIAL IMPACTS

### 5.1 Potential Impacts on Air and Climate Change

#### 5.1.1 Air

The principal source of air emissions will be limited to the construction of the Proposed Wind Farm. There will be dust arising from earthworks, construction of the new access tracks, excavation and backfill of the borrow pit and the movement of material around the site.

Plant and machinery such as generators, excavators etc. will be required at various stages of the construction works. These will be operated on an intermittent basis. Although there will be an emission from these units, given their scale and the length of operation time, these emissions will be imperceptible.

Once the Proposed Wind Farm development is operational there will be no direct emissions to atmosphere.

During the decommissioning phase, the number of HGV movements associated with the removal of turbine components will be significantly lower than the number of vehicles estimated for the construction phase and therefore their respective emissions will not exceed any ambient air quality standards. This phase may also give rise to dust emissions owing to increased vehicle access and removal of access tracks (if required by CCC).

#### 5.1.2 Climate

There is the potential for greenhouse gas emissions to the atmosphere during the construction, operation and decommissioning phases of the Proposed Development such as those arising from construction vehicles, the use of on-site generators, pumps, and excavation works. The potential climatic impacts arising from these emissions are assessed hereunder with respect to micro and macro climates.

##### 5.1.2.1 *Microclimate*

###### 5.1.2.1.1 Proposed Wind Farm

The significance of impacts associated with the conversion of vegetated surfaces to un-vegetated surfaces is assessed through the consideration of the area of the land experiencing such a change.

The Proposed Wind Farm site is predominately an upland location with the exception of existing public road ways and internal track ways. The total area of proposed new permanent hardstanding surface will amount to a small fraction of the overall Proposed Development site and consequently there will be no direct or indirect impact on air temperature and microclimate because of the relatively small proportion of new permanent hardstanding surface.

###### 5.1.2.1.2 Proposed Substation

The total area of proposed new permanent hardstanding surface associated with the Proposed Substation will be smaller than that of the Proposed Wind Farm. Therefore, again, due to the small fraction of land take relative to the surrounding area, there will be no direct or indirect impact on air temperature and microclimate due to the Proposed Substation.



## 5.1.2.2 Macroclimate

### 5.1.2.2.1 Proposed Wind Farm

Carbon dioxide (CO<sub>2</sub>) is a greenhouse gas which if released in excessive amounts can lead to increases in global temperatures known as 'global warming' or 'greenhouse effect' which can influence climate change.

Should the Proposed Wind Farm not be developed, fossil fuel power stations will be the primary alternative to provide the required quantities of electricity. This will further contribute to greenhouse gas and other air pollutant emissions, as well as hindering Ireland in its commitment to meet its target to increase electricity production from renewable sources and to reduce greenhouse gas emissions.

The Proposed Wind Farm project offers Ireland an indigenous form of sustainable electricity and would provide for security of supply against our dependence on imports in addition to the positive impact on the macroclimate.

### 5.1.2.2.2 Proposed Substation

The Proposed Substation, provided it is utilised to feed renewable electricity onto the national grid, will have a positive impact on the macroclimate. The Proposed Substation will form part of the future grid infrastructure which is necessary to dispense with the carbon-intensive fossil fuel electricity generation described in the previous section.

## 5.2 Potential Impact on Noise and Vibration

Noise predictions were performed for the Proposed Development using the highest noise levels at each wind speed, for the Proposed turbine for a range of standardised 10m height wind speeds from 2 m/s up to 12 m/s. Noise from the transformer for the Proposed Substation was also predicted. Receptors within the 35 dB LA90 noise contour of the turbines were modelled. A number of the receptors were identified as farm buildings and these have not been considered as part of the impact assessment and were not assessed against the derived daytime and night-time noise levels.

The predicted noise levels from the Proposed Project are below the daytime and night-time noise levels at all locations, except at receptor H36 which is a stakeholder property. At H36 the daytime limit is exceeded by between 0.5 dB at 7 and 8m/s. The night time limit is exceeded by between 1.8 to 2.5 dB. At some NSL locations, particularly those west of the site, away from the existing Garranereagh windfarm, with the introduction of a new source of noise into the soundscape, it is expected that there will be a long-term moderate significance of impact on the closest dwellings to the Proposed Wind Farm.

In order to protect residents, the cumulative impact from the other nearby wind farm development, Garranereagh was also considered and assessed. When cumulative noise from both windfarms are considered, the noise limits are exceeded at the following locations:

- At H28 the night time limit is exceeded by between 4.2 to 6.6 dB and the daytime limit by between 2.2 and 7.2 dB. H28 is a Garreneragh stakeholder property.
- At H34, the night time limit is exceeded by 1.5 dB above 10 m/s. The daytime limit is met at this location. H34 is a stakeholder property.
- At H36, the night time limit is exceeded by 2.8 dB above 10 m/s. The daytime limit is met at this location. H36 is a stakeholder property.



At some NSLs, a new source of noise will be introduced into the soundscape and it is expected that there will be a long-term moderate significance of impact on the closest dwellings to the Proposed Wind Farm. This is for properties west of the Proposed Wind Farm.

The predicted cumulative noise levels comply with the daytime and night-time limits at the majority of NSLs. The exceedances are at stakeholder properties (H34 and H36). There is an exceedance at Garranereagh stakeholder property H28, close to the existing Garranereagh windfarm, but this is due to noise from Garranereagh windfarm. The noise modelling assumed that this NSL is downwind of all wind turbines. In practice, this will not occur all the time and the actual noise levels at the NSL will be lower when the NSL is upwind or cross wind of the wind farm.

### 5.3 Potential Impact on Biodiversity

The land take associated with the Proposed Development will be low in relation to available habitats within the broader area of the Proposed Wind Farm. Areas to be utilised for internal roads and turbine hardstands will primarily be habitats classified as of low value such as improved agricultural grassland. There will be some removal of hedgerows and treelines to facilitate access tracks and entranceways however land take is low in relation to total areas of these habitats predicted for County Cork; in addition hedgerows along proposed turbine delivery routes may require modification such as trimming or removal in a small number of cases. There is a risk that machinery or materials imported onto the site could transport non-native species of plants.

Developments such as wind farms in general have the potential for different effects on birds, including potential loss of nest sites or habitat fragmentation, displacement due to disturbance (where birds are forced to move or seek alternative feeding or nesting areas), death and injury due to collisions, and disruption of local or migratory movements. General farmland birds such as songbirds are generally accepted as less likely to be significantly affected by many of the above effects; whilst larger species such as Whooper Swan (present at the subject site) may be affected by collision or disturbance, or through alteration of flight paths which may force them to expend more energy on a daily basis.

During construction, works may potentially impact negatively on breeding birds through the removal of suitable breeding habitat such as hedgerows and scrub. During construction, works may impact negatively on fauna (excluding bats) through habitat loss, and noise and visual intrusion which may affect foraging. Although no Otter breeding or resting sites were recorded at proposed stream or river crossings, works may still affect animals which take up occupancy in the interim period prior to the commencement of construction.

The bat activity surveys at the Proposed Development site showed significant bat activity in the immediate vicinity of the proposed turbines. Any impacts on bats prior to mitigation (particularly felling buffers) during the construction and operational phase are predicted to be Long-term Significant Impacts on a Local Level and Irreversible.

Engineering works in the vicinity of streams and at stream crossings can impact directly on aquatic habitat, for example the spawning or nursery areas of fish. Permanent loss of aquatic habitats can also occur where access roads are constructed over or in close proximity to streams/rivers or where streams/rivers are permanently diverted to new channels. Obstruction to upstream movement of fish, particularly salmon and trout, due to construction of crossings can also potentially occur. Soil or other materials may be released during excavation works and find their way into water bodies.



The Proposed Development site is not within the boundaries of any designated nature conservation site. Thus, there will be no direct impact on the size, scale or structure of any designated site as a result of the Proposed Development. As a result of the significant separation between the Proposed Development and designated sites and the construction best practice measures to be applied, the development is expected to have a negligible impact on the receiving environment in terms of surface water. The Proposed Development will not result in any drainage to a designated site, and thus there will be no negative impacts on any aquatic habitats or species of special conservation interest in any designated site.

There may be a cumulative effect from the development, should the Proposed Substation be consented and is constructed in parallel with the Proposed Wind Farm, with possible in combination impacts being increased run-off or siltation due to the construction of the substation.

#### **5.4 Potential Impact on Geology, Hydrogeology and Slope Stability**

The following on-site activities have been identified as the sources of potential risks to the soils and geology on the site:

- Earthwork
- Construction of access tracks
- Construction of wind turbines and hardstanding areas
- Temporary Construction Compound and Substation
- Internal Cabling
- Proposed Substation
- Soil and rock excavation/reuse
- Borrow pit excavation
- Material storage
- Drainage
- Vehicular movement

The excavation for turbines, hardstanding areas, access tracks and roads, stream crossings, a borrow pit, drainage trenches and cable trenches can have a direct permanent impact on the exposed soils and rock in the form of increased erosion and sediment release that could also have additional impacts on water quality due to sedimentation of water courses.

During construction, the use of construction plant and equipment may result in accidental contamination of soil and rock due to oil/fuel or chemical leakages.

Soil compaction may occur due to movement of construction traffic and the storage of soils or other materials. This will occur particularly within areas of topsoil and peat which are highly compressible. This could lead to an increase in runoff and subsequently to an increase in erosion.

The importation of granular fill and other products in the form of concrete or other construction related products will have a permanent impact on the source quarries or borrow pits.

The site is not expected to result in any significant, negative cumulative effects with other existing or permitted developments in the vicinity.



## 5.5 Potential Impact on Hydrology and Water Quality

The main potential hydrological impact of the Proposed Development is an increase in silt laden run-off to watercourses in the vicinity of the Proposed Development and to a lesser extent a very minor increase in runoff from a storm event, due to the change in land use and an increase in impermeable ground conditions.

There are no in-stream works or stream crossings required for this development.

There is no recorded history of flooding at or in the vicinity of the site. However, flooding has occurred downstream at Teereeven, Poulanargid, at a distance of over 2.5 km from the site. Indicative flooding in the main channel of the River Bride and the River Cumber, is shown to occur along the site boundary to the south and to the north of the site respectively. It is proposed to attenuate the minor increase in surface water run-off with the use of swales, stilling ponds and diffuse discharge methods to mitigate any impact on the receiving waters. Consequently, the increase in surface water run-off is considered to be of very low significance.

The relatively low increase in run-off has however, the potential to cause soil erosion and consequent sediment release into the receiving watercourses.

Some activities during the construction of the wind farm, if unmitigated, could have a minor impact on the receiving watercourse, with a risk of sedimentation of sensitive catchments. Operation and maintenance activities are not expected to have a significant effect on the receiving watercourses

The main potential impact of the Proposed Development on water quality is an increase in sediment concentration in watercourses during the construction phase. The main sources of potential increase in sediment to surface water are haul roads passing close to watercourses; silt carried on the wheels of vehicles leaving the site could be carried onto the public road; spoil heaps from the excavations for the turbine bases.

Management of surface water runoff from the project will include settling of suspended solids and attenuation of flows in roadside swales, silt traps, silt fencing and stilling ponds. The water quality treatment potential for swales is 'high' for suspended solids. The impact on water quality during construction will be mitigated by the use of silt protection controls providing settlement.

Further potential impacts on the water quality of both surface water and ground water are:

- spoil heaps from the excavations for the turbine foundations will be stored temporarily; if left exposed, this could lead to an increase in silt-laden run-off draining off site.
- excavations for drainage systems could disturb underlying soils.
- small diameter cross-drains could lead to blockages and consequent flooding and concentration of flows.
- drainage carrying overland flow from upslope could lead to high volumes of run-off eroding the drainage.
- crushing of stone in access tracks by heavy vehicles, creates fines and consequent oozing of soluble material in very wet weather out from the tracks and into the drainage conduits.
- standing water in the excavations will contain an increased concentration of suspended solids as a result of the disturbance to the underlying soils.
- silt carried on the wheels of vehicles leaving the site could be carried onto the public road.
- an increase in impermeable surfaces could result in an increase in surface water run-off from the Proposed Development.
- wet concrete operations could lead to contamination of receiving waters.



