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30 YEARS

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED CROAGHAUN WIND FARM, CO. CARLOW

VOLUME 1 – NON-TECHNICAL SUMMARY

Prepared for: Coillte

COILLTE
GROW · TRANSFORM · SUSTAIN

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1. INTRODUCTION

Fehily Timoney & Company (FT) has prepared the environmental impact assessment report (EIAR) on behalf of Coillte CGA. Coillte intends to apply to Carlow County Council for planning permission to construct the proposed Croaghaun. The proposed project will primarily consist of a wind farm of up to 7 no. wind turbine generators (WTG's) and 1 no. substation compound along with ancillary civil and electrical infrastructure. The project shall also include infrastructure for community use in the form of walking trail enhancements. The wind farm site is located at Croaghaun Hill on the northern slopes of the Blackstairs Mountains, approximately 1.5km south east of the village of Myshall and approximately 5.5 km west of Bunclody. The proposed project consists of four main elements:

- The wind farm;
- Turbine delivery route (TDR);
- Grid connection route (GCR);
- Replant Lands.

The proposed Croaghaun Wind Farm project will consist of up to 7 no. wind turbine generators (WTG's) and 1 no. on site substation along with ancillary civil and electrical infrastructure. The project shall also include infrastructure for community use in the form of walking trail enhancements. The turbines will have a maximum tip height of up to 178m and a maximum rotor diameter of up to 138m. The final turbines chosen may vary but will not exceed theses dimensions. Throughout the Environmental Impact Assessment (EIA) process, consideration of environmental impacts of the proposed development is based on the largest possible size of development i.e. assessment of the worst-case scenario. The potential output of the project is approximately 38.5 megawatts (MW).

The associated grid connection route (GCR) will consist entirely of underground 38kV cable and will connect the on-site substation to the existing 110/220kV substation at Kellistown, within the townland of Kellistown East. The GCR will be ca. 21.5 km in length, with ca. 20.3 km to be constructed primarily within the existing road corridor. The 38kV grid connection cable will primarily follow public roads and shall feature horizontal directional drilling (HDD) at up to 8 no. locations to cross existing watercourses and the N80 National Road.

An off site substation will be required adjacent to the existing Kellistonw substation to accommodate the proposed project. The works will allow the voltage from the wind farm grid connection to be 'stepped up' to 110kV.

The works will comprise a substation compound which will be self-contained and positioned in a neighbouring field to that of the existing Kellistown substation. Two locations have been assessed for this off-site substation as part of this EIAR.

Temporary accommodation works will be required at a number of locations along the turbine delivery route (TDR) to facilitate the delivery of turbine components to the site. These works are ilocated in the townlands of Ballynahallin, Carrickduff , Kilbrannish South and Kilbrannish North.

The project shall include the upgrade of 2.74 km of existing forest tracks and paths that shall be re-purposed as recreational amenity trails for community use as part of the project.

The proposed grid connection to the national grid at Kellistown substation including the associated new off-site substation and the works required along the turbine delivery route are considered as part of the project's assessment in this EIAR but does not form part of this application for consent.Equally an environmental assessment has been carried out for replant lands at Crag, Co. Limerick and Sroove Co. Sligo and is also not included in the application for consent.

Therefore the development description as per the statutory newspaper notice and the application form for which consent from Carlow County Council is being sought is as follows:

- Construction of up to 7 no. wind turbines with a maximum overall blade tip height of up to 178m;
- Construction of turbine foundations and crane pad hardstanding areas;
- Construction of new site tracks and associated drainage infrastructure;
- Upgrading of existing tracks and associated drainage infrastructure where necessary including upgrade of entrance onto L2026.
- All associated drainage and sediment control including , the Installation of new watercourse or drain crossings and the re-use or upgrading of existing internal watercourse and drain crossings;
- Construction of 1 no. permanent onsite 38kV electrical substation 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.
- 1 no. Temporary construction site compound and associated ancillary infrastructure including parking;
- 1 no. on site borrow pit (the borrow pit shall be accessed via wind farm access tracks);
- Tree felling to facilitate construction and operation of the proposed development;
- Installation of medium voltage (20/33kV) and communication underground cabling between the proposed turbines and the proposed on-site substation and associated ancillary works;
- Erection of 1 no. permanent meteorological mast to a maximum height of 100m above ground level;
- Upgrade of existing forest tracks and paths that shall be re-purposed as recreational amenity trails for community use including signage;
- All associated site development works;
- A 10 year planning permission and 35 year operational life from the date of commissioning of the entire wind farm.

1.1 Requirement for EIAR

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 and Development Regulations.

Pursuant to Directive 2014/52/EU (the EIA Directive) of the European Parliament which has amended Directive 2011/92/EU this report constitutes an Environmental Impact Assessment Report (EIAR) and complies fully with the Directive.

As well as an EIAR, an Appropriate Assessment Screening and Natura Impact Statement has been prepared in compliance with Article 6 of the Habitats Directive. This report considers potential impacts on nearby nature conservation areas known as Special Protected Areas (SPAs) and Special Areas of Conservation (SACs).

1.2 EIAR Structure

The EIAR has been prepared using the "grouped format structure" as outlined in EPA guidance documents (EPA, 2002; EPA, 2003) and in line with the draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2017). The format of this EIAR is designed to ensure that standard methods are used to describe all sections of the EIAR.

Using this structure there is a separate chapter for each topic, e.g. air quality and climate, biodiversity, hydrology. The description of the existing environment, the proposed development and the potential impacts, mitigation measures and residual impacts are grouped in the chapter. The grouped format makes it easy to investigate topics of interest and facilitates cross-reference to specialist studies.

The Main EIAR consists of the following chapters:

- Chapter 1 - Introduction
- Chapter 2 - Need for the Development and Alternatives Considered
- Chapter 3 - Description of the Proposed Development
- Chapter 4 - Policy
- Chapter 5 - EIA Scoping, Consultation and Key Issues
- Chapter 6 - Air Quality and Climate
- Chapter 7 - Noise and Vibration
- Chapter 8 - Biodiversity
- Chapter 9 - Land, Soils & Geology
- Chapter 10 - Hydrology and Water Quality
- Chapter 11 – Population, Human Health & Materiel Assets
- Chapter 12 – Shadow Flicker
- Chapter 13 - Traffic & Transportation
- Chapter 14 - Archaeology, Architectural and Cultural Heritage
- Chapter 15 - Landscape & Visual
- Chapter 16 - Telecommunications and Aviation
- Chapter 17 - Interactions of the Foregoing

The EIAR is structured as follows:

Volume 1 – Non-Technical Summary (NTS) (including figures)

Volume 2 – Main EIAR

Volume 3 – Appendices to the Main EIAR

Volume 4 – Landscape and Visual Maps and Photomontages

1.3 Permission Period

A ten-year consent is being requested for this development. That is, planning consent for the construction of the development would remain valid for ten years following the grant of permission. The applicant requests a grant of permission on the basis of a 35-year operational period from the date of commissioning of the wind farm.

1.4 Difficulties Encountered

There were no significant technical difficulties encountered during the preparation of this EIAR.

2. SITE SELECTION AND ALTERNATIVES

2.1 Need for the Development

Ireland is dependent on reliable and secure supplies of electricity. The generation of electricity accounts for about one-third of all energy use each year in Ireland. The proposed Croaghaun Wind Farm is necessary not only to produce electricity for the national grid, but also due to its contribution to transitioning Ireland to a low carbon economy. The proposed development will play a critical role in providing renewable electricity, accounting for up to 1% of the current installed wind energy capacity in the Republic of Ireland.

At a strategic level, the need for the Project is supported by International, European, and National environmental and energy commitments and policies. In Chapter 4 of the EIAR, a detailed analysis of these commitments and policies are outlined.

The Irish Government published the Climate Action Plan in June 2019 which sets ambitious actions to ensure our 2030 targets can be achieved. This is in the context of substantial and continuing failure by Ireland in meeting climate targets to date. According to a 2019 report by Climate Action Network Europe (CAN), Ireland is:

> *"Way off track with its greenhouse gas emission reductions in sectors such as transport, buildings, waste and agriculture (non-ETS) both for 2020 and 2030"*

The Climate Action Plan recognises that Ireland must make a significant increase in the current levels of renewable energy in the country.

It is estimated that the capacity of up to approximately 38.5MW of electricity from the proposed Croaghaun Wind Farm will result in the displacement of approximately 53,118 tonnes of CO_2 per annum.

Substantial new development will be required in Ireland to increase renewable energy production from 30% to 70%, as set out in the Climate Action Plan 2019 Most of this increase is likely to come from wind power. Moving from 2020 targets to 2030 and 2050 targets, wind energy development is required to increase substantially. This demonstrates the importance of and need for the proposed Croaghaun Wind Farm project.

The proposed Croaghaun Wind Farm will assist in mitigating the effects of climate breakdown and will support and maintain onshore wind capacity. The CAP seeks a total installation of 8.2 GW of onshore wind capacity by 2030. The Croaghaun Wind Farm has the potential to contribute to approximately 0.5% of this 2030 target.

The Energy White Paper, Ireland's Transition to a Low Carbon Energy Future 2015-2030 (DoCENR, 2015) sets out a framework to guide policy and actions that the government intends to take in the energy sector. The paper notes that "There will be substantial increases in the cost of carbon in the short and medium term, through the EU Emissions Trading Scheme". The proposed Croaghaun Wind Farm aims to reduce dependence on imported fossil fuels and add to financial autonomy and energy stability in Ireland, further emphasising the need for the proposed development.

In addition to helping Ireland avoid significant fines and reducing Ireland's environmentally damaging emissions, the Croaghaun Wind Farm will also contribute positively to the national and regional economy.

Furthermore, research has shown that wind energy projects are inexpensive over a long period of time. A report published by Barringa in January 2019 states that:

> *"Our analysis indicates that the deployment of 4.1 GW of wind generation capacity in Ireland between 2000 and 2020 will result in a total net cost to consumers, over 20 years, of €0.1bn (€63 million to be exact), which equates to a cost of less than €1 per person per year."* (Baringa, 2019).

2.2 Alternatives

This chapter of the EIAR includes a description of the reasonable alternatives studied by the developer which are relevant to the project and its specific characteristics and an indication of the main reasons for the option chosen, taking into account the environmental effects. The consideration of alternatives typically refers to alternative design, technology, location, size and scale. A 'Do Nothing Scenario' i.e. an outline of what is likely to happen to the environment should the Project not be implemented, should also be included.

In 2014, Coillte's Renewable Energy Development Team undertook a detailed screening process, through Geographical Information Spatial software (GIS), using a number of criteria and stages to assess the potential of a large number of possible sites, on lands within its stewardship (c. 441,000 hectares), suitable to accommodate a wind energy development. This exercise identified a number of projects for Coillte which are currently at pre-planning and planning stage. In 2017 Coillte once again examined the lands under its stewardship for candidate sites for wind energy development using the same site selection process as described above but this time reducing the required contiguous site area from 300ha to 50ha. The proposed site emerged from this process along with other sites and these sites were brought forward for further assessment.

Whilst the above exercise was based on identifying lands for wind energy development, A reasonable alternative source of renewable electricity namely solar was also considered. However, the land requirement would result in a significant loss of commercial forestry and due to its elevated nature the visual impact would be inconsistent with the existing environment.

The design of the proposed Croaghaun Wind Farm was an iterative process which considered a range of alternative designs throughout the evolution of the project. The design iterations were influenced by potential environmental effects identified throughout the environmental assessment, leading to the evolution of the developable area of the project and the establishment of the final design as proposed. 4 no. design iterations were considered with various scales and densities.

The design option chosen to take forward for the proposed project was chosen as it strikes a balance between energy production capacity and avoidance of environmental sensitivities. The chosen option provides for the greatest amount of energy production while avoiding potential significant impacts on the receiving environment. The initial turbine layout consisting of 9 no. turbines has the potential to produce the most energy, however, this option was seen to cause significant visual impact on the nearby settlement of Myshall with potential to impact on residential amenity and the heritage value of the settlement.

When considering an appropriate substation to connect the proposed Croaghaun Wind Farm to the national grid, two substations were identified in proximity to the site on an existing 110kV-220kV line on the national transmission network. The two potential alternative grid options include the Kellistown 110kV-220kV substation, located approximately 14km to the north of the site and the Lodgewood 110kV-220kV substation, located approximately 18km to the south east of the site. No viable 38kV connection options were identified in the area of the Croaghaun site.

A preliminary viability study was carried out for an underground grid connection to the Lodgewood Substation to be buried in local roads and to be brought underneath the Slaney River Valley SAC by horizontal directional drilling. However, technical review and consultation indicated that capacity may not be available at the Lodgewood Substation and that the alternative Kellistown Substation will provide the appropriate capacity required. For this reason, further alternative routes and connection types to the Lodgewood Substation were not further considered.

Three options for the grid connection to the Kellistown Substation were assessed to determine the optimal option. These included an overhead line option, an underground cable option and a mixture of overhead and underground cabling. The proposed grid connection route was chosen as it has less potential visual impact and less potential impact on avifauna than other options including overhead lines. Although the construction activities will take longer and will likely cause more noise, dust and traffic related impacts during construction, when compared to the overhead option, the underground option was found to have the least residual impact on the receiving environment once constructed and was therefore chosen as the optimal option. An underground solution is also in line with the latest recommendations in the Draft Wind Energy Development Guidelines (2019).

Two substation locations for the onsite substation were considered one in the centre of the site and one to the northern boundary of the site. A substation location at the centre of the site was investigated due to its relatively flat topography and its proximity to each of the seven proposed turbines. However the proposed substation and associated compound was later moved to the north of the site. This was in part due to the proximity to the grid route which exits the wind farm site at the north. This position is also secluded from the main walking trails at the wind farm site. The proposed substation position aims to avoid impact on recreation and amenity potential of the site for walking and hiking. The alternative area considered is proximate to walking trail areas and was therefore considered to potentially impact on the amenity value of the site.

Alternative alignments of access tracks were considered throughout the evolution of the project. The proposed development aims to use as much existing access tracks as possible to avoid environmental impact associated with tree felling and ground works. The initial design of the access tracks passed through sensitive habitat to the east of the site and were removed from the design to avoid potential impacts on this area.

Initially a 30-year operational life was considered for the proposed Croaghaun Wind Farm. This is largely in line with other permitted wind farm developments throughout the country. However, the lifespan of wind turbines allows for a 35-year operational life based on the emerging technological advancements in turbine manufacturing and the design-life as set out by the turbine manufacturer. Furthermore, it should be noted that section 7.2 of the Planning Guidelines 2006 states for the following:

> 'The inclusion of a condition which limits the life span of a wind energy development should be avoided, except in exceptional circumstances'

A 35-year operational period has also been considered when compared to a 30-year lifespan due to the long-term benefits to climate change and air quality.

3. DESCRIPTION OF PROPOSED DEVELOPMENT

3.1 Proposed Development

This chapter of the EIAR describes the existing site and the main components of the proposed project and provides details on the construction, operation and decommissioning of the wind farm in compliance with the EIA Directive.

The proposed project assessed in this EIAR is comprised of the following key elements:

- The wind farm (hereinafter referred to as the **'main wind farm site'**);
- Turbine delivery route (hereinafter referred to as the **'turbine delivery route'** or **'TDR'**);
- Grid connection (hereinafter referred to as the **'grid connection'**).

The proposed main wind farm site includes lands in the townlands of Rossacurra, Cranemore, Kilbrannish North, Bealalaw, Raheenliegh and Aclare, Co. Carlow.

The proposed turbine delivery route passes through the following townlands: Killbranish South, Killbranish North, Deerpark New, Barnahask, Clonmullen, Newtownberry, Carrickduff, Skeahanagh, Farmley, Collnahorna, Ballynahallin, Ballynabarney, Ryland Upper, Ryland Lower, Coolattin, Moyeady, Tombrick, Mountfin Lower, Ballinturner, Tomgarrow, Tomacurry, Clavass and Kilcanon.

The grid connection connecting the wind farm to the national grid at Kellistown substation traverses the following townlands: Kellistown East, Kellistown West, Rathtoe, Ballycurragh, Ballynunnery, Gilbertstown, Bendinstown, Ardbeam, Elmicon, Killknock, Killane, Raheenkillane, Killmaglush, Turtane, Ballaghmore, Shangarry, Cappawater, Lasmaconly, Myshall, Ballinrush, Cronruss, Aclare, Bealalaw and Rossacurra

In summary the proposed project will consist of the following:

- Construction of up to 7 no. wind turbines with a maximum overall blade tip height of up to 178m;
- Construction of turbine foundations and crane pad hardstanding areas;
- Construction of new site tracks and associated drainage infrastructure;
- Upgrading of existing tracks and associated drainage infrastructure where necessary including upgrade of entrance onto L2026.
- All associated drainage and sediment control including , the Installation of new watercourse or drain crossings and the re-use or upgrading of existing internal watercourse and drain crossings;
- Construction of 1 no. permanent onsite 38kV electrical substation 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.

- 1 no. Temporary construction site compound and associated ancillary infrastructure including parking;
- 1 no. on site borrow pit (the borrow pit shall be accessed via wind farm access tracks);
- Tree felling to facilitate construction and operation of the proposed development;
- Installation of medium voltage (20/33kV) and communication underground cabling between the proposed turbines and the proposed on-site substation and associated ancillary works;
- Erection of 1 no. permanent meteorological mast to a maximum height of 100m above ground level;
- Upgrade of existing forest tracks and paths that shall be re-purposed as recreational amenity trails for community use including signage;
- All associated site development works;
- A 10 year planning permission and 35 year operational life from the date of commissioning of the entire wind farm.

The proposed grid connection to the national grid and works to the turbine delivery route are considered as part of the overall project in this EIAR but do not form part of this application for consent.

Replanting lands at Sroove Co. Sligo and Crag Co. Limerick have also been assessed for cumulative impacts. Reports detailing environmental assessments carried out on these sites are contained in Appendix 3.3 and 4.4 of the EIAR.

3.2 Wind Turbines

The proposed turbines will have a tip height of up to 178m. Detailed drawings, which accompany the planning application, show a turbine that may be used for the proposed development. However, the exact make and model of the turbine will be dictated by a competitive tender process which is informed by the energy production efficiencies of various turbines on the market at the time but will not exceed the maximum size envelope set out within the development description.

3.3 Turbine Transport

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

- Loads will depart Dublin Port and travel through the Dublin Port Tunnel to the M50;
- Loads will travel south on the M50;
- Loads will continue south on the N11 and M11;
- Loads will depart the M11 and continue west on the N30;
- Loads will continue north west on the N30 and onto the N80 to Bunclody;
- Loads will travel through Bunclody on the N80 before departing left onto the L2026 travelling west;
- Loads will continue west on the L2026 to the proposed site entrance.

Temporary accommodation works will be required for the delivery of turbines to the site.

3.4 Connection to the National Grid.

Two grid connection route variants have been assessed in addition to the primary route which makes use of private agricultural lands at two separate locations to both minimise the overall length of the route and reduce the number of watercourse crossings required for the project. In both cases, where the primary route leaves the public road and passes through private lands, an alternative route variant has been assessed which involves the cable route following the public road corridor. Two separate cable route options for entering the proposed substation at Kellistown substation have also been assessed.

Works will also be required in proximity to the Kellistown substation to accommodate the proposed project. The works will allow the voltage from the wind farm grid connection to be 'stepped up' to 110kV. The proposed substation compound will be self-contained and positioned in a neighboring field to that of the existing Kellistown substation. Two locations have been assessed for this off-site substation as part of this EIAR.

3.5 Tree Felling and Replant Lands.

Much of the proposed main wind farm site comprises commercial coniferous forestry. 3 no. turbines are located within forestry and consequently tree felling will be required as part of the project. Permanent felling of approximately 24.4 ha of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbines, hardstands, crane pads, access tracks and the proposed onsite substation. The above felling hectarage includes some areas which have recently been felled already for commercial timber extraction.

The felling area proposed is the minimum necessary to construct the proposed project and comply with any environmental mitigation (bats in particular).

Replanting lands at Sroove Co. Sligo and Crag Co. Limerick have been assessed for cumulative impacts. Reports detailing environmental assessments carried out on these sites are contained in Appendix 3.3 and 4.4 of this EIAR.

Replacement replanting of forestry in Ireland is subject to license in compliance with the Forestry Act 2014 as amended. The consent for such replanting is covered by the Forestry Regulations 2017 (S.I. No. 191 of 2017).