- suspended solids could potentially lead to siltation and consequent effects on flora and fauna in aquatic habitats.
- siltation arising from excavations at the site could impact on the water quality status of the receiving waters.
- refuelling activities could result in fuel spillages.
- sanitary waste could lead to contamination of groundwater.
- there is the potential for fuel spill/leaks from refuelling activities and storage tanks which will be stored on site for plant machinery.
- cable trenches could act as a conduit for surface water flows.
- open bodies of water present a risk to the safety of site personnel and the public.
- incorrect site management of excavations or material storage areas could lead to the release of suspended solids to surface waters.

The potential impacts of the Proposed Development is expected to have a negligible impact on the receiving environment in terms of an increase in flooding or sedimentation. The main potential impact of the development on water quality during operation is a minor increase in run-off from a storm event, due to the change in land use and an increase in hardstanding areas i.e. impermeable ground conditions.

Some infiltration will occur through the hardcore material of the track construction. There is a potential risk of some hydrocarbons polluting the watercourses following run-off from the impermeable trafficked areas.

During the operation phase, small quantities of oil will be used in cooling the transformers. There is potential for small oil spills.

When operational, the wind farm development will have a negligible effect on surface water quality as there will be no further disturbance of soils post construction and only a minimum of trafficking.

The Potential Cumulative Impact from Other Developments in close proximity to the wind farm is negligible.

In the event of decommissioning of the wind farm, activities would take place in a similar fashion to the construction phase. Potential impacts would be similar to the construction phase but to a lesser degree. It is proposed that turbine foundations and hardstanding areas should be left in place, covered over with local soil/topsoil and allowed to re-vegetate naturally, if required. The internal site access tracks may be left in place, subject to agreement with Cork County Council and the landowner. It is considered that leaving these areas in-situ will cause less environmental damage than removing and recycling them. However, if removal is deemed to be required all infrastructure will be removed with mitigation measures similar to those during construction being employed. Any diesel or fuel oils stored on site will be banded.

The alternative grid connection route (AGCR) will generally run within, or adjacent to, existing public highways which are assumed to be served by formal drainage systems or shed surface water to adjacent verges. Any agricultural land crossed by the cable trench will presently drain naturally via infiltration, evaporation and overland runoff.



The following potential impacts could result from the construction activities related to grid route installation and associated watercourse crossings:

- Suspended solids drained to watercourse could potentially lead to siltation and physical effect on flora and fauna.
- Excavated soil could be mobilized in the surface water runoff during an extreme rainfall event.
- The excavation of trenches for cable laying, and the launch and reception areas for directional drilling, could lead to silt-laden surface water run-off.
- Inadequate storage of fuels and oils could lead to contamination of surface water.
- Refuelling activities could result in fuel spillage.
- Works leading to erosion of the riverbanks/bed could negatively impact on the fisheries habitat.
- Drilling fluids (e.g. bentonite) associated with HDD works at the four locations could pollute watercourses either from poor management of bentonite or breakout into the channel during drilling.
- Sediment-laden runoff during the launch pit and reception pit excavation works.

The TDR will follow existing the existing Knockboy road and cross the Bride Lee River SAC just south of Hornhill and then running along the R585 Road.

The following potential impacts could result from the construction activities related to delivery route installation and associated watercourse crossings:

- Suspended solids drained to watercourse could potentially lead to siltation and physical effect on flora and fauna.
- Excavated soil could be mobilized in the surface water runoff during an extreme rainfall event.
- The excavation of trenches for cable laying, and the launch and reception areas for directional drilling, could lead to silt-laden surface water run-off.
- Inadequate storage of fuels and oils could lead to contamination of surface water.
- Refuelling activities could result in fuel spillage.
- Works leading to erosion of the riverbanks/bed could negatively impact on the fisheries habitat.
- Drilling fluids (e.g. bentonite) associated with HDD works at the four locations could pollute watercourses either from poor management of bentonite or breakout into the channel during drilling.
- Sediment-laden runoff during the launch pit and reception pit excavation works.

It is highly unlikely there will be replacement of any large wind turbine components during the operational phase therefore the TDR will not be affected during this time.



## 5.6 Potential Impacts on Human Environment

### 5.6.1 Population

The potential effects on population and demographic trends arising from the Proposed Development during its construction phase relate to potential population increase or decrease.

During the construction phase of the project, it is likely that many of the workers travelling to the site will do so from outside of the area. This is due to the large numbers expected to be employed at the project site. It is expected that workers from the locality within the immediate area will also be employed, however, the relatively low population available in the area, combined with a high percentage of employed persons, indicates that there is a limited available work force in the project area and therefore many workers employed at the construction site are likely to travel from the surrounding catchment of County Cork.

This will give rise to short-term/brief population growth at the site during working hours. This is associated with the direct employment of construction workers, trades people, labourers and specialised contractors. The construction phase of the Proposed Development has potential to create between approximately 27-30 jobs. In a best-case scenario, the Proposed Development has the potential to create between approximately 40-70 jobs.

The population of the Study Area recorded in the 2016 Census was 4,663 persons. An estimate of between 27 and 70 jobs associated with the construction works has potential to increase the population of the Study Area by between 0.5% and 1.5%. However, this increase is associated with daily construction works and therefore the population of the Study Area will increase daily during construction hours and return back to normal outside of working hours resulting in a brief increase to population numbers on a daily basis over the 12-18 month construction period. As construction work is temporary, it is unlikely that workers will take up residence in the area of the Proposed Development, however, it is likely that some workers will stay in accommodation within the Study Area or at nearby towns. Overall, this will result in a slight, short-term increase in population resulting in a slight, short-term neutral impact.

It is proposed to construct the 110kV Substation and connect to the overhead 110kV line via a loop in-loop out connection. The AGCR may be utilised if the overhead option is considered unviable and the substation will not be built. The proposed AGCR will be considered cumulatively as the works relating to the AGCR pertain to an existing permission.

In relation to the enabling works along the TDR, the only works that will be carried out are those that were granted permission under P.A. Ref. No. 14/6803. This permission was for construction of a private roadway, approximately 150 metres long, from the R585 to the L6008 and all associated works. These works are to be considered as a cumulative impact of the Proposed Development and not as part of the Proposed Development.

It is unlikely that permanent effects to population at the Proposed Development site will occur, in terms of changes to population trends or population density as a result of the construction phase.

Once constructed, it is envisaged that there will be direct and indirect employment associated with the operational phase of the Proposed Development. Opportunities for mechanical-electrical contractors and craftspeople to become involved with the operation and maintenance of the project will arise.

It is expected that the operational phase of the Proposed Development could create between 8 and 10 long term jobs (with an installed capacity of approximately 25MW). These jobs include operations and maintenance, back-office support and indirect jobs created by other activities related to installed turbines including IPP/utilities, consultancy firms, research institutions, universities and financial services.



Although only a small proportion of these jobs are likely to be based in the site, the operational phase will give rise to temporary, slight population increase at the Proposed Development site during working hours as a result of operations and maintenance occurring at the site. This effect is expected to be brief and imperceptible.

The potential effects associated with the decommissioning phase in relation to population trends will be similar to those associated with construction phase but of a reduced magnitude.

A construction crew will be required for dismantling the infrastructure and carrying out remediation where necessary. As the decommissioning of the development is expected to be less intensive than the construction phase, it is likely that less construction workers will be required for this phase. During the decommissioning phase, the population of the Site will increase daily during working hours and return back to normal outside of working hours.

As removal works will be of relatively short duration, it is unlikely that workers will take up residence in the Study Area, however, it is likely that some workers will stay in accommodation within the area of the Proposed Development Site or nearby towns, resulting in potential brief to temporary population increases. The decommissioning phase is therefore likely to result in a slight, brief/temporary increase in population at the Proposed Development Site and nearby towns, producing a slight temporary impact on population trends. It is not likely that the decommissioning phase will result in any permanent impact to population in terms of changes to population trends and density.

As mentioned previously, it is proposed to construct the 110kV Substation and connect to the overhead 110kV line via a loop in-loop out connection. The AGCR may be utilised if the overhead option is considered unviable and the substation will not be built. The proposed AGCR will be considered cumulatively as the works relating to the AGCR pertain to an existing permission.

### 5.6.2 Land Use

The existing land-uses in proximity to the Proposed Development will remain broadly unchanged during the construction phase of the project, however, some land use in close proximity to the site will be temporarily disrupted during the construction phase as a result of construction activity. The land uses located within the footprint of the Proposed Development will be disrupted in the long-term due to the presence of the Proposed Wind Farm and Proposed Substation. This will occur on the agricultural lands and treelines where turbines and associated infrastructure are proposed.

There are 6 no. proposed wind turbines and associated hardstandings located on agricultural lands. The access track associated with the met mast at the south of the site passes adjacent an active farmyard.

Agricultural practice can continue during the construction phase, however, sections of lands adjacent the proposed infrastructure may be temporarily inaccessible due to construction activities. For example, cut and fill operations across the Proposed Development site will disturb the soil and are likely to impact agriculture practices during construction. The temporary compound area will be utilised during the construction phase for construction activity, storage, parking and welfare facilities. This is likely to have a temporary slight negative effect on agricultural practice at the site.



TDR node upgrade activity has potential for slight, brief to temporary impacts to land use in proximity to each node. The majority of works have potential to cause non-significant brief impacts where street furniture and wall removal, temporary load bearing surfaces and vegetation trimming is required. Brief impact may also occur to the supply of electricity and telecommunications to homes and businesses as a result of temporary removal of services to accommodate turbine delivery. Turbine delivery may effect land use temporarily or briefly due to the transportation of oversized loads on the public road. This is likely to have a brief to temporary slight, negative impact on residential land-use due to noise nuisance as a result of use of machinery.

It is anticipated that there will be minimal impact on existing land uses arising from the operational phase. The area of lands which will change use from open field agricultural use to wind farm use will be approximately 2.7 hectares. This will consist of turbine hardstands, access tracks, turning heads and meteorological mast. This will result in a long-term slight negative impact on available agricultural lands, however, the proposed upgraded and new access tracks can be utilised for the ongoing agricultural activity on the site and therefore is likely to result in a slight positive impact to agricultural land use at the site.

The operational phase of the Proposed Development will not negatively impact on agricultural practices on lands adjacent to the site. There are no peer reviewed studies which indicate that wind energy development has a negative impact on the health of livestock. There are numerous examples of renewable energy developments throughout the country and internationally where livestock coexist and routinely graze in the same fields as wind turbines (AWEA, 2019). This includes the Boolard Wind Farm and Rathnacally Wind Farm. Existing land-use, such as grazing livestock or crops can continue on the site as normal. As such, there will be no likely significant negative impact to agricultural practice as a result of the Proposed Development.

It is unlikely that the TDR route will be required during the operational phase of the project, unless in the unlikely event a turbine component requires to be transported for replacement or repair. In this case, there is potential for slight temporary negative impact on residential land-use due to noise nuisance as a result of the use of machinery.

The potential effects associated with the decommissioning phase in relation to land use will be similar to those associated with construction phase but of a reduced magnitude.

Decommissioning works will include removal of all above ground structures including the turbines and met mast. The on-site substation will be taken in charge by ESB/EirGrid and therefore will remain in situ to become part of the electricity network. The turbine foundations will be covered over and allowed to re-vegetate naturally and access tracks will be left in situ to continue to be used for agricultural and forestry land uses. This will result in a direct benefit from the new and upgraded access tracks left in situ throughout the site resulting in a long-term slight, positive impact on forestry and agricultural uses at the site.

The decommissioning works will require a construction crew on-site and may cause temporary disruption to surrounding land uses. Removal of infrastructure from the site may temporarily affect agricultural practices. During decommissioning works agricultural access tracks within the site may be in use by construction crews which may temporarily hinder access to areas of agricultural pasture. Impact to these land uses during the decommissioning phase is expected to be temporary to short-term slight, negative.

### 5.6.3 Socio-Economics, Employment and Economic Activity

The site preparation and installation of the Proposed Development will create temporary employment within the Study Area.



It is estimated that between approximately 27 and 70 staff/contractors could be employed during the construction phase of the Proposed Development. The employment of tradespeople, labourers, and specialised contractors for the construction phase will have a direct, short-term significant, positive effect on employment in the Study Area.

It is likely that there will be direct employment for people living in the Study Area who may be qualified for construction related roles. Materials will also be sourced in the general locality where possible. This will assist in sustaining employment in the local construction trade.