As it is proposed to fell approximately 24.4 ha of coniferous forestry for the proposed project, replant lands of the same area are required. The replacement replanting of forestry can occur anywhere in the State subject to licence.

3.6 Recreational Amenity Trail

The project includes the upgrade of 2.74 km of existing forest tracks and paths that shall be re-purposed as recreational amenity trails for community use and shall include trail signage and way-markers. All signage and way-markers shall be positioned within the corridor of the proposed trail upgrades.

3.7 Construction

The construction sequence will be as follows. Tree felling, upgrading of existing site tracks and the provision of new site tracks will precede all other activities. Drainage infrastructure will be constructed in parallel with the track construction. This will be followed by the construction of the turbine foundations and the provision of the hardstanding areas. In parallel with these works the on-site electrical works; sub-station and internal cable network and off-site connection works to the national grid will be completed. It is expected that the construction phase, including civil, electrical and grid works, and turbine assembly will take between approximately 12 - 18 months.

Access tracks to facilitate turbine and material deliveries for Croaghaun Wind Farm shall consist of the construction of approximately 3.9 km of new site tracks and associated drainage infrastructure. The project will incorporate the upgrading of approximately 5.3 km of existing forest tracks.

For cable trenches located in public roads, the contractor will excavate cable trenches and then lay high density polyethylene (HDPE) ducting in the trench in a surround of cement bound material (CBM). A rope will be inserted into the ducts to facilitate cable-pulling later. The as-constructed detail of the cable duct locations will be carefully recorded. Cable marker strips will be placed above the ducts and the two communication ducts will also be laid. An additional layer of cable marker strips will be laid above the communication ducts and the trench backfilled. Back-filling and reinstatement in public roads will be to a specification to be agreed with the road authority.

A similar construction methodology will apply for cable trenches laid within site access tracks. In this case the cable-ducts will generally be laid when the track is being constructed and will follow the edge of the site access tracks. The trenches within these locations will generally be backfilled using the excavated material.

3.8 Operation, Maintenance and Decommissioning/Reinstatement

The expected physical lifetime of the turbine is approximately 35 years, and permission is sought for a 35-year operation period commencing from full operational commissioning of the wind farm.

During the operation of the project some maintenance work may be required for the turbines and underground cabling. It will require maintenance and operations crews to tend to the site periodically throughout the lifetime of the project.

On decommissioning, cranes will disassemble the above ground turbine components which would be removed off site for recycling. All the major component parts are bolted together, so this is a relatively straightforward process. The foundations will be covered over and allowed to re-vegetate naturally. Leaving the turbine foundations in situ is considered a more environmentally sensible option as to remove the reinforced concrete associated with each turbine would result in environmental nuisances such as noise and vibration and dust. It is proposed that the internal site access tracks will be left in place.

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

The recreational trails and associated signage shall be left in situ.

4. POLICY

This Chapter of the EIAR outlines current EU, national, regional and where relevant local policy and legislation relating to the proposed Croaghaun Wind Farm.

Relevant international policies in relation to renewable energy and the need to prevent climate change include the United Nations Framework Convention on Climate Change and the Kyoto Protocol.

EU Directives and Policies include:

- Directive on the Promotion of the Use of Energy from Renewable Resources
- European 2020 Strategy for Growth
- Europe 2020 Indicators – Climate Change and Energy
- 2030 Climate and Energy Framework
- A Roadmap for Moving to a Competitive Low Carbon Economy in 2050
- Recast Renewable Energy Directive (RED2)
- European Green Deal
- Clean Energy for all Europeans Package

Relevant National Policies considered include:

- Project Ireland 2040: The National Planning Framework
- Project Ireland 2040: National Development Plan 2018 – 2027
- Climate Action Plan (2019)
- Climate Action and Low Carbon Development Act 2015
- Ireland's Greenhouse Gas Emissions Projections 2019 – 2040
- Climate Action and Low Carbon Development (Amendment) Bill 2020

Regional and Local plans have also been considered including the Cork County Development Plan 2014 which sets out the wind energy strategy for the county. Lands located within the wind farm development are identified as being 'open for consideration' for wind energy development.

The development of the Croaghaun Wind Farm is in support of national policy as set out above. The project supports the enhancement of the competitiveness of rural areas and facilitates the development and diversification of the rural economy by supporting the energy sector and increasing the share of renewables in Ireland's energy mix.

The proposed development contributes to the nation's target increase of renewable energy from 30% to 70% by 2030 and supports the doubling of onshore wind energy in Ireland by 2030 as set out in the Climate Action Plan.

The project supports national targets of climate change mitigation and reduction in greenhouse gas emissions where significant focus has been set out in the recent Climate Action and Low Carbon Development (Amendment) Bill 2020. 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.

The project promotes the generation of renewable energy at appropriate locations and supports the achievement of a low carbon economy by 2050. It is therefore considered that the Croaghaun Wind Farm is in line with national policy and supports the achievement of national energy and sustainability targets.

The development of the proposed Croaghaun Wind Farm project is considered to be in line with local policy. The County Development Plan 215-2021 (CDP) supports the facilitation and development of renewable energy projects, citing the potential for the County to absorb additional wind energy development in order to support the achievement of national targets for renewable energy and greenhouse gas emission reductions. The Wind Energy Strategy for the County identifies Kilbrannish Hill, Tinnamogney and Greenoge as being 'Open for Consideration' for wind energy development. The Wind Energy Strategy states the following in relation to these areas:

> "In these instances, applications for planning permission will be treated on their merits. It is likely that such instances may arise only in the Mount Leinster/ Blackstairs area, given the requirement for adequate wind speeds."

Although the entirety of the proposed Croaghaun Wind Farm does not fall within the area marked as 'Open to Consideration', there is no apparent logical rationale for these polygons. The landscape character-based recommendations as set out in Table 2 of the strategy indicates that development of wind farms in mountain/moorland areas which correspond to the Mount Leinster/ Blackstairs Landscape Character Area, can accommodate wind farms of large spatial extent with generally no restrictions on height (further analysis of the visual impact of the proposed development is provided in Chapter 15: Landscape and Visual), in line with recommendations of the Wind Energy Development Guidelines. It is important to note that a wind farm was previously granted on this site and there is an establishes wind farm constructed adjacent to the proposed site and permission in place for an additional wind turbine in the adjacent area also. This establishes the precedent of wind farms in this area.

The proposed development also supports the provision of tourism and recreation facilities as set out in the CDP. A looped walkway and improved forestry tracks for hill walkers will be provided in support of the objectives of the CDP.

5. EIA SCOPING, CONSULTATION AND KEY ISSUES

This section of the EIAR describes the EIA scoping process and the stakeholder consultation that was conducted throughout the development of the Croaghaun Wind Farm project. The purpose of the EIA scoping process is to identify the key points and issues which are likely to be important during the environmental impact assessment (EIA) and to eliminate those that are not. This is conducted by preparing a report detailing the proposed development and sending it to a list of consultees such as various governmental departments, non-governmental organisations, environmental bodies, interested parties and key stakeholders, including telecommunication companies and aviation authorities which operate in the area of the Croaghaun Wind Farm.

A scoping request was sent to relevant parties on the 19th of December 2019. The scoping process proved beneficial to the identification of potential issues in relation to the proposed Croaghaun Wind Farm. Responses from the consultees identified a range of observations which have been taken into consideration in the preparation of the respective chapters of this EIAR.

Stakeholder consultation took place with a range of groups and individuals. Two pre-planning meetings were held with Carlow County Council where FT presented work done and the development of the project to Council Planners and the Environmental Officer. Concerns raised were incorporated into the environmental assessment and design of the project. Other consultation was also carried out with Inland Fisheries Ireland and the Carlow County Council Roads Department. Record data was also received from the NPWS.

Community consultation was conducted in line with the Code of Practice for Wind Energy Development in Ireland. It began in June 2018. A Community Liaison Officer (CLO) was appointed to be the main point of contact for the local community. The CLO's role included door to door consultation with community members within 2km of the proposed development, distribution of project materials to community members, follow up meetings with community members where requested, liaison between local residents and the project team, communication of any project updates and circulation of information regarding upcoming public events.

Community information events were held to provide information about the Croaghaun Wind Farm project, to discuss the details of the project with the public and to inform the design of the project through feedback from the community. A dedicated project website was set up which presented updates on the project and hosts a platform for the downloading of project information. Community Councils were also included in the consultation process.

Further public events aimed at community engagement were scheduled for 2020 as further design iterations were produced, however, due to national COVID 19 restrictions, these events could not take place. Alternative means of public engagement were developed for the project including an online virtual workshop where individuals could log on and view the presentation and provide feedback to the project team. This was supported by media presence to encourage attendance.

Observations and issues that arose during the scoping and consultation process have informed the design, assessment and mitigation measures proposed as part of this project.

6. AIR AND CLIMATE

This section describes the existing air and climate environment of the proposed Croaghaun Wind Farm project as a whole. It examines the various elements of the construction, operational and decommissioning phases of the proposed green energy project which consists of 7 no. wind turbines, grid connection route, turbine delivery route (TDR), internal site access tracks, cable trenching and electrical infrastructure and associated works which have the potential to impact on air quality and climate. Mitigation measures and the residual impacts after the proposed mitigation measures have been implemented are also described. A cumulative impacts assessment is also carried out.

6.1 Air

In order to protect our health, vegetation and ecosystems, EU Directives have set out air quality standards for Ireland and the other member states for a wide variety of pollutants and limits have been set for nitrogen dioxide, nitrogen monoxide, particulate matter, lead, carbon monoxide and benzene. There are no statutory limits for dust deposition. A review of existing air quality monitoring data undertaken by the Environmental Protection Agency was carried and used to characterise the existing environment.

To predict potential air and climate impacts the Croaghaun Wind Farm construction site was assessed and categorised according to Transport Infrastructure Ireland criteria which categorises traffic movements and potential dust deposition as a result of the construction traffic of a project. The principal source of potential air emissions will occur during the construction of the wind farm and placement of the grid connection route which will produce dust. Dust emissions arise when particulate matter becomes airborne making it available to be carried downwind from the source and may cause dust soiling in the surrounding area. Following the implementation of mitigation measures, the Croaghaun Wind Farm may result in slight to moderate residual impacts arising from fugitive dust emissions during particular construction activities. These will be localised in nature and as they will be associated with particular elements of the construction phase, they will be temporary in nature and will not result in any permanent residual impacts.

Traffic emissions were not taken into account when predicting air quality for the Croaghaun Wind Farm as traffic increase numbers will fall below the screening criteria set out in guidance, on which the Transport Infrastructure Ireland guidance is based. Plant and machinery such as generators, excavators etc. will be required at various stages of the construction works. These will be relatively small units which 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, the impacts of emissions from these units will be negligible.

Once the proposed Croaghaun Wind Farm is constructed there will be no significant direct emissions to atmosphere. In terms of decommissioning, traffic emissions and dust also would be significantly less than the construction phase and would potentially result in a slight temporary impact. There will also be emissions from machinery at the wind farm, however, this is not likely to result in significant 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. There are a large number of existing and approved projects and developments in the planning system within the vicinity of the site including housing developments, agricultural developments mainly. These developments are small in nature and will not act cumulatively with the wind farm.

There are a number of wind farms within 20km of the proposed development, the closest of these is Greenoge Wind Farm, currently operational, which is located 500m at its closest extent to the proposed development. The next nearest is Ballon Wind Farm, commissioned in 2017 which is located some 7km to the north. These facilities are operational and will have no cumulative effect on air emissions as a result of construction traffic.

Cumulative impacts may arise if the construction period of other projects occurs simultaneously with the construction of the proposed wind farm and grid connection route. However, provided the mitigation measures are implemented and the mitigation measures proposed for other developments are implemented, there will be no significant cumulative effects on air quality

Mitigation measures have been outlined for dust during the construction phase of the project. A Construction Environmental Management Plan (CEMP) has been prepared and is included in Appendix 3.1. of the EIAR. The developer in association with the contractor will be required to implement a dust control plan as part of the CEMP. As the operation of the project will have positive impacts on air quality, mitigation measures for the operational phase are considered unnecessary. Measures for the decommissioning phase will be similar to those laid out for the construction phase.

6.2 Climate

Carbon dioxide is a greenhouse gas which, if released in excessive amounts, can lead to increases in global temperatures known as 'global warming' or the 'greenhouse effect' which can influence climate change. Under the Kyoto Protocol and the Doha Amendment, Ireland has committed to reduce greenhouse gas emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020. At the Paris climate conference which Ireland has adopted and is legally binding. The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C (degrees Celsius) above pre-industrial levels and to limit the increase to 1.5°C. Under the agreement, Governments also agreed on the need for global emissions to peak as soon as possible, recognising that this will take longer for developing countries and to undertake rapid reductions thereafter in accordance with the best available science.

A desk-top study assessment was undertaken of available climatic information to characterise the existing environment. There is the potential for greenhouse gas emissions to the atmosphere during the construction phase of the wind farm such as those arising from construction vehicles, the use of on-site generators, pumps etc. The potential climatic impacts arising from these emissions were assessed in terms of carbon losses and savings as a result of the proposed construction and operation of the wind farm, by using a carbon calculator provided by the Scottish Government for wind farm development on peat. The wind farm will, during construction, result in carbon dioxide losses. These are due to the manufacture, construction and decommissioning of the turbines, losses due to reduced carbon fixing potential, losses from soil organic matter and losses due to felling forestry. However, payback time is estimated at approximately 0.4 years. It is estimated that the Croaghaun Wind Farm will result in the net displacement of approximately 53,118 tonnes of carbon dioxide annually. From an operational perspective, the Croaghaun Wind Farm will displace the emission of carbon dioxide from other less clean forms of energy generation and will assist Ireland in meeting its renewable energy targets and obligations.

In terms of climate, the proposed Croaghaun Wind Farm will act cumulatively with other renewable energy projects in reducing carbon dioxide emissions by displacing fossil fuel in the production of electricity, resulting in a slight-moderate positive impact on climate. There will be residual positive impacts from the operation of the proposed Croaghaun Wind Farm in terms of the displacement of fossil fuel energy generation with renewable energy.

7. NOISE AND VIBRATION

The proposed Croaghaun Wind Farm is located within a rural environment, in an area comprising of forestry and agricultural activities.

Baseline noise monitoring has been carried out at ten receptor locations surrounding the proposed Croaghaun Wind Farm development to establish existing levels of background noise in the vicinity of the proposed wind farm and to then enable appropriate noise limits for the site to be derived. The standard approach to derivation of noise limits is to carry out baseline measurements at several noise sensitive locations (NSL) around the proposed site. Noise limits are then derived for the properties at which the measurements were carried out based on the results of these measurements. As it is not usually possible to carry out measurements at every NSL, NSLs near to the measurement property are then assigned the same limits as the measurement location. The operational impact at each of the measurement locations was appraised in accordance with the Institute of Acoustic's Good Practice Guidelines.

The chosen noise monitoring locations were representative of the different noise environments in the vicinity of the proposed Croaghaun Wind Farm development in addition to being located at some of the closest dwellings to the proposed wind farm development. The baseline noise monitoring was used to derive appropriate noise limits according to the Department of the Environment, Heritage and Local Government DoEHLG *Wind Energy Planning Guidelines 2006*.

Potential noise and vibration impacts during the operational phase and construction phase were assessed.

The predicted on-site construction noise is predicted to be greatest from works associated with the preparation of hardstanding areas. On site construction and construction of the substation at Kellistown will both be below the relevant limits. In some instances, the maximum predicted noise levels from grid connection works may be above the noise limit of 65 dB $L_{Aeq,1hr}$. However, these elevated noise levels will only occur for short durations at a limited number of dwellings. Given the nature of the grid connection works, construction activities will not occur over an extended period at any one location. The noise levels presented are predicted maximum expected levels and are expected to occur at a very limited number of dwellings. There are four dwellings within 10 m of the grid connection works, 59 dwellings between 25 – 50 m, 68 dwellings between 25 – 50 m and 28 dwellings between 50 - 100 m. Directional drilling is required at up to 9 no. of locations, the nearest dwellings have been identified the closest distance being 25 m. The other dwellings are at least 70m away and at some directional drilling locations directional drilling is up to 345 m away. The predicted noise levels are below the noise limits.

The predicted noise levels from the operation of the proposed development are below the daytime and night-time noise levels. However, at some receptor locations, 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.

There are several wind farms within 20 km of the site including Ballaman, Ballindaggin, Ballon, Ballycadden, Ballynancoran, Carranroe, Castledockrell, Cronelea, Gibbet Hill, Greenoge, Knockalour, Monaughrim, Shillelagh and Tullow Mushroom Growers. Greenoge Wind Farm in the immediate vicinity of the proposed development, which is located directly east of the proposed wind farm site. Using the IOA GPG, it is not necessary to consider cumulative noise from all these wind farms, as these are considered sufficiently distant so that cumulative noise is 10 dB less than the predicted levels of the proposed Croaghaun Wind Farm. Greenoge Wind Farm is the only wind farm that meets the IOA GPG criteria. The cumulative predicted noise levels comply with the daytime and night-time limits? at the majority of noise sensitive locations. The only exceedance is during night-time periods at location R39 at standardised 10m height wind speeds of 11 and 12 m/s.

The dominant noise at this receptor is from Greenoge Wind Farm. At a standardised 10 m height wind speeds of 11 and 12 m/s the noise from Greenoge Wind Farm is 42.1 and 43.4 dB, respectively. Mitigation measures will be put in place to ensure compliance with the noise limits.

8. BIODIVERSITY

The ecological appraisal for the project was undertaken by Fehily Timoney and Company (FT). A series of ecological surveys were undertaken within the proposed wind farm site (including at the site of turbines, access tracks, borrow pits, compound and substation) as well as the route of proposed underground grid connection route and turbine delivery route (including watercourse crossings of routes). Ecological walkover surveys, habitat surveys, botanical surveys, invasive species surveys and mammal surveys (including bats). Two years of bat surveys have been completed within the study area during the years 2019 and 2020. Monthly activity bat surveys were undertaken within and near the boundary of the proposed wind farm site from June to September 2019, static detectors surveys were undertaken May to September 2019 and winter roosts surveys were undertaken on 27th March 2020 followed by a survey of watercourse crossings on 9th October 2020.

Aquatic ecology surveys were carried out in 2019 and 2020 along with ecology surveys of the proposed replant lands.

Extensive Ornithology surveys of the main wind farm site were also carried out for the site. These surveys were carried out over a number of years form 2017 to 2020.

The site does not overlap any designated nature conservation site but is nearby to the Blackstairs Mountains Special Area of Conservation (SAC) and is upstream of the River Barrow and River Nore cSAC (002162) and the Slaney River Valley cSAC (000781). In total there are three European Sites within 15km of the proposed development. In terms of Nationally designated sites, there is no Natural Heritage Area (NHA) and five proposed Natural Heritage Areas (pNHAs) within 10 km of the proposed wind farm, while a further two pNHAs are present within 10 km of the proposed grid connection route.

Habitats present within and adjacent to the site include the following:

Improved Agricultural Grassland	Recolonising bare ground
Conifer Plantation	Dry meadows and grassy verges
Hedgerows	Dry siliceous heath
Scrub	Recently felled woodland
Buildings and Artificial Surfaces	Recolonising bare ground
Spoil and bare ground	

The cable route from the on-site substation to the Kellistown substation along the road corridor includes the following habitats:

Buildings and artificial surfaces	Spoil and bare ground
Grassy verges	Eroding/upland rivers
Hedgerows	Depositing/lowland rivers
Treelines and amenity grassland	Stone walls and other stonework
Scrub	Arable crops
Dry meadows and grassy verges	Improved agricultural grassland

These habitats are also present all the turbine delivery route

No rare or protected flora species were recorded during the site surveys. Sycamore, an invasive species, is present along the grid connection route and turbine delivery route. Canadian waterweed was recorded nearby along the Burren and Slaney rivers.

Target bird species present within and in the environs of the site included:

Hen harrier	Eurasian curlew
Short-eared owl	Whooper swan
Sparrowhawk	Woodcock
Common buzzard	Red grouse
Kestrel	Black-headed gull
Long-eared owl	Golden plover
Northern Lapwing	

A total of 11 terrestrial mammals were identified within the study area during surveys. These include; badger, bank vole, brown rat, Eurasian rabbit, feral goat, hedgehog, Irish hare, pygmy shrew, red fox, sika deer and wood mouse.

Aquatic Ecology

Detailed mitigation measures are provided within the main body of the EIAR to be put in place to protect downstream water quality, birds, bats, habitats and prevent spread of invasive species.