Furthermore, local businesses in the nearby villages of Kilmurry, Crookstown & Newscestown and the town of Macroom further north will likely receive a slight indirect positive economic impact due to the influx of workers to the area who will require services such as shops and food places.

As a result, the construction phase of the Proposed Development will have a short-term, significant positive effect on the employment profile of the Study Area and a short-term slight, positive effect on local businesses and services in the nearby towns and villages in proximity to the Study Area.

Once the Proposed Development is constructed, it is envisaged that there will be direct and indirect employment associated with the operational phase of the Proposed Development. Opportunities for mechanical-electrical contractors and craftspeople to become involved with the operation and maintenance of the project will arise. The operational phase of the Proposed Development could produce between 8 and 10 jobs. It is therefore considered that the operational phase of the Proposed Development has potential for an indirect, long-term slight, positive effect on employment in the Study Area, nearby towns and wider County Cork.

Rates and development contributions paid by the developer will contribute significant funds to Cork County Council which will likely be used to improve the services available to the people of the County. Business rates will also contribute significantly throughout the lifetime of the Proposed Development. General council services will benefit from rates and development contributions which include road upkeep, fire services, environmental protection, street lighting, footpath works etc., along with other local community initiatives and supports. This is likely to have a slight positive, long-term effect on resources of the Local Authority during the operational phase.

The potential impacts associated with the decommissioning phase in relation to socio-economics, employment and economic activity will be similar to those associated with the construction phase but of a reduced magnitude.

A construction crew will be required for dismantling the infrastructure and carrying out remediation where necessary. As the decommissioning of the project is expected to be less intensive than the construction phase, it is likely that less construction workers will be required for this phase. During the decommissioning phase employment opportunities will be available at the Proposed Development site and outlying areas. The influx of construction workers to the Site will have a temporary to short-term indirect positive impact on local businesses and services contributing to the local economy, similar to that of the construction phase but of lesser magnitude.

There will be a temporary to short-term slight, positive impact to socio-economics, employment and economic activity in the Site associated with the employment of construction workers within the vicinity of the Proposed Development during the decommissioning phase.

Overall, it is concluded that the socio-economic impacts will be beneficial on a local, regional and national level.



#### 5.6.4 Recreation, Amenity and Tourism

There are no significant tourism attractions located in proximity to the Proposed Development, and as such, the construction phase of the Proposed Development is not expected to impact on major tourism attractions, tourism numbers or tourism revenue.

The proposed works associated with the site and will avoid negative impact on nearby community facilities, town centre services and amenities due to lack of proximity. The proposed works do not interact with nearby recreation and tourism amenities and therefore there are no expected direct impacts on these features.

The TDR passes the existing Garranereagh Windfarm and through the village of Crookstown County Cork. During turbine delivery there is potential for indirect impact to town/village centre services due to the transportation of large and bulky loads through the settlements. This will likely be as a result of traffic calming measures during the escorting of the turbine components. Temporary accommodation works will not be required in these settlements and therefore impact is likely to be temporary to brief, negative and non-significant. Mitigation is set out in Chapter 11: Traffic and Transportation in order to avoid indirect impact so far as possible on town and village centre facilities and services during turbine delivery.

Overall, it is expected that the operational phase of the Proposed Development will have a non-significant neutral impact on recreation and tourism in the area due to the distance of the proposed turbines from significant features. The provision of the community benefit fund will likely have a moderate positive long-term impact on the amenities of the nearby residents.

The potential impacts associated with the decommissioning phase in relation to recreation, amenity and tourism will be similar to those associated with construction phase but will likely be of a reduced magnitude. Decommissioning works will include removal of above ground structures including the turbines, mountings and fencing and will see increased traffic in the area of the Proposed Development. The decommissioning works will not interact with nearby recreation and tourism amenities and therefore it is expected that the decommissioning phase of the Proposed Development will have a non-significant impact on recreation, amenity and tourism.

#### 5.6.5 Human Health and Safety

##### ***Wind Farm Construction***

The construction phase of the Proposed Development has potential to create health and safety hazards for both construction workers and the general public. This is as a result of construction activities and the associated impacts including increased traffic, transport of heavy or bulky materials, noise emissions, dust emissions, construction activities on public roads, excavation and general site-safety. The wind farm will be designed, constructed and decommissioned in accordance with the all relevant health and safety legislation and guidelines.

##### ***Wind Farm Operations***

It is not anticipated that the workings of the turbine will present a danger to the public. The components of a wind turbine are typically designed to last 30 years and are equipped with a number of safety devices to ensure safe operation during their lifetime.

Under normal conditions, access to the site and turbines is very safe for people and animals. There are no fences or barriers restricting access other than normal livestock fencing and livestock can continue to graze on the land during operation as normal.



The Proposed Development is expected to have a minimal impact on agricultural practices at the lands due to a small area of land being lost, however, it is not expected to have an adverse impact on livestock (cows or sheep) and/ or horses in the surrounding area. There are numerous examples of wind farms with livestock and/ or horses co-existing and grazing routinely in the same fields as wind turbines. There is no evidence that wind farms adversely impact on livestock or horses. Existing land-use, such as grazing livestock or crops can continue on the site as normal, therefore, there will be no adverse effect on local residents or farmers as a result of the Proposed Development.

The rigorous safety checks imposed on the turbines during design, construction and commissioning should ensure the risks posed to humans are negligible. The health and safety record of the wind energy industry worldwide is exceptionally good. Wind energy has a better safety record than any other form of power production.

### 5.6.6 Material Assets

#### ***Non-renewable Resources***

It is anticipated that the stone required for the construction of the internal access roads, hardstands, temporary construction compound and the substation will be sourced from the on-site borrow pit. If suitable site won material is not available for the finishing layer on the access roads and hardstands, this material will be imported from quarries in the vicinity.

Existing tracks have been used where possible and the layout was designed to minimise the length of new track required in order to reduce the requirement for stone material. The use of imported material will have a slight, permanent negative impact on non-renewable stone resources of the source quarries. This impact is considered to be imperceptible in the long-term.

Once the Proposed Development is operational, the potential for negative effects on material assets is minimal. Maintenance of access tracks and infrastructure may require small amounts of imported fill, however, the impact of this is likely to be slight/imperceptible.

#### ***Renewable Resources***

The Proposed Development is intended to capture the renewable wind resource at the site. There will be no negative effects on the renewable wind resource of the receiving environment.

It is considered that the Proposed Development will have an overall long-term positive impact in terms of carbon reduction and climate change. It will assist Ireland in meeting its target of producing 80% of electricity from renewable sources by 2030 as set out in the Climate Action Plan 2023.

No tree felling is required for the Proposed Development.

However, the overall effect of the Proposed Development on renewable timber resources at a national scale will be neutral.

The direct effect of electricity generated by the Proposed Development will give rise to a reduction in the quantity of fossil fuels required for electricity generation across the State. This will give rise to a long-term slight positive impact on renewable energy resource and will contribute to reducing Ireland's dependency on imported fuel resources.

There will be no significant negative impacts on renewable and non-renewable resources during the decommissioning phase.



## **Utilities Infrastructure**

It is proposed to connect to the overhead 110kV line via a loop in-loop out connection. Apart from the 110Kv line, there is no major utility infrastructure located within the site.

Appendix 13.2 of this EIAR includes the Turbine Delivery Route Survey Report. This report indicates where overhead utilities, poles, lighting columns, bollards and signage will require temporary removal at certain points along the route to accommodate the delivery of wind turbine components.

The removal of overhead utility infrastructure has the potential to cause a brief to temporary non-significant negative impact on nearby dwellings and commercial/industrial activities in proximity to TDR nodes.

Lighting columns will require temporary removal at various points along the TDR. This is expected to have a temporary non-significant negative impact on utility infrastructure. The TDR Report details the locations and extent of the temporary removal works required.

The TDR also crosses a gas mains pipeline on the L1322. Accommodation works are not required at this point and therefore the gas pipeline will not be affected.

There is potential for turbine delivery to negatively impact on major road infrastructure if unmitigated. Turbine delivery could potentially cause traffic disturbance and damage to road infrastructure if not properly planned and assessed. Potential impact on road infrastructure is detailed in Chapter 11: Traffic & Transportation.

Potential effects on telecommunications are discussed in Chapter 13: Telecommunications and Aviation. As set out in Chapter 13, the Proposed Development will have no impact on the telecommunications signals during the construction of the project.

Importation of materials and equipment for the Proposed Development will also increase shipping traffic at the ports being used and increase freight on the motorway, national primary routes and local road network. This impact is assessed in Chapter 11: Traffic and Transportation.

No impact on existing major utility infrastructure is expected at the wind farm site during the operational phase.

No likely negative impacts on utility infrastructure are expected during the decommissioning phase.

## **Waste**

During the construction phase of the Proposed Development, waste will be generated due to the various construction activities and materials required for the installation of infrastructure at the site.

Significant volume of waste is not expected to be produced during the operation phase of the Proposed Development. In the event that maintenance works are required at the site during the operational phase, a CEMP will be in place, and waste management procedures as set out in section 10.8.2.4 will be followed. Any waste produced during the operational phase of the Proposed Development will have an imperceptible impact on the receiving environment.

Waste will be produced as a result of the decommissioning activities. A decommissioning plan and associated CEMP, similar to that included in Appendix 2.2, will be followed during the decommissioning phase and waste management procedures as set out in section 10.8.2.4 will be followed.



## 5.7 Potential Impacts of Shadow Flicker

There is the potential for shadow flicker to occur at 28 of the 38 receptors considered within the Study Area. At the remaining 10 receptors there is no potential for shadow flicker effects to occur because the sun's angle relative to the turbines and receptors never reaches the required position.

A full listing of the worst-case total theoretical instances of shadow flicker by receptor can be found in Appendix 10.2. The calculated area over which shadows from the turbines may be cast (resulting in the potential for shadow flicker to occur) is shown on Figure 10.6 of Chapter 10.

The shadow flicker model for annual impacts sets out the total theoretical hours per year that each receptor can potentially receive shadow flicker. To consider a more realistic 'likely' scenario, the annual average sunshine hours for the region have also been taken into account. The predicted 'likely' levels of shadow flicker have been checked against the WEDG criteria of 30 hours per year, as detailed in Table 10.11.

It is not appropriate to apply the annual average sunshine hours correction to the predicted daily totals as the data is based upon monthly averages, which cannot be applied to daily levels with sufficient accuracy. Furthermore, the infrequency of clear skies is more likely to reduce the overall number of instances of shadow flicker over the year, rather than reduce the length of each individual instance. As such, the assessment of daily impacts considers the maximum theoretical amount of shadow flicker only and is inherently conservative.

The predicted maximum theoretical minutes per day of shadow flicker is detailed in Table 10.11 of Chapter 10. Further details, including the duration of individual shadow flicker events occurring at each receptor, are included in Appendix 10-2.

There are two receptors located within the WEDG 500 m assessment area and both of these exceed the daily 30 minutes and the annual 30 hours per year when considering the worst case predictions. Taking into account the 'likely' sunshine hours per day, one receptor (receptor 36) remains above the 30 hours per year limit. Accordingly, mitigation measures will be required to reduce shadow flicker impacts for this location.

When considering the wider 1170 m Study Area, the number of receptors that exceed 30 minutes in a day is 25. 20 receptors exceed the annual limit of 30 hours per year, however, taking into account the 'likely' sunshine hours this is reduced to just 4 receptors.

The IWEA Guidelines recommend that all existing and/or permitted wind farm developments within 2 km of a Proposed Wind Farm should be considered in a cumulative shadow flicker assessment. There is one wind farm located within 2 km of the Proposed Wind Farm, Garranereagh Wind Farm, which is located immediately to the east. Garranereagh Wind Farm consists of 4 no. of Enercon E-82 turbines with a rotor diameter of 82 m and a tip height of 119.3 m.

Shadow flicker modelling of both turbine developments has been undertaken, with a 10 rotor diameter Study Area applied to all turbines. Shadow flicker effects from both the Proposed Development and Garranereagh Wind Farm are predicted to occur at six receptors. These receptors are located to the east of the Proposed Wind Farm and to the west of Garranereagh. It should be noted that shadow flicker from both developments would not occur at the same time, or upon the same facades/windows, however, the total number and duration of shadow flicker occurrences at the property would increase due to the cumulative operation of both developments.



The Cumulative Assessment, concludes as follows:

- Of the six receptors within 10 rotor diameters of both the Proposed Wind Farm and Garraneragh Wind Farm, five receptors are predicted to receive cumulative shadow flicker effects from the operation of both turbine developments. Calculated shadow flicker levels at the sixth receptor (49) are identical to those detailed in Table 10-11, therefore the potential shadow flicker effects at this receptor are from the Proposed Wind Farm only.
- The maximum theoretical minutes per day of existing shadow flicker at these receptors are above WEDG daily limits. Accordingly, mitigation measures are required.
- The theoretical maximum number of hours per year of shadow flicker at all receptors exceed the WEDG limits, however, when considering likely sunshine hours, only one receptor is above the WEDG limits.

## 5.8 Potential Impacts on Traffic and Transportation

The construction phase of the project will result in additional traffic volumes on local, regional and national roads. The direct effect during this period will be temporary and will be slight.

During the operational phase the direct effect on the surrounding local highway network will be neutral and long term given that there will be approximately two maintenance staff travelling to site at any one time.

The design life of the Proposed Wind Farm is 25 years after which point it will be decommissioned and cranes will disassemble each turbine tower and all equipment.

All turbine infrastructure including turbine components will be separated and removed off-site for re-use, recycling and waste disposal. Turbine foundations would remain in place underground and would be covered with earth and reseeded as appropriate. It is proposed to leave the access roads and hardstanding areas in situ at the decommissioning stage for use by the landowner. Leaving the turbine foundations, access tracks and hardstanding areas in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration.

The Proposed Substation will remain in-situ as it will remain an EirGrid asset with the decommissioning of the Proposed Wind Farm site.

Any impact and consequential effect that occurs during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The mitigation measures prescribed for the construction phase of the Proposed Development will be implemented during the decommissioning phase thereby minimising any potential impacts. A Decommissioning Plan will be agreed with Cork County Council prior to undertaking this process.

## 5.9 Potential Impacts on Archaeology, Architecture and Cultural Heritage

No National Monuments or those subject to a Preservation Order are located on or within the immediate vicinity of the Proposed Development boundary. No direct impacts to this resource as a result of the Proposed Development are therefore identified.



No recorded monuments are located within the Proposed Development boundary or in the immediate vicinity of any proposed infrastructure. No direct impacts to this resource are therefore identified.

No newly recorded archaeological sites or features were noted within the Proposed Development boundary. No direct impacts to this resource are therefore identified.

The potential exists for sub-surface archaeological finds, features or deposits to exist within the Proposed Wind Development. Ground disturbance associated with the Proposed Development has the potential to uncover such features and associated artefacts, particularly in areas now covered by peat or topsoil. The construction of the Proposed Development, i.e., topsoil removal, could potentially directly impact on unknown sub-surface archaeological deposits or features which have no above ground expression should they exist within the footprint of the Proposed Development site.

Should new sites be present within the Proposed Development site (currently not visible on the surface) the impact is likely to be significant negative and permanent (i.e. the excavation by machinery would permanently remove the sites resulting in a significant negative impact).

No Protected Structures or those included in the NIAH are located on or in the immediate vicinity of the Proposed Development. No potential direct impacts to this resource as a result of the Proposed Development are therefore identified.

The proposed access track adjacent to T3 crosses a townland boundary. A direct impact to this feature is therefore identified. In the absence of appropriate mitigation measures the impact to the townland boundary is likely to be significant, negative and permanent (i.e. the excavation by machinery would permanently remove portions of the boundary resulting in a significant negative impact).

No items of cultural heritage merit are located within the Proposed Substation site. No direct impacts to this resource as a result of the Proposed Substation are therefore identified.

Potential impact to the visual amenity of a site or area and the significance of same is dependent on a number of factors regarding the sensitivity of the location or 'receptor' and the scale or magnitude of the Proposed Development. Similarly, the extent of the development and its duration and reversibility should all be considered (Guidelines for Landscape and Visual Impact Assessment 3rd edition – Consultation Draft).

Viewshed analysis from National Monument no. 233 Cahervagliar ringfort was carried out and demonstrated that no proposed turbines will theoretically be visible from this monument. This accords with the ZTV which also indicates no theoretical visibility of the proposed turbines from the area of the National Monument. No potential impacts to the wider setting of this monument are therefore identified.

Viewshed analysis from National Monument no. 618 Kinneigh Round Tower was carried out and demonstrated that no proposed turbines will theoretically be visible in full from this monument. Theoretical visibility of the blade tips (131m) of all six turbines was demonstrated, however. This accords with the ZTV which also demonstrates theoretical visibility of the proposed turbines from this location. The Round Tower is located over 5km to the south of the nearest proposed turbine (T6) and impacts to its immediate setting as a result of the proposed turbines will not occur. A change to the wider setting of the monument is acknowledged, however, and is considered to be Not Significant.

No National Monuments are located on or in the immediate vicinity of the Proposed Substation. The nearest National Monument to same is 3.7km to the south-west and comprises Cahervagliar ringfort (Nat Mon No. 233). The viewshed analysis carried out from this monument demonstrates no theoretical visibility of the area of the Proposed Substation therefore no potential impacts to the wider setting of the monument as a result of the Proposed Substation are identified.



No recorded monuments are located within the Proposed Development site. Two hundred and ninety-two (292) recorded monuments are located within 5km of the nearest proposed turbine. The ZTV demonstrates theoretical visibility of the proposed turbines from many locations in the surrounding 5km. The immediate setting of these monuments will not be impacted by the proposed turbines given the distance between same. A change to the wider setting of many of these monuments is acknowledged, however, and is considered to be Not Significant.

The nearest monuments CO095-001---- and CO083-078---- ringforts are situated 225m and 251m from turbine 6 and 2, respectively. The next nearest monument Enclosure CO094-036----, is situated c. 347m to the south-west of T6. The ZTV demonstrates theoretical visibility of 5-6 turbines from all three locations. In this regard a change to the wider setting of the monuments as a result of the proposed turbines is acknowledged and is considered to be Slight.

No recorded monuments are located on or in the immediate vicinity of the Proposed Substation. The nearest recorded monument to the Proposed Substation site is situated c. 700m to the south-east and comprises a ringfort in Garranereagh townland CO095-003----. The ZTV demonstrates theoretical visibility of the Proposed Substation from the ringfort. No potential visual effects to the immediate setting of this monument as a result of the Proposed Substation are anticipated given the intervening distance between the Proposed Substation and the ringfort. A change to the wider setting of the monument is acknowledged, however, and is considered to be Not Significant.

No Protected Structures are located on or in the immediate vicinity of the proposed turbines. Five structures are located within 5km of the nearest proposed turbine. The ZTV demonstrates that there will be theoretical visibility of 5-6 turbines from three of these structures (RPS Ref. 544, 547 and 552) with no theoretical visibility of the proposed turbines from the other Protected Structures. Given the distance between the Protected Structures and the proposed turbines no visual effects to the immediate setting of any of the Protected Structures will occur. A change to the wider setting of three of the Protected Structures is acknowledged, however, as there is theoretical visibility of the proposed turbines from those locations. The potential visual effect is regarded as Imperceptible.

No NIAH structures or historic gardens are located on or in the immediate vicinity of the Proposed Development. Fourteen NIAH structures are located within 5km of the nearest proposed turbine with the nearest comprising Clearagh House (Reg. 20908314) over 2.4km from T1. The ZTV shows no theoretical visibility of the proposed turbines from that location. There is some theoretical visibility from some of the other NIAH structures, however, no effects to the immediate setting of the structures will occur given the distance of the proposed turbines from same. A change to the wider setting in which the structures are located will occur but is regarded as Imperceptible.

## 5.10 Potential Impact on Landscape and Visual

Based on the assessment criteria employed herein, potential significant impacts are considered most likely to occur in instances where highly sensitive landscape and visual receptors coincide with high order landscape and visual effects. From Macro Works previous experience of this type of development in a rural setting, it is considered that potentially significant landscape and visual impacts have the potential to occur in the following ways.

### Landscape Impacts

- Irreversible physical effects on sensitive landscape features
- Disruption of existing land use patterns



- Incongruous change to areas of sensitive landscape character

## Visual Impacts

- A combination of visual and spatial dominance as seen from highly sensitive receptor locations. This is most likely to occur within 1-3km of the Proposed Development.
- Visual clutter and ambiguity as seen from highly sensitive receptor locations. This can occur at any distance, but tends to occur beyond 2-3km as turbines can become stacked in perspective and a more two dimensional layout is perceived.
- A combination of both of the above effects.

From baseline studies and early stage assessment specific to the Proposed Development, some of the most highly sensitive physical landscape receptors are considered to be the River Lee and The Gearagh Nature Reserve, both of which are situated in the wider northern half of the Study Area.

The most sensitive visual receptors are likely to be the designated scenic routes identified in the Cork County Development Plan in addition to the local walking trails along the River Lee and its surrounding tributaries, which are sensitive receptor locations on the basis that they represent a notable degree of scenic and recreational amenity.

## 5.11 Potential Impacts on Telecommunications and Aviation

### 5.11.1 Telecommunications

Interference to a communication system can occur in two ways as follows:

- Signal scattering as a result of the obstruction presented by the blades, an effect that mimics the presence of a lower power source operating from the location of the wind turbine
- Signal obstruction as it passes through the area swept by the rotating blade

A detailed consultation process was undertaken with relevant service providers. No response indicated that the Proposed Development would have an impact on telecommunications signals.

### 5.11.2 Television and Radio

It is possible that houses in the immediate vicinity of the turbines could require some remedial measures in relation to television reception and radio signal.

### 5.11.3 Aviation

No significant impacts are expected and no response to the consultation letter has indicated any impact.





## 6. SUMMARY OF MITIGATION MEASURES

### 6.1 Mitigation Measures for Air and Climate Change

#### 6.1.1 Air

An Outline Construction Environmental Management Plan (CEMP) has been prepared and is included in Appendix 2.2 of Volume 2. This includes for the following mitigation measures during the construction phase of the wind farm relevant to air quality:

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate which compacts, preventing dust;
- A water bowser will be available to spray work areas and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable;
- The access and egress of construction vehicles will be controlled and directed to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits;
- Construction vehicles and machinery will be serviced and in good working order;
- Wheel washing facilities will be provided at the main entrance/exit point of the Proposed Development as described in the CEMP accompanying this EIAR (Appendix 2.2 of Volume 2);
- The developer in association with the contractor will be required to implement the dust control plan as part of the CEMP (a CEMP is contained in Appendix 2.2 of Volume 2). In the event the Planning Authority decides to grant permission for the Proposed Development, the final CEMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Planning Authority;
- Ensure all vehicles switch off engines when stationary – no idling vehicles; and
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.

As the operation of the Proposed Development will have positive impacts on air quality, mitigation measures are considered unnecessary.

Mitigation measures for the removal of wind turbines and all other site works from the Proposed Development site will be the same as the construction phase with respect to dust control and minimisation. The proposed access tracks across the Proposed Development will be left in situ and utilised as forest roads following decommissioning and no mitigation measures are proposed. In terms of the Proposed Substation, this will be left in situ and so no mitigation measures are proposed.



## 6.1.2 Climate

It is considered that the Proposed Development will have an overall positive impact in terms of carbon reduction and climate change. It will assist Ireland in meeting the new binding renewable energy target for the EU of 32% by 2030. Also, it will aid in increasing the onshore wind capacity, as per the Climate Action Plan 2022. In terms of renewable energy, an increase in electricity generated from renewable sources is to increase up to 80% by 2030, with up to 8GW of increased onshore wind capacity. This will be achieved by:

- Phasing out fossil fuels
- Harnessing renewable energy
- Micro-generation; and
- Other measures.

As no significant impacts on climate are predicted during construction, operation and decommissioning no mitigation measures are necessary or proposed. In terms of the operational phase, the operation of the Proposed Development will have a positive effect on climate due to the displacement of fossil fuels.

## 6.1.3 Cumulative Impacts

In terms of cumulative impacts, negative cumulative impacts in relation to air quality would only occur if a large development was located in the vicinity of the site and was in the process of construction at the same time. The most obvious developments which may occur in tandem with the construction of the Proposed Wind Farm and substation are the construction of the consented alternative grid connection route (AGCR) and the consented turbine delivery route (TDR).