Following identified detailed mitigation to reduce possible impacts to important ecological features outlined above, the following conclusions were determined.

No significant residual effect are identified on any protected European site (SAC, SPA) or nationally designated site (NHA, pNHA). No significant residual effects are identified on fisheries, freshwater pearl mussel and other sensitive aquatic biodiversity due to the project once mitigation measures are imposed.

No significant changes will arise to habitats of local ecological value on the site as some additional areas previously covered in coniferous forest will be allowed to develop into semi natural grassland/ scrub.

Avifauna

Effects on Avifauna associated with habitat loss, disturbance or displacement and collision were assessed in detail. The residual impacts on important bird species including hen harrier have been evaluated and characterised as localised, slight / imperceptible and reversible throughout the construction, operation and decommissioning phases of the CGEP once mitigation measures are imposed.

The development will be constructed, operated and decommissioned in strict accordance with the design and mitigation described in the EIAR and as such no significant residual effects are likely to local biodiversity or the downstream hydrologically connected River Barrow and River Slaney (internationally important).

A review of other plans and projects in the surrounding area was undertaken, exploring the possibility of cumulative impacts with other projects and plans on relevant Important Ecological Features. No indirect or direct cumulative impacts were identified once mitigation measures are imposed.

9. LAND, SOILS AND GEOLOGY

The Quaternary Geology underlying the proposed Croaghaun Wind Farm, found on Geological Survey of Ireland mapping, comprises of Till derived from metamorphic rocks (TMp); Bedrock outcrop or sub-crop (Rck); and Limited extent of blanket peat (BktPt). The majority of the proposed grid connection route is underlain by Till derived from Granites with limited areas of bedrock sub-crop or outcrop and alluvium indicated along the proposed grid connection route and at the proposed substation at Kellistown.

There is one main fault-line within the bedrock of the site boundary. The fault has north to south trend.

The Groundwater Vulnerability within the proposed project boundary is classified by the GSI as generally being classified as 'X – Rock Near Surface', with localised areas of 'High' to 'Extreme' also present within the proposed project site. Along the proposed grid connection, the vulnerability classification ranges from 'Moderate' to 'Extreme' with localised areas of exposed bedrock (X). At the Kellistown substation, the groundwater vulnerability is classified as 'High'. Based on the GSI aquifer vulnerability mapping, overburden deposits are generally <3m deep across the majority of the site.

Based on a review of the GSI Groundwater Wells and Springs database there are 16 No. Groundwater Wells recorded (accuracy up to 500 m, 500 m to 1 km and 1 km to 2km) within 1km of the proposed project site.

According to the GSI datasets, there are no karst features recorded within the proposed site.

The GSI Online Irish Geological Heritage database indicates that the proposed project area is not located in an area of specific geological heritage interest. The nearest site of significant geological heritage feature to the study area is located approximately 2km to the north of the proposed project at Aclare. The feature is described by the GSI as comprising the largest lithium bearing pegmatite deposit in the Leinster Region.

The GSI Online Minerals Database accessed via the Public Data Viewer shows several active and historic quarries and mineral occurrences surrounding the study area. These consist of rock quarries, a sand and gravel quarry and recorded mineral occurrences, none of which are located within the site boundary.

Intrusive investigations were undertaken at the proposed borrow pit location, at selected proposed turbine locations and at the proposed HDD road crossing location on the proposed grid connection route. Topsoil was encountered across the site and at each infrastructure location during the site walkover and intrusive investigations. The Topsoil ranged from *soft to firm, peaty Topsoil* with *peaty Clay* deposits also encountered to a maximum depth of 0.6m bgl. Peat deposits were generally noted to be limited in extent and thin with typical thicknesses of between 0.1 – 0.3m.

No evidence of slope instability was observed at the site and there are no historical records of landslide activity within or close to the site on the GSI database.

During construction potential impacts include soil erosion, soil compaction, ground water pollution slope failures. The overall magnitude of the potential direct impacts associated with the construction phase of the proposed development, prior to mitigation, is considered to be a Short Term, Negative Impact of Slight to Moderate Significance.

Potential operational impacts relate to potential leaks and spills of fuel, oils and chemicals and the impact of same on ground water. The magnitude of these potential impacts, prior to mitigation, is considered to be of Slight Significance.

Cumulative impacts associated with land, soils and geology are not considered to be significant.

Mitigation measures during construction include the development of a comprehensive surface water management system which is incorporated into the Construction Environmental Management Plan which is included in the EIAR.

Excavated material will be reused onsite for construction of access tracks, hardstands, landscaping and reinstatement, in order to avoid materials being transported off-site. These materials will be temporarily stored in a level area adjacent to the construction phase excavations prior to reuse.

To avoid 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 peatland / soils outside the work area is not damaged. Excavations will then be carried out from access tracks, where possible, as they are constructed in order to reduce the compaction of soft ground.

To monitor possible peat movements, it is proposed to install sighting posts upslope and downslope of construction activities, at staggered intervals at locations where the peat deposits occur. This is focused at turbine 4 where thin blanket peat has been identified. Turbines located in areas adjacent to peat deposits will incorporate drainage measures such that surface water will be drained away from the peat and will not be allowed to collect adjacent to the peat mass.

Likely impacts on land, soils and geology during the operational phase relate to potential spills and leakage of oils, chemicals and fuels. Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. The management of oils and fuels will include:

- Oils and fuels on the construction site will be carefully handled to avoid spillage.
- Any spillage of fuels, lubricants or oils will be immediately contained and properly disposed of off-site.
- Waste oils and fuels will be collected in leak-proof containers and removed from the site for disposal.
- Appropriate spill control equipment will be kept in the construction area and in each item of machinery.

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

Residual impacts associate with land, soil and geology relate to the excavation of fill materials from local quarries and the disposal of material deemed unsuitable for reuse. This will put a demand on existing quarries and available void space at licensed facilities which will impact on the long term capacity of these facilities. Following implementation of the proposed mitigation measures, there are no significant residual impacts associated with land, soil and geology.

10. HYDROLOGY AND WATER QUALITY

Croaghaun wind farm is located within Hydrometric Area No. HA 12, Slaney & Wexford Harbour, of the Irish River Network System. The standard average annual rainfall at the location of the proposed wind farm is 1,063 mm.

The wind farm site is located in 5 sub-basins as defined in the Water Framework Directive and the cable route is located in 6 sub-basins which are as follows:

- Clashavey_River _010 - IE_SE_12C00500,
- Douglas_(Ballon)_010 – IE_SE_12D030200,
- Burren_030 – IE_SE_14B050200,
- Ballaghmore_Distibutary_010 – IE_SE12B120990,
- Burren_040 – IE_SE_14B050310,
- Burren_050 – IE_SE_14B050400.
- Kildavin_Stream_010_010 - IE_SE_12K040800
- Clody_010 – IE_SW_12C030080
- Burren_020 – IE_SE_14B050110

The national flood hazard mapping (available at www.floodmaps.ie) does not indicate any record of historical flooding on the wind farm site. There are no areas defined as 'benefitting lands' within the site in the OPW flood hazard mapping. The underground grid connection crosses Flood Zone A at two locations.

It can be observed that the river status and waterbody risk of the receiving waters at the northern side of the wind farm is classified as 'Moderate' and 'At Risk'. River status and waterbody risk of the receiving waters at the southern side of the proposed wind farm is classified as 'Good' or 'High' and 'Not at Risk'.

The proposed development is not situated within any environmentally designated areas, however surface water running off the site drains into the Slaney River Valley SAC. The closest SAC is just south-west of the wind farm development, Blackstairs Mountains SAC (000770). However, no runoff from the proposed development will discharge in that area. The proposed grid connection route will cross watercourses which drain into the River Barrow and River Nore SAC.

The proposed development does not traverse any Special Protection Area (SPA) or natural Heritage Area (NHA). The closest SPA, Wexford Harbour and Slobs SPA (004076), is approximately 22km southeast of the site.

The hydrological environment of the Croaghaun wind farm is considered to be of 'high' sensitivity for receptors draining to the River Slaney. The significance of the effect of the increase in runoff is imperceptible on receiving waters because estimated increases in runoff are low compared to the flows of receiving waters. The overall estimated increase in the peak runoff due to the development is 0.077 m^3/s (or 0.07 %) for a 1 in 100 years storm event.

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

Possible potential indirect impacts on surface water quality during tree felling and construction activities include increased sediment in watercourses, increase in nutrients from tree felling, blockages in cross drains could lead to flooding, suspended solids could affect aquatic fauna and habitats, fuel leaks or spills could affect watercourses, wet concrete could affect receiving waters.

The main hydrological impact of the development is estimated increased runoff. Due to the insignificance of the increase in runoff from the development, the grassing over the drainage swales and revegetation of other exposed surfaces, and the non-intrusive nature of site operations, there is a negligible risk of sediment release to the watercourses during the operational stage.

Proposed drainage measures to reduce and protect the receiving waters from the potential impacts during the construction of the proposed development are as outlined in chapter 10 of the EIAR. These include measures to prevent runoff erosion from vulnerable areas and consequent sediment release into the nearby watercourses to which the proposed development site drains. The main mitigation measures are the use of stilling ponds, silt fencing, monitoring of works by a suitably qualified person, silt traps, use of cross drains, swales, proper storage of fuels and oils and designated refueling areas.

Trees will be felled away from aquatic zones where possible. Brash mats will be used as necessary on any off-road harvesting routes, removed and replenished if they become worn. Branches, logs or debris will not be allowed to accumulate in aquatic zones and will be removed as soon as possible.

When operational, the development will have a negligible effect on surface water quality as there will be no further disturbance of soils post-construction. During the operation stage, small quantities of oil will be used in cooling the transformers associated with the facility. There is therefore a potential for small oil spills. Risks of potential oil leakage and pollutions draining to the watercourse from the installed transformer is mitigated with transformer interceptor bund wall. The proposed development is not considered to have any cumulative effect with neighbouring projects.

It is not envisaged that the maintenance period will involve any significant impacts on the hydrological regime of the area. The maintenance of the development will incorporate effective maintenance of the drainage system.

Following the implementation of mitigation measures, the residual risk to the receiving watercourses would be 'Imperceptible' and 'Not significant' during the construction, operation and decommissioning stage of the development.

In the event of decommissioning of the development, 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.