## 6.2 **Mitigation Measures for Noise and Vibration**

### Construction Noise

The predicted noise from vehicle movements on the access track to the north of the site has the potential to exceed the noise limits in BS 5228-1:2009+A1:2014. This exceedance affects two stakeholder properties located immediately north of the access track (H1 and H35). It is therefore recommended that construction hoarding is located between these properties and the adjacent access road for the duration of the construction works.

At other locations, the predicted noise levels from on-site activity from the Proposed Development is below the noise limits in BS 5228-1:2009+A1:2014. Nonetheless, several mitigation measures will be employed to minimise any potential impacts from the Proposed Development.

The noise impact for construction works traffic will be mitigated by generally restricting movements along access routes to the standard working hours and exclude Sundays, unless specifically agreed otherwise. For example, during turbine erection, an extension to the working day may be required, i.e. 05:00 to 21:00, but this would be necessary only on a relatively small number of occasions. If turbine deliveries are required at night it will be ensured that vehicles on local roads do not wait outside residential properties with their engines idling, and that the local residents will be informed of any activities likely to occur outside of normal working hours.

Consultation with the local community is important in minimising the impacts and therefore construction will be undertaken in consultation with the local authority as well as the residents being informed of construction activities through the Community Liaison Officer.



The construction works on site will be carried out in accordance with the guidance set out in BS 5228:2009+A1:2014, and the noise control measures set out in the Construction Environmental Management Plan (CEMP) within this EIAR. Proper maintenance of plant will be employed to minimise the noise produced by any site operations.

All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the project. Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 07:00 - 19:00 hours Monday to Friday and 07:00 - 13:00 hours on Saturdays. However, to ensure that optimal use is made of fair-weather windows, or at critical periods within the programme, it could occasionally be necessary to work outside these hours. Any such out of hours working would be agreed in advance with the local planning authority.

The on-site construction and decommissioning noise levels will be below the relevant noise limit of 65 dB  $L_{Aeq,1hr}$  for operations exceeding one month, and therefore construction noise impacts are not considered to be significant. However, there is potential for temporary elevated noise levels due to the grid connection works. However, the impact of these works at any particular NSL will be for a short duration (i.e. less than 3 days). Where the works at elevated noise levels are required over an extended period at a given location, a temporary barrier or screen will be used to reduce noise levels below the noise limit where required. The noise impact will also be minimised by limiting the number of plant items operating simultaneously where reasonably practicable.

### Operational Noise

There are nineteen properties close to the Proposed Development which are either derelict, owned by stakeholders or both. Full details are provided in Appendix 9.3.

The predicted noise from the Proposed Wind Farm is within the daytime and night-time noise limits at all but one non-stakeholder NSL (H28). This location is a Garreneragh stakeholder property and exceeds the limits as a result of the adjacent Garreneragh windfarm. Noise from the Proposed Wind Farm only is within the criteria at this property. No noise mitigation is proposed at this location as the noise levels are determined by Garreneragh Windfarm.

There are two stakeholder properties (H34 and H36) that exceed daytime and night time limits, as discussed in previous sections. Again no noise mitigation is proposed for these properties. The stakeholder properties have been made aware of the exceedances and are happy to proceed on this basis.

This assessment is based on noise modelling which assumes that NSL are downwind of all wind turbines. In practice, this will not occur all the time and when the NSL is upwind or cross-wind the actual noise levels will be lower.

### Mitigation during Decommissioning

Similar mitigation measures should be employed as for during construction works, although construction noise levels are anticipated to be below the construction noise limits. The main noise mitigation measures include construction works traffic will be mitigated by restricting movements along access routes to the standard working hours and exclude working on Sundays, unless specifically agreed otherwise with the local authority. Decommissioning works, which will be of a lower impact than construction works, will be carried out in accordance with the policies and guidance required at the time of the works, and restricted to normal working hours, 07:00 - 19:00 hours Monday to Friday and 07:00 - 13:00 on Saturdays in accordance with best practice.



### 6.3 Mitigation Measures for Biodiversity

A Project Ecologist will be appointed to monitor works, particularly the implementation and ongoing effectiveness of mitigation measures during the construction and decommissioning phases. Monitoring will be carried out as required during the operational phase.

No disturbance to habitats or flora outside the Proposed Development footprint will be allowed to occur. All works and temporary storage of material will be restricted to the immediate footprint of the development, which will be wholly within the development site boundary.

Hedgerow and treeline planting will be carried out for the Proposed Development. This will reinstate or replace linear habitat loss to ensure no net loss of these habitats occurs.

Where invasive non-native species are present within the Proposed Development site, measures will be implemented to ensure spread of these species is prevented, and where feasible eradicated as described below in the invasive species management plan (Appendix 5.8). Prior to works an invasive species survey will be undertaken in the area to reconfirm the findings of the EIAR.

A preconstruction mammal survey will be undertaken to reconfirm the findings of the EIAR.

An ecologist will supervise areas where vegetation, scrub and hedgerow removal will occur prior to and during construction as appropriate. This will ensure that any site-specific issues in relation to wildlife not currently present (e.g. badger setts, red squirrel dreys) on site will be reconfirmed prior to commencement of works so as to allow appropriate mitigation measures to be put in place.

In the event that an issue arises, the NPWS will be updated, consulted with, relevant guidelines shall be followed and any licences/amendments to licences will be sought from NPWS.

Construction operations will take place predominantly during the hours of daylight to minimise disturbances to faunal species at night. Some works may occur at night but the project ecologist/ECOW shall limit night-time works to sections of the site which avoid sensitive features (e.g. mature treelines and hedgerows).

No evidence of badger setts was observed within the Study Area, and no badger signs were recorded at the Proposed Development site.

A pre-construction mammal survey including a badger survey will be undertaken within the mammal survey Study Area to reconfirm the existing environment as described in the EIAR and, in the event that a badger sett should be encountered at any point, then NPWS will be informed and NRA *Guidelines for the Treatment of Badgers Prior To the Construction of National Road Schemes* will be followed.

There is the potential for setts to be discovered during vegetation clearance works. Care will need to be taken during this early stage of the development and a competent ecologist will be required on-site for these works. If setts are discovered all works within 30m of the sett shall cease including vegetation clearance. NPWS shall be contacted, and the mitigation plan shall be amended as required. An activity survey shall be carried out to assess the potential for the sett to be used by badgers.

In the event that a badger is found injured during the proposed mitigation measures, it is important to realise that injured badgers will be frightened and can be very dangerous. They are strong animals and are not used to being handled, so no attempt will be made to touch an injured badger, as this could result in workers being bitten. NPWS shall be contacted along with ISPCA and potentially a vet specified by NPWS capable of treating the species.



No evidence of otter holts was observed within the Study Area, and no otter signs were recorded at the Proposed Development site.

A pre-construction mammal survey will be undertaken (no later than 12 months prior to construction) within the mammal survey Study Area to reconfirm the existing environment as described in the EIAR and, if an otter holt should be encountered at any point, then NPWS will be informed and NRA *Guidelines for the Treatment of Otters Prior To the Construction of National Road Schemes* will be followed.

Where possible, any required felling of trees in forestry areas will be limited to time periods outside which Red Squirrel may have young in dreys (peak period January to March).

If this is unavoidable, then areas to be clear felled will be surveyed in advance by a suitably qualified ecologist to determine whether any occupied dreys are present. A derogation/disturbance licence will be sought if dreys are found within the felling footprint or adjacent areas.

Where possible, felling of trees in forestry areas will be limited to time periods outside which pine martens may have young in dens (March and April). If this is unavoidable, then areas to be clear felled will be surveyed in advance by a suitably qualified ecologist to determine whether any occupied pine marten dens are present. A license under the Wildlife act will be applied for should any sites have to be disturbed.

An ecologist will check for the presence of hibernating hedgehog and or young mammals as appropriate, prior to vegetation clearance works prior to or during construction (as necessary).

To minimize risk to bat populations, a buffer zone is required around any treeline, hedgerow, woodland feature, into which no part of the turbine should intrude.

An ecologist/ECOW will supervise areas where vegetation, scrub and hedgerow removal will occur prior to and during construction as appropriate (e.g., ecologist may be required during some clearance works of areas where vegetation is too dense to check beforehand). This will ensure that any site-specific issues in relation to wildlife not currently present (e.g., bat roost locations) on site will be discovered prior to commencement of works to allow appropriate mitigation measures to be put in place. In the event that an issue arises, the NPWS will be informed and the relevant guidelines will be implemented as appropriate (e.g. NRA guidelines).

Several species of bats roost in trees. No trees offering potential bat roosting habitat were found within the Proposed Development site.

Retained trees will be protected from root damage by an exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees will be fenced off by adequate temporary fencing prior to other works commencing.

If three years lapse from between planning-stage surveys in 2022 and installation of the wind turbines, it will be necessary to repeat one season of static detector surveys during the activity period (EUROBATS, 2014). Future survey work will be completed according to best practice guidelines available (Hundt, 2012; Collins, 2016; NatureScot, 2019; 2021) and includes static detector, activity and roost inspection surveys.

Hedgerow maintenance will not be carried out between the 1<sup>st</sup> of March and 31<sup>st</sup> of August as this is the nesting period for birds and any maintenance at this time will disturb breeding; this is in keeping with the Wildlife Act 1976 (as amended).



In general, artificial light creates a barrier to bats so lighting should be avoided where possible. Construction operations within the Proposed Development site will take place during the hours of daylight where possible to minimise disturbances to faunal species at night. Some works may occur at night but the project ecologist/ECOW shall limit night-time works to sections of the route / site which avoid sensitive features (e.g. streams, treelines and hedgerows). Where lighting is required, directional lighting (i.e. lighting which only shines on work areas and not nearby countryside) will be used to prevent overspill.

Subject to other environmental concerns (e.g., run-off), the removal of vegetation and scrub will be undertaken outside of the bird breeding season (March 1<sup>st</sup> to August 31<sup>st</sup> inclusive). This will help protect nesting birds. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms (Drewitt, A. L. and Langston, R. H., 2006).

The clearance of vegetation at the Site should only be carried out in the period September to February inclusive, i.e. outside the main bird nesting season.

Construction operations will take place during the hours of daylight to minimise disturbances to roosting birds, or active nocturnal bird species. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms (Drewitt and Langston, 2006). Limited operations such as concrete pours, turbine erection and installation of the grid connection may require night-time operating hours; these works will be supervised by the project ecologist/ECOW.

Toolbox talks will be undertaken with construction staff on disturbance to key species during construction. This will help minimise disturbance. This is in line with best practice recommendations for mitigation measures with regard to birds and wind farms (Drewitt and Langston, 2006).

Re-instated hedgerows will be planted with locally sourced native species. This will result in habitat enhancement for local species of conservation importance such as Greenfinch. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms (Drewitt and Langston, 2006).

Re-confirmatory surveys (March/April) of the proposed turbine locations, Roads and hard standings will be conducted to assess any evidence of Buzzard, Kestrel, Sparrowhawk and Snipe activity or taking up of new territories. Should any new nests be recorded, works at these locations will be restricted to outside the breeding season (April-July) or until chicks are deemed to have fledged (following monitoring).

If construction commences during snipe breeding season, a survey to locate breeding territories and nests will be completed to reconfirm the findings of the EIAR, and any nest locations in the potential ZoI will be cordoned off, with a no works zone of 500m around the nests, until breeding activity is finished.

If construction commences during meadow pipit breeding season, a survey to locate breeding territories and nests will be completed to reconfirm the findings of the EIAR, and any nest locations in the potential ZoI will be cordoned off until breeding activity is finished.

All measures for the protection of water quality within the Proposed Development site, as detailed in the CEMP, will also protect the aquatic ecology and fisheries value of downstream watercourses. The measures adopted within the CEMP will ensure effective protection of aquatic ecological interests downstream of the Proposed Development, particularly the habitats supporting sensitive aquatic species and with connectivity to the downstream watercourses.

Invasive species will continue to be monitored during the operational phase, and where required, treated within the project area according to the invasive species management plan for as long as they persist within the site.



Turbine blades spinning in low wind can kill bats, however bats cannot be killed by feathered blades which are not spinning (Horn et al., 2008). The reduction in speed resulting from feathering compared with normal idling may reduce fatality rates by up to 50% (NatureScot, 2021). As such, the feathering of blades to prevent 'idling' during low wind speeds is proposed for all turbines.

Cut-in speeds will be implemented for all turbines from commencement of operation. From the commencement of operation of the Proposed Wind Farm cut-in speeds will be increased during the bat activity season (April-October) and/or where weather conditions are optimal for bat activity from 30 minutes prior to sunset and to 30 minutes after sunrise at all turbines.

Flashing red aviation obstruction lights will be provided on perimeter turbines, subject to approval by the IAA.

The vegetation-free buffer zones around the identified turbines will be managed and maintained during the operational life of the development. These will be kept clear by mechanical means only (no chemicals / herbicides) and maintained on an annual basis in the same condition as during first clearance.

The success of the implemented mitigation measures for bats on the project shall be monitored for a period of no less than three years post construction and appropriate measures taken to enhance these if and where required.

During operation a comprehensive bird monitoring programme including fatality monitoring will be implemented at the site. An initial programme will monitor the operation of the wind farm for a period of five years; with a comprehensive monitoring program also being implemented following construction of the Proposed Wind Farm. The implementation of a monitoring programme is within recommended best practice mitigation measures.

The operational wind farm will have a negligible effect on aquatic ecological interests and fisheries, as there are no further potential impacts on surface water run-off or watercourses within the site. During the operation phase, oils will be required for cooling the transformers giving rise to the potential for oil spills within the site.

It is not envisaged that maintenance will involve any significant impacts on the hydrological regime of the area. Weekly inspections of the erosion and sediment control measures on site will be required during the construction period, followed by fortnightly inspections until the risk of erosion or siltation has declined following the successful establishment of vegetation during the operational phase.

Sediment control measures for turbine felling buffers shall be maintained and replaced as required throughout the lifespan of the wind farm.

The same mitigation measures for the Proposed Development will apply for the decommissioning phase as for the construction phase. This will include a mammal survey to check if any setts or holts have become established during operation, in addition to breeding or resting places of any other protected mammals.

In relation to aquatic ecology, the same mitigation measures will apply for the decommissioning phase as for the construction phase. In the event of decommissioning of the Proposed Wind Farm, the access tracks may be used in the decommissioning process. Mitigation measures applied during decommissioning activities will be similar to those applied during construction but potential impacts will be of reduced magnitude.



It is proposed that turbine foundations and hardstand areas should be left in place and covered with local soil/topsoil to revegetate at the decommissioning stage. It is considered that leaving the turbine foundations, access tracks and hardstand areas in-situ will cause less environmental damage than removing them. The grid cable, ducting and substation will be left in situ as part of the national grid, therefore no potential impacts during decommissioning stage are likely to occur. Hence no mitigation measures are required for these elements.

## 6.4 Mitigation Measures for Soils and Geology

The project will be constructed in a phased manner to reduce the potential impacts of the Proposed Development on the Soils, Geology and Hydrogeology. Phased construction reduces the amount of open, exposed excavations at any one time. Given that the works comprises a significant proportion of excavation and earthworks, suitably qualified and experienced geotechnical personnel will be required on site to supervise the works.

One of the primary mitigation measures employed at the preliminary design stage was the minimisation of volumes of excavated overburden deposits to be exported off site. All excavated overburden will be retained on-site.

This will include:

- Use of suitable site won material (crushed rock) 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.

To mitigate against the compaction of soil at the site, prior to the commencement of any earthworks, the work corridor will be pegged, and machinery will stay within this corridor so that soils outside the work area are not damaged. Excavations will then be carried out from access tracks as they are constructed in order to reduce the compaction of soft ground.

To mitigate against erosion of the exposed soil or rock, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or prior to heavy rainfall events (>10mm/hour). To mitigate against possible contamination of the exposed soils and bedrock, refuelling of machinery and plant will only occur at designated refuelling areas.

All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Gravel fill will be used to provide additional support to temporary cuts/excavations where appropriate. Unstable temporary cuts/excavations will not be left unsupported. Where appropriate and necessary, temporary cuts and excavations will be protected against the ingress of water or erosion.

To minimise the impact to surface water quality, existing forestry drainage will be maintained outside the immediate site area, and where appropriate, additional site drainage and settlement ponds will be installed as required prior to construction activities. Silt fencing will be installed in new drainage and monitoring of water quality undertaken during the construction phase.

Details of oil spill protection measures adjacent to sensitive receptors and emergency spill response procedures are outlined in Section 4.3.5 of the CEMP which is contained in Appendix 2.2 of Volume 2.



Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. Refuelling of construction vehicles will be carried out from these tanks or from delivery vehicles at designated refuelling areas.

To mitigate against the increased vulnerability of the underlying aquifer to groundwater pollution, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or prior to heavy rainfall events. To mitigate against possible contamination of the underlying groundwater, refuelling of machinery and plant will only occur at designated refuelling areas. Details of mitigation measures related to spills and fuel storage are outlined above.

It is not envisaged that the operation of the Proposed Development will result in significant impacts on the geological and hydrogeological regimes within the Proposed Development Study Area, as there will be no further disturbance of overburden post-construction.

Due to the reduced magnitude of the impacts, no additional mitigation measures are required for the maintenance and operation of the Proposed Development site, over and above those incorporated into the design of the substation transformer, which will be bunded to protect soils against accidental leakages of oils and battery fluids.

Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant.

## 6.5 Mitigation Measures for Hydrology and Water Quality

### 6.5.1 Proposed Mitigation Measures for the Construction Stage

Best practice construction methods will be used during the construction stage to minimise impacts on water quality. Examples of further mitigative measures for key parts of the construction phase are identified below. These are outlined in more detail in the CEMP Chapter. For instance, regarding good practice associated with mitigating the risk of hydrocarbon release during construction, as stated in the SWMP, construction vehicles will be refuelled off-site, wherever possible. This will primarily be the case for road vehicles such as vans and trucks. Refuelling of mobile plant during construction will be carried out at the temporary construction compound. Any additional fuel containers, other than the fuel bowser, used for smaller equipment (such as generators, lights etc.) will be stored within additional secondary containment e.g. bund for static tanks or drip trays for smaller mobile containers. Taps/nozzles for fuels and storage containers for oils will be fitted with locks to ensure their use is controlled. Only designated trained and competent operatives will be authorised to refuel plant on site.

All tank and drum storage areas shall, as a minimum, be bunded, either locally or remotely, to a volume not less than the greater of the following:

- a) a. 110% of the capacity of the largest tank or drum within the bunded area; or
- b) b. 25% of the total volume of substance which could be stored within the bunded area.

Despite the area of the site delineated by the boundary, the footprint of the infrastructure and associated buffer of land changed on site is significantly less. This means the vast majority of the site will remain as its current land use. For instance, regarding the foundations of each turbine, each foundation is circular, with relatively narrow (25 m) diameter and (3.5m) depth. This is an inherent mitigation in design.



### 6.5.2 Proposed Mitigation Measures for Operation and Maintenance Stage

The proposed surface water management plan (SWMP) will ensure that there is no impact on water quality as a result of the Proposed Development. The proposed drainage system will provide several stages of treatment to surface water runoff from constructed areas, which follows the concept of a multi-stage SuDS 'treatment train'.

Interceptor drains installed upslope of access tracks and areas of hardstanding will divert surface water runoff from undeveloped land around the constructed areas to disperse naturally within open ground without mixing with the construction drainage.

The proposed swales will intercept surface water runoff from access tracks and areas of hardstanding. The grass within the swales will provide some filtration to remove a portion of silt and suspended solids. Silt traps will be provided upstream of outfalls from roadside swales.

The settlement ponds will be designed to provide sufficient retention time and a low velocity environment to allow suspended solids of a very small particle size to fall out of suspension prior to discharge. Additional treatment will be provided upstream of the settlement pond with the use of drainage stone at the inlet to provide filtration. In an emergency, the outfall from a settlement pond can be blocked to provide a temporary holding area for accidental spillages on site.

As stated in the SWMP, to adhere to CIRIA C753, part of the maintenance routine that will mitigate issues relating to surface water is to inspect the following: drains, cross-drains and culverts for blockages; outfalls to existing field drains and watercourses, existing roadside swales for obstructions; progress of re-vegetation.

The water quality will also be tested at outfalls at appropriate intervals (to be defined when informed) for 12 months to comprise the baseline monitoring regime pre-construction.

### 6.5.3 Proposed Mitigation Measure for Decommissioning Stage

The access tracks would remain in situ for land management purposes, after the end of the operational period. Additionally, the turbine foundations and hardstanding will remain in situ and be covered over with soil from the site to re-vegetate naturally. This inherently mitigates disturbance through decommissioning process. Silt protection procedures, similar to during construction will be re-instated for decommissioning. If there is perceived to be risk of erosion during inspection of the revegetated hardstandings then erosion control measures will be taken.

### 6.5.4 Proposed Mitigation Measures for Flooding

The Proposed turbine Bases, new access tracks, widened existing access tracks and new compound areas will all increase the impermeable area within the site potentially increasing the rate and volume of surface water runoff during storm events.

All access tracks will be constructed from aggregate which will allow a portion of rainfall to infiltrate and, therefore, reduce surface water runoff. Adjacent swales will also intercept and retain surface water runoff allowing this to disperse naturally via infiltration and evapotranspiration. Where swales are installed on sloped ground, check dam structures will be used within the channels to provide storage, allowing a portion of the flows to disperse naturally.



Swales and drainage channels will discharge runoff from access roads and areas of hardstanding to settlement ponds. These will be suitably size to accommodate flows from storm events up to and including the 1 in 100-year storm event.

Settlement ponds will not discharge to a watercourse and flows from the ponds will disperse naturally within the catchment.

Watercourse crossings will be suitably sized to accommodate flows during the 1 in 100-year storm event, with no risk of impeding flows during extreme storm events and causing flooding upstream of the crossing.

The cable trenches will be excavated in dry weather where possible and infilled and revegetated where appropriate. There will, therefore, be no increase in the risk of flooding.

The surface water management system at the site will ensure that there will be no increase in the risk of fluvial or surface water flooding downstream as a result of the Proposed Development.

## 6.6 Mitigation Measures for Human Environment

### 6.6.1 Population

As there are no significant effects predicted on population trends and population density, no mitigation measures are required.

### 6.6.2 Socio-Economics, Employment and Economic Activity

Given that potential effects of the Proposed Development at construction, operation and decommissioning phases are predominantly positive in respect of socio-economics, employment and economic activity, no mitigation measures are considered necessary.

### 6.6.3 Land Use

Mitigation measures for land use are primarily related to preliminary design stage, which has allowed for the prevention of unnecessary or inappropriate ground works or land use alterations to occur. The construction and operational footprint of the Proposed Development has been kept to the minimum necessary to avoid negative effects on existing land uses as so far as possible.

Existing agricultural tracks have been incorporated into the design in order to minimise the construction of new tracks and roads and minimise the removal of agricultural and forested areas. Where new access tracks are required, these have been sensitively designed in order to minimise impact on agriculture so far as possible. Electricity cables will be installed underground in or alongside access tracks to avoid negative effects on agricultural practices.

The construction and decommissioning works will be planned and controlled by a Construction and Environmental Management Plan (CEMP). The CEMP for the construction phase is included in Appendix 2.2 of Volume 2 of this EIAR. This provides details on day to day works and methodologies. As part of these works, the public and other stakeholders will be provided with updates on construction activities which will affect access to lands. This will be communicated to members of the public through a community liaison officer employed for the duration of the construction period.



#### 6.6.4 Recreation, Amenity and Tourism

The Proposed Development will not result in a critically adverse visual impact on the landscape and mitigation measures in this respect are not required.

#### 6.6.5 Health and Safety

##### 6.6.5.1 *Mitigation Measures – Construction & Decommissioning*

To maintain safety and avoid health impacts on construction workers and the general public, best practice site safety and environmental management will be maintained. The Proposed Development will be designed, constructed, operated and decommissioned<sup>4</sup> in accordance with the following:

- Safety, Health & Welfare at Work (Construction) Regulations 2013
- Safety, Health & Welfare at Work Act 2005
- Safety, Health & Welfare at Work (General Applications) Regulations 2007

All construction staff will be trained to the correct Health and Safety standards in order to carry out their duties and will be informed and aware of potential hazards. A Construction and Environmental Management Plan is included in Appendix 2.2, will be circulated to all construction workers which will detail safety protocol and methodology. Furthermore, site investigation has been completed and mitigation has been proposed as detailed in Chapter 6: Lands, Soils and Geology and Chapter 7: Hydrology and Water Quality.