11. POPULATION, HUMAN HEALTH AND MATERIAL ASSETS

11.1 Population

The population of the wind farm area is 1,696 and the population of the Grid Route Area is 3,609 (2016 Census). The population density of the study area is far less than the state or county-wide average indicating a low population in the immediate area of the Croaghaun Wind Farm.

The construction stage will bring short-term/temporary population growth in the study area during working hours where an estimation of between 46 and 62 workers will attend the site. This growth is associated with daily construction work and therefore the population of the study area will increase daily during construction hours and return back to normal outside of working hours. It is unlikely that the construction stage will permanently impact population trends of the study area or grid route area.

The operational phase of the Croaghaun Wind Farm will potentially provide between 11 and 15 jobs. Although only a small proportion of these jobs are likely to be based in the study area, the operational phase will give rise to temporary, slight population increase in the study area during working hours as a result of operations and maintenance. This impact is expected to be imperceptible.

11.2 Socio-Economics

The study area has above average numbers of at-work population as well as average numbers of unemployed population. Professional services and commerce and trade are the most common employment of the population based in the study area (Census 2016).

It is estimated that between approximately 46 and 62 jobs will be created during the construction stage of the project which is expected to last up to eighteen months. This will cause a direct short-term, positive impact on the local economy, bringing significant benefits to local service providers and businesses with a direct and indirect financial benefit to the local community. 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 locality where possible. This is likely to cause a short-term, positive impact on the employment profile of the area.

The operation phase of the Croaghaun Wind Farm has potential to provide between 11 and 15 long term direct and indirect jobs. Only a small proportion of these jobs are likely to be directly based in the study area. It is therefore considered that the operational phase of the proposed development has potential for a slight positive indirect impact on employment in the study area. Rates and development contributions paid by the developer will contribute significant funds to Carlow County Council which will be used to improve the services available to the people of the County. Business rates will also contribute significantly.

Coillte aim to develop long-life assets in such a way to ensure long-term benefits to the local community and economy are created and sustained. Coillte expects that for each megawatt hour (MWh) of electricity produced by the wind farm, the project will contribute €2 into a community benefit fund for the RESS period i.e. the first 15 years of operation and €1 per MWh for the remaining lifetime of the wind farm. If this commitment is improved upon in upcoming Government Policy, the figures will be adjusted accordingly.

Assuming that the export capacity of the proposed development will be approximately 38.5MW and is contracted under the RESS, it is anticipated that the community benefit fund for the proposed Croaghaun Wind Farm has potential to deliver up to €200,000 per year to the local community for the first 15 years of operations following the commissioning of the project, and €100,000 per year for the remaining lifetime of the project.

The provision of the Community Benefit Fund will have a significant positive impact on the socio-economic profile of the study area and wider area, providing a regular payment to near neighbours of the project and providing for projects which will benefit the community as a whole, bringing long-term economic benefits.

11.3 Land Use

The proposed development site comprises commercial forestry and small areas of third party agricultural lands.

Temporary disruption to agricultural and forestry lands is likely to occur during the construction phase. Slight, temporary impact to agricultural lands will occur during construction due to the small extent of infrastructure located on these lands. 24.4 hectares of coniferous forest is required to be felled to provide for infrastructure of the wind farm. This will result in a moderate, permanent impact to forestry in the area, if unmitigated.

Temporary effects on land use will arise as a result of the installation of the 110 kV underground grid route connection which will be constructed partially on forestry lands, with the majority to be installed within the public road corridor. This may temporarily affect access to forestry and agricultural lands. This impact is likely to be slight and temporary.

The operational phase will result in the change of land use in areas where access tracks, wind turbine bases, hardstanding areas, substations, recreation trail, met mast, borrow pits, and associated drainage works are required. The areas of the Croaghaun Wind Farm occupying agricultural land will have an insignificant impact on land use due to the small extent of development located on these lands. Farming practices can continue as usual during the operational phase. The 24.4 hectares of forestry that will be removed will be replanted at alternative sites. This will result in an imperceptible impact on forestry land use overall.

The design of the project has provided for mitigation to avoid impact on land uses in the area. Construction and decommissioning works will be controlled by a detailed construction and environmental management plan. This will set out best practice methods to avoid impact on land uses in the area during these works. Replant lands are proposed to mitigate against the loss of forestry associated with the project.

11.4 Recreation, Amenity and Tourism

The Blackstairs Mountains are also noted as one of the most important natural attractions in the Carlow. Recreation and amenity attractions in the area include a number of walking trails including 'the Windfarm Loop' and 'the Kilbrannish Forest Loop'. A section of the South Leinster Way passes through these looped walks. It is considered that the main tourism and recreation potential for the area is trail walking and hiking.

The Columban Way is a cultural walking route being developed across Europe which begins in the Backstairs Mountains. A section of the route passes through the proposed wind farm site.

Hang-gliding and paragliding activities take place around Mount Leinster to the south of the site.

The construction phase has potential to impact on recreation, amenity and tourism activities within the vicinity of the site. This will likely occur due to the closure of forestry trails at the site due to construction works. These trails are used by the locals as part of Coillte's Open Forest Policy. Closure of these tracks is expected to last the duration of the construction phase of 12-18 months. Therefore, a significant, temporary impact to the sections of forestry trails associated with the Croaghaun Wind Farm site will occur due to closure during the construction phase. However, trails adjacent to the site such as Deerpark Old will remain accessible for the duration of the construction works. The Columban Way walking route which is currently being developed by the Local Authority and Local Groups will pass through the wind farm site; however, the route will be diverted to the public road during construction of the proposed wind farm.

Activities associated with the nearby attractions including the "Nine Stones" vantage point and Mount Leinster may experience indirect impact due to construction activities as a result of nuisance in the form of increased traffic and noise. This may have a slight temporary negative impact on activities associated with these nearby amenities.

The operational phase of the Croaghaun Wind Farm will provide an upgrade of 2.74km of existing forest track for the purpose of recreation and amenity. A section of these upgraded tracks form part of the existing Kilbrannish Wood recreation trail as well as a section of the South Leinster Way. An additional looped walking trail will be developed named the Croaghaun Wind Farm Trail. The inclusion of this element of the project will maintain and improve recreation activity at the site, provide a long-term significant positive impact on recreation, amenity and tourism.

There is however potential for a moderate negative impact on hang gliding and paragliding activities currently taking place in the area. The Mount Leinster area of Co. Carlow is known to be popular for Hang Gliding. Hang Gliding and Paragliding in Ireland is not regulated and the area in question is not designated for such activities. However, the IAA recommends that those considering in engaging in this activity contact the Irish Hang Gliding & Paragliding Association (IHPA)

Coillte have been consulting with the IHPA and will continue to consult in order to seek to minimise potential impacts on hang gliding activities in the area. However, for the purpose of this EIAR the worst case scenario is that the Westerly Car Park will become unusable for hang-gliding and paragliding. In such circumstances this will have a moderate negative impact however, the wind farm will not create an overall significant impact on this activity in the wider area as it will not negatively impact on the other locations for hang-gliding and paragliding activity in the area.

As part of ongoing engagement, Coillte have discussed the possibility of locating IHPA wind monitoring equipment on Croaghaun Wind Farm's permanent meteorological mast to allow IHPA to assess real time wind conditions prior to travelling to site.

While there is potential for a slight, temporary impact to recreation, amenity and tourism due to the closure of existing forestry tracks during the construction and decommissioning phases of the proposed development, there are no expected significant, adverse impacts to recreation, amenity and tourism in the surrounding area as a result of the development of the proposed Croaghaun Wind Farm. Under worst case scenario, a moderate negative impact to hang-gliding and paragliding activity will occur in close proximity to the site due to the presence of the proposed wind turbines, however, much of this activity is concentrated to the south of the site around Mount Leinster and can continue during the operational phase.

A residual long-term significant positive impact on recreation, amenity and tourism is expected as a result of the provision of new and improved recreation facilities at the site which will remain after decommissioning of the wind farm development.

11.5 Human Health

2016 Census Data indicates that the population of the study area is generally in good health with 89% of respondents stating they have good or very good health.

The construction works associated with the proposed development have potential to create health and safety hazards for both construction workers and the general public. Hazards may occur on site due to a range of construction activities. Potential health and safety hazards may occur on public roads and adjacent land uses including agricultural lands and forestry lands and associated recreation uses (forestry racks) due to construction activities. If unmitigated, hazards may be caused by the presence of a construction crew, increased traffic, presence of heavy goods vehicles and machinery, potential obstructions on the public road and potential obstruction to recreation and amenity trails.

At the time of preparation of the EIAR, the COVID-19 virus represents a significant risk to human health. Similar to any construction site, potential for spread of the virus during the construction phase of the proposed development may occur due to potential transmission from worker to worker due to construction activities and potential for close quarter working conditions. Up to date HSE guidance will be consulted regularly in line with HSA recommendations and all reasonable on-site and travel precautions will be taken if COVID-19 remains a significant health issue during the construction phase.

No significant impacts on air quality have been identified with regard to the emissions of construction related traffic. The potential impacts from noise during the construction phase are expected to have a slight and temporary impact on nearby homes. Noise levels are not expected to exceed construction noise limits. A slope stability assessment was carried out which indicated that a landslide is unlikely to occur at the site as a result of construction work. Flood risk assessment has indicated that flooding will not occur at the site. There is potential for impact to water quality as a result of construction work which could impact on ground water abstraction if unmitigated.

Appropriate site safety measures will be used during the operational phase by all permitted employees. Wind turbines are equipped with a number of safety devices to ensure safe operation during their lifetime. This includes anti-vibration sensors which will detect ice build-up on a turbine and switch it off until the ice is removed. Shadow flicker detection systems will be put in place which will turn turbines off during the period in which shadow flicker may occur on a house. There is no likely impact to public safety or employee safety as a result of the proposed development provided that mitigation measures are in place. Improvement of walking trails throughout the site will result in a positive health gain with potential to provide a moderate positive impact to human health in the locality.

A literature review was carried out in relation to potential impacts of wind turbines on human health. It is concluded that there is no scientific consensus to support an association between negative health impacts and responsible wind turbine development. Therefore, provided that mitigation measures are implemented, the operation of the wind farm is expected to have a negligible impact on human health and safety.

The project was assessed in relation to its vulnerability to potential natural disasters. This included an assessment of flooding, fire, landslides and major incidents involving dangerous substances. It is concluded that it is unlikely that the proposed development will be impacted by natural disaster.