All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project.

FÁS Safe Pass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required.

The developer is required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety & Health Management Plan.

In relation to COVID-19, up to date HSE guidance will be consulted regularly in line with HSA recommendations and all reasonable on-site precautions will be taken to reduce the spread of COVID-19 on construction sites, should the virus be prevalent at the time of construction.

Once mitigation measures and health and safety measures are followed, the potential for impact on human health on the construction site during construction and decommissioning is expected to be not significant and temporary to short-term.

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<sup>4</sup> The Proposed Substation will not be decommissioned as it will become an ESBN/EirGrid asset following construction and become a part of the electricity grid network



Appropriate warning signage will be posted at the construction site entrance, directing all visitors to the site manager. Appropriate signage will be provided on public roads approaching site entrances and along haul routes to maintain public safety.

In relation to the TDR, extra safety measures will be employed when large loads are being transported, for instance, Garda escort will be requested for turbine delivery and a comprehensive turbine delivery plan will be utilised to avoid potential impact to human safety for road users and pedestrians. A traffic and transport assessment has been completed and is detailed in Chapter 11: Traffic and Transportation.

Once mitigation measures and health and safety measures are implemented and followed, the potential for impact on human health for members of the public during construction and decommissioning of the Proposed Project is expected to be not significant and temporary to short-term.

#### *6.6.5.2 Mitigation Measures - Operational*

For operation and maintenance staff working at the Proposed Development, appropriate site safety measures will be utilised during the operational phase by all permitted employees.

All personnel undertaking works in or around the turbines will be fully trained and will use appropriate Personal Protective Equipment (PPE) to prevent injury.

Equipment within high voltage substations presents a potential hazard to health and safety. The Proposed Substation will be enclosed by palisade fencing and equipped with intruder and fire alarms in line with ESB and EirGrid standards.

All electrical elements of the Proposed Development are designed to ensure compliance with EMF standards for human safety.

All on-site electrical connections are carried by underground cable and will be marked out above ground where they extend beyond the track or hardstanding surface. Details of cables installed in the public road will be available from ESBN.

Lightning conductors will be installed on each turbine as all structures standing tall in the sky require this protection. Turbines specifically require this to prevent power surges to electrical components.

Turbines will be fitted with ice detection systems which will stop the turbine from rotating if ice is forming on a turbine blade. This aims to prevent ice throw which can cause injury.

Rigorous statutory and engineering safety checks imposed on the turbines during design, construction, commissioning and operation will ensure the risk posed to humans is negligible. 24-hour remote monitoring and fault notifications are included as standard in the Turbine Operations and Maintenance Contracts.

In addition to scheduled maintenance, the maintenance contracts will allow for call out of local engineers to resolve any issues as soon as they are picked up on the remote monitoring system.

Access to the turbines inner structure will be locked at all times and only accessed by licenced employees for maintenance.

In line with the Health Service Executive's Emergency Planning recommendations, any incident which may occur at the site which requires emergency services, incident information will be provided in the 'ETHANE' format.



The design of the Proposed Development has considered the susceptibility to natural disasters. The proposed site drainage will mitigate against any potential flooding risk with the use of swales as described in Chapter 7 – Hydrology and Water Quality.

A nominated competent person shall carry out checks and routine maintenance work to ensure the reliability and safe operation of fire-fighting equipment and installed systems such as fire alarms and emergency lighting. A record of the work carried out on such equipment and systems will be kept on site at all times.

Shadow flicker control modules, consisting of light sensors and specialised software, will be installed on the turbines to prevent operation during periods when shadow flicker is predicted to exceed the thresholds set out in WEDG 2006 at all sensitive receptors located within 10 rotor diameters of the Proposed Development. This is beyond the requirements of WEDG 2006, which recommends the limits apply only to properties located within 500 m of a development. This is further detailed in section 10.7.3.3.

In order to ensure the Proposed Wind Farm is compliant with the noise limits, some of the turbines may need to be operated in noise reduced modes of operation in order to protect residential amenity. Details of these mitigation measures are set out in Chapter 9: Noise and Vibration.

The wind farm system shall include a kill switch that can be operated at any time with an overriding manual shutdown system in case of an emergency.

#### 6.6.6 Material Assets

Non-renewable resources of stone and fill will be sourced locally insofar as possible to minimise transportation distances.

Where services and street furniture are required to be removed temporarily to accommodate turbine delivery, residents and business in proximity to the works will be informed in advance.

The turbine delivery procedure will follow the steps outlined in Section 11.6 of this EIAR, to avoid negative impact on roads and private property along the TDR including the N22, R585, and L6008 leading to the site. It is likely that turbine delivery will take place outside of regular travelling/commuting hours in order to avoid potential traffic impacts on major routes and will be supervised under Garda escort.

A Construction Waste Management Plan has been prepared for the Proposed Development and is included in the CEMP in Appendix 2.2, in line with the “Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects” (2006) as published by the Department of the Environment, Community and Local Government and supported by the Southern Region Waste Management Plan 2015-2021.

The Waste Management Plan will be finalised in accordance with the CEMP following the appointment of the contractor for the main construction works and will take cognisance of any newly published waste management policy.

### 6.7 Mitigation Measures for Shadow Flicker

Shadow flicker control modules, consisting of light sensors and specialised software, will be installed on the turbines to prevent operation during periods when shadow flicker is predicted to exceed the exposure thresholds set out in WEDG 2006 at all sensitive receptors located within 10 rotor diameters of the Proposed Wind Farm i.e. 30 minutes per day and / or 30 hours per year. This is beyond the requirements of WEDG 2006, which recommends the limits apply only to properties located within 500 m of a development.



The calculated shadow flicker periods, which are detailed in Appendix 10-3, can be input into the turbine control software and when the correct conditions are met i.e. the light intensity is sufficient, the turbine is operational and orientated towards the receptor, the event is within a calculated potential period of shadow flicker, and the thresholds identified in the WEDG 2006 have been exceeded (30 minutes per day or 30 hours per year of shadow flicker), individual turbines will cease operation (allowing for a short period for the control software to react and for the turbine blades to gradually slow down) until the conditions for shadow flicker are no longer present.

## **6.8 Mitigation Measures for Traffic and Transportation**

### Mitigation by Design

Mitigation by design measures includes the following;

- Selection of the most appropriate delivery route to transport the wind turbine components, requiring minimum remedial works to accommodate the vehicles as set out in Section 11.6 of Chapter 11.
- Construction of temporary improvements at locations identified in Section 11.6 of Chapter 11.
- Use of on-site borrow pit to produce materials to minimise deliveries to site during construction.
- Use of granted alternative grid connection between the site and the existing Carrigarierk Wind Site to alleviate requirement for construction works along regional road. It is noted that this will only be used in the eventuality that the Proposed Substation included as part of the Proposed Development is not granted planning permission.

### Mitigation Measures During the Construction Stage

The successful completion of the Proposed Development will require significant coordination and planning and it is therefore recommended that the following comprehensive set of mitigation measures will be put in place before and during the construction stage of the project in order to minimise the effects of the additional traffic generated by the Proposed Development.

#### **Delivery of abnormal sized loads**

The following are the main points to note for these deliveries which will take place after peak evening traffic:

- The delivery of turbine components is a specialist transport operation with the transportation of components carried out at night when traffic is at its lightest and the impact minimised.
- The deliveries will be made in consultation with the Local Authority and An Garda Síochána.
- It is estimated that 48 abnormal sized loads will be delivered to the site, comprising 10 convoys of 5, undertaken over 10 separate nights.
- These nights will be spread out over an approximate period of 5 weeks and will be agreed in advance with the relevant authorities
- In order to manage each of the travelling convoys, for each convoy there will be two police escort vehicles that will stop traffic at the front and rear of the convoy of 5 vehicles.
- There will also be two escort vehicles provided by the haulage company for each convoy.



## Other traffic management measures

A **Traffic Management Plan (TMP)** has been prepared and will require to be adopted by the Contractor once engaged prior to the commencement of the construction phase of the Proposed Development. The TMP includes the following:

- **Traffic Management Coordinator** – a competent Traffic Management Co-ordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management.
- **Delivery Programme** – a programme of deliveries will be submitted to the County Council in advance of deliveries of turbine components to site. Liaison with the relevant local authorities and Transport Infrastructure Ireland (TII) will be carried out where required regarding requirements such as delivery timetabling. The programme will ensure that deliveries are scheduled in order to minimise the demand on the local network and minimise the pressure on the access to the site.
- **Information to locals** – Locals in the area will be informed of any upcoming traffic related matters e.g. temporary lane/road closures (where required) or delivery of turbine components at night, via letter drops and posters in public places. Information will include the contact details of the Traffic Management Co-ordinator, who will be the main point of contact for all queries from the public or local authority during normal working hours. An "out of hours" emergency number will also be provided.
- **A Pre and Post Construction Condition Survey** – Where required by the local authority, a pre-condition survey of roads associated with the Proposed Development can be carried out immediately prior to construction commencement to record an accurate condition of the road at the time. A post construction survey will be carried out after works are completed to ensure that any remediation works are carried out to a satisfactory standard. Where required the timing of these surveys will be agreed with the local authority. All road surfaces and boundaries will be reinstated to pre-development condition, as agreed with the local authority engineers.
- **Liaison with the relevant local authority** - Liaison with the County Council and An Garda Síochána, will be carried out during the delivery phase of the large turbine vehicles, when an escort for all convoys will be required. Once the surveys have been carried out and “prior to commencement” status of the relevant roads established, (in compliance with the provisions of the CEMP), the Roads section will be informed of the relevant names and contact numbers for the Traffic Management Co-ordinator , the Project Developer/Contractor Site Manager as well as the Site Environmental Manager.
- **Utilisation of temporary alterations to road network at critical junctions** – at locations highlighted in Section 11.6 of Chapter 11. In addition, in order to minimise the impact on the existing environment during turbine component deliveries the option of blade adaptor trailers will also be used where deemed practicable.
- **Identification of delivery routes** – These routes will be agreed with the County Council and adhered to by all contractors.
- **Delivery times of large turbine components** - The management plan will include the option to deliver the large wind turbine plant components at night in order to minimise disruption to general traffic during the construction stage.
- **Travel plan for construction workers** – While the assessment above has assumed the worst case in that construction workers will drive to the site, the construction company will be required to provide a travel plan for construction staff, which will include the identification of routes to / from the site and identification of an area for parking.



- **Additional measures** - Various additional measures will be put in place in order to minimise the effects of the development traffic on the surrounding road network including wheel washing facilities on site and sweeping / cleaning of local roads as required. These are set out in the CEMP which is included as Appendix 2.2 of Volume 2 of this EIAR.
- **Re-instatement works** - All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers.

#### Mitigation Measures During Operational Stage

Due to the very low volumes of traffic forecast to be generated during this stage no mitigation measures are required.

#### Mitigation Measures During Decommissioning Stage

In the event that the Proposed Development is decommissioned after the c.25 years of operation, a decommissioning plan, including material recycling / disposal and traffic management plan will be prepared for agreement with the local authority. This plan will contain similar mitigation measures to those implemented during the construction phase.

### **6.9 Mitigation Measures for Archaeological, Architecture & Cultural Heritage**

A number of mitigation measures are provided in relation to Archaeological, Architectural and Cultural Heritage.

- Archaeological monitoring of any geotechnical / engineering trial pits or investigations and a report detailing the results of same.
- Pre-construction archaeological testing of turbine bases and hardstands, proposed access tracks and Proposed Substation will be carried out prior to construction. A report setting out the results of the testing will be submitted to the relevant authorities.
- Archaeological monitoring of ground works during construction. A report on the results of the monitoring shall be compiled and submitted to the relevant authorities on completion of the project. This is in accordance with the appropriate guidelines.
- Archaeological monitoring of the removal of the townland boundary. A drawn and descriptive record of the portions of the boundary to be removed should be made and included in the monitoring report.

### **6.10 Mitigation Measures for Landscape and Visual**

Given the highly visible nature of commercial wind energy developments it is not generally feasible to screen them from view using on-site measures as would be the primary form of mitigation for many other types of development. Instead, landscape and visual mitigation for wind farms must be incorporated into the early stage site selection and design phases.