The potential impacts associated with decommissioning phase in relation to human health will be similar to those associated with construction phase. Potential impacts to human health and safety on-site will be prevented through best practice methods.

If unmitigated, hazards to the public may be caused by the presence of a construction crew, increased traffic, presence of heavy goods vehicles and machinery, potential obstructions on the public road and potential obstruction to recreation and amenity trails. Potential impact to public health and safety during the decommissioning phase is moderate and temporary.

A Safety and Health Management Plan covering all aspects of the construction and decommissioning process will control site safety and other related issues. This plan will be prepared prior to construction and decommissioning and will include a traffic management plan. Best practice construction methods will be followed at all times. Public safety will be addressed by restricting access to the public in the vicinity of the site works during the construction and decommissioning stage. Appropriate signage will be utilised to raise awareness.

Access to electrical infrastructure will be prohibited during the operational phase. All personnel working on the site will be appropriately trained and will be equipped with the necessary protective equipment. Lightning conductors will be installed on each turbine and lights will be installed on each turbine as an aircraft safety precaution. Ice detection systems will be installed in each turbine to prevent turbines from rotating while ice is forming on a blade. A shadow flicker detection system will be installed on all turbines which will prevent shadow flicker from occurring at nearby homes. Noise control measures will be used in times of high winds to prevent excessive noise at nearby homes. Fire safety measures and equipment throughout the site will be kept in effective working order. Routine maintenance will take place.

Due to the significant setback distance, elimination of shadow flicker and noise control measures to reduce potential impacts on nearby homes as well as the mitigation measures set out throughout the EIAR, impact on human health as a result of the Croaghaun Wind Farm is expected to be imperceptible.

Long-term positive residual impacts will occur due to the provision of clean, renewable electricity. The operation of the Croaghaun Wind Farm will result in the net displacement of 98,725 tonnes of CO2 per annum which would otherwise be emitted through the burning of fossil fuels.

The use of upgraded forest tracks and provision of a new looped walking trail for recreational activity will provide opportunities for health gain through encouragement of exercise. This has potential to provide a long-term moderate positive impact to human health in the locality.

11.6 Renewable Resources, Non-Renewable Resources and Utility Infrastructure

There are a number of disused quarries and mineral occurrences in the vicinity of the site. There is also two active quarries nearby in Clonmelsh and Millford. It is proposed to haul construction materials from batching plants, quarries and pits within the vicinity of the proposed development. The quarries and pits within the vicinity of the proposed development provide sources of aggregates, hardcore, fill materials, washed sand and gravel, pebble sand aggregates and mortar. Ready mix concrete will be sourced from batching plants. In terms of other non-renewable resources within the site area, there is peat boglands located north of the east of the site and another area of peat bog to the north west of the site

Renewable resources in the area includes extensive forestry plantations.

Construction will impact on a natural resources such as aggregates (sand, gravel, crushed stone) which will be sourced from quarries and pits in the area. 15,000m^3 of aggregate materiel will be taken from an onsite borrow pit located at the site. This will result in a slight, permanent impact on non-renewable resources of the area.

24.4 hectares of commercial forestry will be felled to accommodate the proposed development. Impact on renewable timber resources will be imperceptible due to replanting of forestry at an alternative site.

Once the Croaghaun Wind Farm is operational, the potential for negative effects on material assets is minimal. 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 positive impact and will contribute to reducing Ireland's dependency on imported fuel resources.

Mitigation measures relating to land use primarily relate to the appropriate management of construction impacts which are outlined in the CEMP submitted with the EIAR.

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

The proposed development will result in a positive residual impact on non-renewable resources by offsetting the use of fossil fuels in electricity generation over the lifetime of the project.

The proposed development will result in a positive residual impact on non-renewable resources by offsetting the use of fossil fuels in electricity generation. The two proposed substations are expected to be taken in charge of by Eirgrid or ESB following decommissioning, providing a positive residual impact on electricity infrastructure in the area.

12. 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 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. At greater distances the effects are generally considered to be negligible.

A study area of 1,380m from each of the 7 wind turbines was selected for this assessment. This is based upon ten times the maximum rotor diameter (138 m) that would be used within the proposed development in in accordance with current guidelines. The assessment considers all identified potential shadow flicker sensitive receptors within the study area. For this assessment, inhabited residential buildings have been considered sensitive receptors (no other property types were identified within the study area).

It is possible to predict the total theoretical number of hours per year that shadow flicker may occur in a building from the relative position of the turbines to the building, the geometry of the wind turbines, the latitude of the wind turbine site and the size & orientation of the windows potentially affected. These predictions can then be used to identify the times when curtailment may be required in order to mitigate the effects of shadow flicker. The assessment assumes that the sun is shining all day, every day.

The potential for shadow flicker to occur and the intensity and duration of any effects depend upon the following factors:

- the location and orientation of the window relative to the turbines;
- whether a window has direct, unobstructed line of sight to the turbine rotor;
- the distance of the building from the turbines;
- the turbine geometry;
- the time of year (which impacts the trajectory of the sun's path across the sky);
- the frequency of cloudless skies (particularly at low elevations above the horizon); and,
- the wind direction (which impacts on turbine orientation).

A shadow flicker model was created using computer software. This calculates all the possible instances of shadow flicker throughout the year at all shadow flicker sensitive receptors (houses and offices) within the study area. This assumes that there are clear skies 100% of the time, all windows have unobstructed views of the turbines and all turbines are facing the window at all times. In reality shadow flicker will only occur some of the time, as turbines will not always be orientated as described, clouds will obscure the sun and line of sight may be obscured by trees or other obstacles. A correction factor is then applied to the theoretical occurrence figures which considers the average % of time per year that there are clear skies. The likely occurrence of shadow flicker can then be calculated.

In total, 30 properties have been identified within 10 rotor diameters (1,380m) of the turbines; all have been identified as dwellings and are therefore considered potential shadow flicker receptors. There are no receptors within 500 m of the proposed wind turbines.

There is the potential for shadow flicker to occur at 22 of the 30 receptors considered within the overall study area (10 rotor diameters); at the remaining 8 receptors no shadow flicker effects are predicted.

The shadow flicker model for potential annual impacts sets out the total theoretical hours per year which each receptor can potentially receive shadow flicker; the model utilises a number of conservative assumptions which help to identify all periods and locations where shadow flicker may occur, however it does not account for weather conditions, which have a significant impact upon the amount of shadow flicker which may actually occur.

In order to consider a more realistic 'likely' scenario, annual average sunshine hours for the region have been taken into account. Predicted 'likely' levels of shadow flicker, taking annual average sunshine hours into account, are below the *Wind Energy Guidelines* (2006) recommended 30 hours per year threshold at all receptors.

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 hours per day of shadow flicker exceeds 30 minutes at 12 receptors within the overall study area, however the average theoretical hours per day exceed 30 minutes at only 2 receptors.

Greenoge Wind Farm is considered in relation to potential cumulative impacts of shadow flicker. Potential cumulative impact of shadow flicker is negligible when considering the potential impacts of Croaghaun Wind Farm in combination with the operational Greenoge Wind Farm.

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 exceeds the thresholds as set out in the WEDG 2006 and therefore the project can demonstrate compliance with the Guidelines.

13. TRAFFIC AND TRANSPORT

The construction of the project in its entirety is expected to take between 12 – 18 months. There are a number of items which will be conducted in parallel, but the basis of the construction programme will involve site establishment, site access road and drainage construction, hardstanding construction and substation works. The grid connection works are likely to be done in parallel with the site works and the turbine installation works will be completed before commissioning, reinstatement and landscaping. However, it is also possible that the grid route could commence prior to the on-site infrastructure or subsequent to the construction of the on-site infrastructure. Carrying out the grid connection works in parallel with the site works represents the worst case scenario.

Croaghaun Wind Farm shall have one site entrance which will be used for both construction and operation. Access to the site shall be via an existing Coillte forestry entrance on the L2026. This site entrance shall be developed in accordance with TII design guidelines and is capable of achieving sightlines of 160m in both directions at a setback distance of X=3m.

Underground grid route connection works to Kellistown substation will involve the installation of ducting, joint bays, drainage and ancillary infrastructure and the subsequent running of cables predominantly along the existing road network. This will require delivery of plant and construction materials, followed by excavation, laying of cables and subsequent reinstatement of trenches.

It is expected that full road closures will be put in place to facilitate cabling works in combination with lane closures, partial road closures and stop/go systems. This will enable the works to be completed as quickly and as safely as possible, with minimal disruption time for residents of the area. These works shall be undertaken on a rolling basis with short sections closed for short periods before moving onto the next section.

In constructing the wind farm, materials and plant will need to be delivered to the site. The material haul routes will include some of the surrounding road network which will need to cater for the additional traffic associated with the project.

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

- Loads will depart Dublin Port and travel through the Dublin Port Tunnel to the M50;
- Loads will travel south on the M50;
- Loads will continue south on the N11 and M11;
- Loads will depart the M11 and continue west on the N30;
- Loads will continue north west on the N30 and onto the N80 to Bunclody;
- Loads will travel through Bunclody on the N80 before departing left onto the L2026 travelling west;
- Loads will continue west on the L2026 to the proposed site entrance.

In some cases, accommodation works are required along the turbine delivery route such as hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and local road widening.

All turbine blades will be carried on a hybrid trailer to reduce the need for mitigation in constrained sections of the route. Towers will be carried in a 4+7 clamp adaptor style trailer, whereas loads such as the hub, nacelle housing and drive train will be carried on a six axle step frame trailer.

For oversized loads associated with turbine component deliveries, it is proposed to construct a temporary bridge directly south of the existing bridge crossing on the L2026. The temporary bridge will comprise of a modular steel structure that shall be assembled and erected on site by a crane.

A temporary stone access track and hard standing will be constructed to facilitate the installation of the crossing as well as laying of aggregate load bearing surface to public road verges. The works will include the removal of hedgerows and trees within the footprint of the works, construction of concrete bridge supports which will be built from both the field and public road and lifting of the assembled bridge structure into place. The bridge components will be delivered to site on standard HGV's.