In this instance, the main form of landscape and visual mitigation employed was:

- Mitigation by avoidance and design



### 6.10.1 Mitigation by Avoidance and Design

In this instance, the main mitigation by avoidance measure is the siting of the Proposed Development in a robust part of Cork's landscape that is not heavily influenced by susceptible landscape receptors. Indeed, the current Cork CDP reinforces the robust nature of this landscape context as the Proposed Development is situated in a part of Cork classified as 'Areas Most Likely to be Suitable' in relation to wind energy development. Furthermore, the current CDP also designates the landscape of much of the central Study Area with 'local importance', 'low value' and 'low sensitivity', further highlighting the typical and non-distinctive nature of this landscape context that can well accommodate a modest-scale wind energy development. It is also important to note that the Proposed Development is also sited adjacent to an existing wind farm development, and therefore, the Proposed Development represents the intensification of an existing land use and not the introduction of a new and unfamiliar one.

## 6.11 Mitigation Measures for Telecommunications and Aviation

### 6.11.1 Telecommunications and Broadcasting

Mitigation measures consist of mitigation by design to avoid impacts on telecommunication links. As there is no potential for electromagnetic interference from the Proposed Development on telecommunications, there are no mitigation measures proposed for the construction, operation, or decommissioning phase of the Proposed Development.

There is potential for broadcasting to be affected at receivers close to the Proposed Development during the operational phase, i.e. nearby dwellings. Mitigation by design has achieved a setback of over 800m between the proposed turbines and the nearest dwelling which will reduce potential effects on receivers. RTE Transmission Network Ltd have identified interference to broadcast services in the area from Mullaghanish. They requested that a protocol be signed between 2RN and the developer should the site go ahead. The protocol sets out the developer's obligation to correct any deterioration in television and radio signal reception.

It is possible that houses in the immediate vicinity of the turbines could require some remedial measures in relation to television reception. In practice, such measures are not difficult to implement, are relatively inexpensive and if necessary will be undertaken by the developer in conjunction with RTÉ. Such measures could include:

- antenna relocation
- replacing aerials with more directional types
- the relaying of signals around the site using another transmitter
- the relaying of signals through the site using deflectors mounted on the turbines
- the cabling of signals underground through the site
- the installation of booster signals
- provision of satellite television facilities

The requirement for the implementation of such measures will be addressed individually with telecommunication service providers, should the need arise.



#### 6.11.1.1 Aviation

In line with standard practice for wind farm developments, the coordinates and elevations for turbines will be supplied to the IAA at the end of the construction phase. An aeronautical obstacle lighting scheme will be agreed with IAA in line with IAA's consultation response and applied to the proposed turbines.





## 7. SUMMARY OF RESIDUAL IMPACTS

### 7.1 Residual Impacts on Air and Climate

There will be a long term positive residual impact on air quality and climate as a result of the Proposed Development due to the displacement of fossil fuels.

### 7.2 Residual Impacts on Noise and Vibration

No significant effects are likely for noise or vibration effects during construction and/ or operation of the Proposed Development.

No significant decommissioning noise effects are predicted.

Vibration arising from construction or decommissioning of the wind farm will not be significant.

No significant residual impacts are predicted as operational wind farm noise level, as, excluding stakeholder properties, no significant noise impact is predicted.

### 7.3 Residual Impacts on Ecology

With the implementation of the detailed mitigation measures (outlined in the Natura Impact Statement, Chapter 5 Biodiversity, Chapter 6 Geology, Hydrogeology and Slope Stability, Chapter 7 Hydrology and Water Quality and the CEMP) there will be no significant residual impacts from the Proposed Development site on biodiversity.

### 7.4 Residual Impacts on Soils and Geology

It can be observed following the implementation of mitigation measures, the residual impact significance to the receiving environment would be imperceptible during the construction period and imperceptible during the operation of the Proposed Development. Mitigation measures will be monitored throughout the construction, operational and decommissioning phases.

The Proposed Development is not expected to contribute to any significant, negative cumulative effects of other existing or known developments in the vicinity. Slight residual cumulative effects from the excavation of fill material from local quarries and disposal of material deemed unsuitable for reuse are considered to result from the Proposed Development by placing demand on existing quarries and available void space at licensed facilities during the construction phase of the project.

### 7.5 Residual Impacts on Hydrology and Water Quality

#### 7.5.1 Residual Impacts during Construction Stage

The effect of the impacts on hydrology and water quality will be mitigated against. This will ensure that the residual impacts of the construction stage are Not significant and there will be no perceivable impact on the receptors that are hydrologically connected to the site.



The significance of the effect of the release of the cement-based products into the receiving waters is Moderate because following best practice pollution prevention measures, it is unlikely that a huge amount of cement-based products could be released into the environment.

#### 7.5.2 Residual Impacts during Operation and Maintenance Stage

The unmitigated potential impact during the operational phase of the site was not significant. Visual monitoring and water quality monitoring at appropriate intervals should be undertaken as precautionary measures to inform any required contingency mitigation measures during operation. The main risk to surface water is the release of hydrocarbons, such as fuel into surface water bodies via runoff. The residual risk is maintained as Not Significant.

#### 7.5.3 Residual Impacts during Decommissioning Stage

Mitigated with measures will ensure that the residual impacts of the decommissioning stage are Not significant and there will be no perceivable impact, which are highly sensitive receptors that are hydrologically connected to the site.

### 7.6 **Residual Impacts on Human Environment**

#### 7.6.1 Population

The residual effects of the Proposed Development with respect to population are associated with operation and maintenance jobs during the operational phase of the Proposed Development. This is likely to result in a temporary slight, neutral impact on population statistics due to population increase in Study Area during working hours.

As per the assessment of operational impacts, any impact on population as a result of the Proposed Development in terms of changes to population trends will be imperceptible. It is therefore unlikely that long term residual effects will occur to population and demographic trends as a result of the Proposed Development.

#### 7.6.2 Socio-Economics , Employment and Economic Activity

Overall, the residual effect associated with socio-economics, employment and economic activity as a result of the Proposed Development is considered long-term significant and positive.

#### 7.6.3 Land Use

Once mitigation measures are in place and the appropriate design measures are incorporated, as proposed, there will be no significant adverse negative residual effects arising from the project on land use.

Benefits to agricultural practices as a result of the upgrading of access tracks throughout the site will cause a slight, positive impact for agriculture at this location.



Other infrastructure that will remain in situ includes turbine foundations and hardstands which will be covered over and re-vegetated. The on-site substation will be taken in charge by ESB/EirGrid. The residual impact on land use as a result of the in-situ hardstands, foundations and substation following decommissioning is likely to be permanent, imperceptible and neutral due to the small extent of land affected.

#### 7.6.4 Recreation, Amenity and Tourism

There are no expected significant, adverse impacts to recreation, amenity and tourism in the surrounding area as a result of the Proposed Development due to the distance from major tourism attractions and the short-term/temporary nature of the construction works.

The community benefits gained during the operational phase due to the capital investment in the area are expected to last beyond the decommissioning phase resulting in a likely residual permanent significant, positive impact on the amenities of the area of the wind farm site.

#### 7.6.5 Human Health and Safety

Through various aspects of the design process for the Proposed Development, negative residual impact on human health is expected to be imperceptible. This is due to the reduction of potential occurrence of shadow flicker on neighbouring dwellings through shadow flicker control modules, consisting of light sensors and specialised software and noise control measures to reduce potential noise impacts. Furthermore, the mitigation measures as set out throughout the EIAR will prevent any potential significant negative impacts on human health during the construction and decommissioning phases.

Long-term positive imperceptible residual impacts will occur due to the provision of clean, renewable electricity. The operation of the Proposed Development will result in the net displacement of c. 24,283 tonnes of CO<sub>2</sub> per annum which would otherwise be emitted through the burning of fossil fuels.

#### 7.6.6 Material Assets

Non-renewable resources such as aggregates and cement are required onsite during the construction phase. This will result in a permanent negative imperceptible residual impact on non-renewable resources.

The Proposed Development will result in a long-term slight positive residual impact on non-renewable resources by offsetting the use of fossil fuels in electricity generation over the lifetime of the project.

Residual waste from the construction, operation and decommissioning phases will be disposed of at a licenced waste facility. This will result in a permanent slight negative impact to capacity of licenced waste facilities in the area of the Proposed Development. The waste facilities currently in operation in proximity to the site are identified in Section 2.4.4 of Chapter 2 of the EIAR.

### 7.7 **Residual Impacts of Shadow Flicker**

The proposed method of mitigation can be used to mitigate shadow flicker effects to all properties within the 10 rotor diameter Study Area to stay below the WEDG 2006 guidelines levels.



## 7.8 Residual Impacts on Traffic and Transportation

### Construction Stage

During the construction stage of the Proposed Development, it is forecast that the additional traffic that will travel on the delivery route indicated in Figure 11.2a will have a slight, negative and temporary impact on existing road users, which will be minimised with the implementation of the mitigation measures included in the proposed traffic management plan.

### Operational Stage

As the traffic impact of the Proposed Development will be imperceptible during the operational stage, there will be no residual impacts during this stage.

### Decommissioning Stage

As stated above, in the event that the Proposed Wind Farm is decommissioned a decommissioning plan will be prepared and implemented in order to minimise the residual impacts during this stage.

## 7.9 Residual Impacts on Archaeology, Architecture and Cultural Heritage

No residual impacts are envisaged as all archaeological, architectural and cultural heritage issues will be resolved at the pre-construction and construction stages of the development with the mitigation measures which will have been implemented.

## 7.10 Residual Impacts on Landscape and Visual

### 7.10.1 Landscape Impacts

Based on the assessment described Chapter 8 the significance of landscape impact is considered to be Moderate throughout the Central Study Area.

For the wider Study Area (beyond 5km from the site), landscape impact significance is not considered to exceed Slight and will reduce to Slight and Imperceptible at increasing distances as the project becomes a progressively smaller component of the wider landscape fabric even in the context of higher sensitivity landscape units / features.

### 7.10.2 Visual Impacts

Based on the visual impact assessments outlined in Chapter 8, the significance of visual impacts for the 'Designated Scenic Routes', 'Centre of Population', 'Major route' and 'Amenity and Heritage Feature' receptor categories are generally in the mid to low range. Only in respect of the 'Local Community Views' are impacts considered to be higher, however, these impacts are not considered to be significant. The most notable impacts will likely arise from those local receptors in the immediate vicinity of the site (i.e. less than 1km from the turbines). Nevertheless, even from these near-distances, the Proposed Development will not appear over-scaled or with any strong sense of overbearing and relate in terms of scale and function to this local landscape context, which is also influenced by existing wind energy development of a similar scale and nature.



Overall, it is not considered that the Proposed Development will result in significant visual impacts, albeit there will be some localised areas in the immediate proximity of the site that will experience impacts that are close to significant. Nonetheless, this is considered a robust working landscape that is not highly susceptible to development (reinforced by the 'Low' sensitivity classification in the Cork CDP) that can well accommodate a development of this scale and nature.

## **7.11 Residual Impacts on Telecommunications and Aviation**

### **7.11.1 Telecommunications and Broadcasting**

Following the implementation of mitigation measures, no significant residual effects are expected on telecommunications and broadcasting as a result of the Proposed Development.

### **7.11.2 Aviation**

Following the implementation of mitigation measures, no residual effects are expected on aviation as a result of the Proposed Development.

## **7.12 Interaction of the Impacts**

Direct, indirect, cumulative, and interactive impacts were considered during the siting of turbines to minimise impacts on landscape and visual, the human environment, geology and slope stability, flora and fauna, hydrology, water quality, shadow flicker and archaeological, architectural and cultural heritage. Other factors and constraints such as telecommunications requirements and the requirements of Cork County Development Plan were also considered.

The development has the potential to impact on various environmental aspects, and there are interactions and inter-relationships between these aspects. The EIA has considered these interactions and inter-relationships throughout the appraisal, firstly through the design of the turbine layout and cable routes to avoid impacts where possible and also in the definition of suitable mitigation measures to minimise the impacts.

In summary, based on the positive impacts of the development, and the low level of negative impacts (as mitigated, where required), it is considered that Barnadivane is a suitable location for a wind farm development.







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