The bridge will only be used for oversized turbine component deliveries. Following completion of turbine component deliveries, the bridge shall be disassembled and removed. The temporary aggregate track hard standing areas shall be removed and fully reinstated. Concrete bridge supports shall be left in situ, covered with soil in line with ground level and grass will be reinstated

The construction activities associated with the wind farm will lead to additional construction related traffic on the existing public road network over the duration of the construction works. These impacts will include:

- Heavy Goods Vehicles (HGVs) transporting materials to and from the site, including road making materials, concrete, building materials, drainage/ducting materials, cabling, electrical components and excavated material.
- HGVs transporting conventional earthworks machinery such as excavators, dumper trucks and rollers.
- Fuel trucks transporting fuel for plant to each site compound during the construction phase
- Light Goods Vehicles (LGVs) such as cars, 4x4s and vans used by the workers and supervisory staff involved in the construction works.
- Oversized loads including turbine components.

The cable route construction works will involve constantly moving the working area as the cable installation works progress. Grid works within the public road corridor are estimated to take approximately 10 months on the assumption that an average of 75m of cable is installed each day. These works will lead to additional traffic associated with the cable route construction.

The grid connection construction works will require a combination of temporary road closures with traffic diversions and temporary lane closures along the proposed route. All road works will be subject to a road opening licence, but it is anticipated that the cable installation along local roads will be advanced using a combination of rolling lane closures and temporary road closures where the existing road width is insufficient to accommodate an open lane for traffic to pass the works area.

The delivery of turbine components including blades, tower sections and nacelles is a specialist transport operation owing to the oversized loads involved. The blades are the longest component and have been considered for the purpose of this assessment. Turbine component deliveries will be carried out during off-peak times and will be done using a convoy and a specialist heavy haulage company. Turbine deliveries will also be escorted by An Garda Siochána. This will ensure the impacts of the turbine deliveries on the existing road network are minimised.

A number of measures will be employed during construction to reduce and minimise disruption to the public and road users. These measures include the following:

- A Traffic Management Plan to be implemented
- A Traffic Management Coordinator to be appointed
- Road pre-condition survey to be carried out
- Road reinstatement on completion of the works
- Site inductions – all workers will receive an induction
- 24-hour emergency contact
- Traffic management guidance – all temporary traffic management will be planned and executed in accordance with best practice
- Letter drops will be carried out
- Signage – clear signage will be provided
- Road sweeper – if necessary a road sweeper will be used
- Site entrance – the entrance will be secured when not in use and when necessary a flagman will be used.

Negative or adverse effects on the receiving environment associated with the construction works within the main wind farm site are considered to be short-term in duration and slight in significance following mitigation.

Negative or adverse effects on the receiving environment associated with the turbine delivery route are considered to be temporary and imperceptible following mitigation.

Negative or adverse effects on the receiving environment associated with the grid connection route are considered to be temporary and slight following mitigation.

The trip generation for the development once operational is anticipated to be minimal. Effects on the receiving environment associated with the operation phase of the development are considered to be neutral in terms of quality, long-term in duration and imperceptible in significance.

14. ARCHAEOLOGY, ARCHITECTURAL AND CULTURAL HERITAGE

There are no recorded archaeological sites located on the footprint of any element of the main wind farm site while there are nine examples ranging from the late prehistoric to post-medieval periods located within the surrounding 2km study area. There are no designated architectural heritage structures within the site or the surrounding study area.

A review of the public roads and local diversions through a number of green field areas that will form the grid connection revealed no recorded archaeological sites or designated architectural structures located on the direct footprint of the route. A review of the locations of two substation options adjacent to the existing Kellistown substation revealed that they are no recorded sites or structures at either location. There are a number of recorded archaeological sites and architectural heritage structures in adjoining lands within 100m of roads along the grid connection, but none have recorded elements that extend into the footprint of the route. There are no recorded sites located within 100m of the sections within green field areas.

A masonry road bridge, known as Ballynunnery Bridge, located on a section of the route is not listed in the RPS or NIAH for County Carlow. The crossing at this location will comprise horizontal directional drilling which will not require any interventions to the bridge or watercourse. In addition, the grid connection does not extend through any towns or villages. While the route avoids Myshall village it does extend along a section of the L3033 road located c.450m to the south of the settlement. This road is known locally as the Croppy Road and it is recorded that this name originated in the aftermath of the 1798 rising when a local priest interceded with Robert Cornwall of Myshall Lodge on behalf of members of the outlawed United Irishmen who were given the option of building the road rather than facing execution. A review of the 6-inch OS map (1830s-40s) indicates that the existing public road follows the same line as the 19th century road. While the former road is not a recorded archaeological site or a designated architectural feature, any buried remains will be of local cultural heritage interest.

The proposed delivery route to the main wind farm site will extend from Dublin Port and not require the construction of new roads or interventions to any architectural heritage structures. The section of the L2026 road that will form part of the delivery route to the south of the main wind farm site truncates a levelled enclosure site (CW020-008----) in Kilbrannish North townland. Works in this area will entail minor widening of the disturbed road verge within the Zone of Notification (ZON) of this enclosure and the construction of a temporary bridge structure over a stream to the east which will not extend into the ZON. The temporary bridge will not require any in-channel works.

The construction phase of the main wind farm site and grid connection will result in no predicted direct or indirect impacts on the known cultural heritage resource. The turbine delivery route will require minor road widening works within the Zone of Notification for enclosure (CW020-008----) in Kilbrannish North townland to the south of the main wind farm site. Given the previous disturbance of the location of the proposed minor widening works by the construction of the existing road and a modern drain within the verge, it is predicted that this work will result in a not significant, direct negative impact on the enclosure.

The operation phase of the proposed project will result in no predicted direct impacts on the known cultural heritage resource. The successful implementation of the construction phase archaeological mitigation measures presented within the chapter will result in the preservation *in situ*, by avoidance, or the preservation in record, by archaeological excavation, of any unrecorded, sub-surface archaeological features that may exist within proposed development areas. There will, therefore, be no predicted impacts on any such potential unrecorded archaeological sites during the operational phase.

There are nine recorded archaeological sites located within 2km of the main wind farm site and none are located within 550m of proposed turbine locations. The extant standing stone (CW020-028----) within the study area is c.560m from the nearest turbine and is screened from the main wind farm site to the east by existing topography. The remaining archaeological sites within the study area are either levelled or partially levelled and possess no visual sensitivities such as alignments across the landscape. There will, therefore, be no predicted indirect impacts on the setting of the cultural heritage resource within 2km of the main wind farm site during the operational phase.

The recorded archaeological resource within an area extending for 10km from the proposed development was assessed to determine the presence of National Monuments and other monuments that may have potential visual alignments across the wider landscape. Three monuments with potential visual alignments within the hills to the southwest (cursus sites CW020-026---- & CW020-027---- and stone row CW020-017----) have low surface expressions and are not aligned towards the main wind farm site. The proposed development will result in not significant, indirect negative impacts on the setting of these monuments during the operational phase.

The assessment of visual impacts undertaken by the Landscape and Visual Impact Assessment consultant within the wider 20km area included a number of cultural heritage receptors accessible to the public which are identified in Chapter 15. The assessment of the sensitivities and impacts on the cultural heritage receptors presented in that chapter were reviewed by the archaeological consultant during the assessment process. No significant operational phase visual impacts on these cultural heritage receptors were identified.

The grid connection will comprise a buried cable within the existing road network and will result in no predicted direct or indirect impacts on the cultural heritage resource during the operational phase.

No impacts relating to the turbine delivery route will arise during the operational phase.

A review of a number of developments was undertaken in order to assess the potential for cumulative impacts on the cultural heritage resource. These included a review of a separate assessment of proposed replacement tree replant lands as well as the surrounding forestry plantations and an existing wind farm to the east of the main wind farm site. The proposed project will not result in any predicted cumulative impacts on the cultural heritage resource in combination with these developments.

A systematic advance programme of archaeological site inspections will be undertaken within all development areas following pre-construction tree felling and this will be followed by monitoring of ground excavation works during the construction phase under licence by the National Monument Service. In the event that any previously unrecorded archaeological sites are identified they will be recorded and cordoned off while the National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation by avoidance or preservation by record through a systematic archaeological excavation.

A programme of licensed archaeological monitoring of all ground excavation works within the environs of recorded archaeological sites as well as the Protected Structure in Kilknock townland will be carried out during the construction phase. Trenching works within all green field areas and along the section of the route extending along the Croppy Road to the south of Myshall will also be subject to archaeological monitoring. An archaeological watching brief of ground excavation works will be maintained for the remainder of the grid connection works.

The delivery of turbines to the main wind farm site will require minor widening works along a disturbed verge of an existing public road at the location of an enclosure (CW013-003----) and the creation of a temporary bridge structure to the east of its location, both of which are located in Killbrannish North townland. All ground works at these locations will be subject to archaeological monitoring.

No residual impacts on the architectural heritage and undesignated cultural heritage resources are predicted to arise from the proposed project.

15. LANDSCAPE AND VISUAL

15.1 Receiving Environment

Situated in the northern foothills of the Blackstairs Mountains, the main wind farm site extends across Croaghaun Hill, which rises to a max elevation of 455m AOD. North and west of site the terrain swiftly descends towards the lowland context of County Carlow, whilst a collection of rolling hills at similar elevations occur immediately east of the main wind farm site and includes Kilbranish Hill, Greenoge and Johns Hill. Immediately south of the site the terrain transitions to the principal ridgeline associated with the Blackstairs Mountains which is oriented in a general north-south direction and denotes the county boundary between Carlow and Wexford. Mount Leinster is the highest peak in the Blackstairs rising to a height of 794m AOD and begins to ascend from its foothills c.2km south of the proposal site. Emerging from the northern slopes of Mount Leinster, the Burren River and several of its tributaries flow immediately south and west of Croaghaun Hill whilst the River Clody and its tributaries flow to the east of Mount Leinster and its surrounding hills, before merging with the River Slaney at the settlement of Bunclody. Away from the rolling hills and upland context of the central study area, much of the wider study area in County Carlow constitutes a relatively flat landscape punctuated by small streams, river valleys, and isolated rolling hills.

In terms of surrounding land uses the proposed wind farm site is located in an area of commercial conifer forest that cloaks the upper slopes of Croaghaun Hill. The surrounding hillsides transition between naturalistic moorland and blocks of commercial forestry, with the lower slopes contained in areas of pastoral farmland. Whilst large blocks of conifer forest and mountain moorland exist to the south of the site and cloak upland areas of Mount Leinster and the surrounding Blackstairs, the primary land use within the study area is that of pastoral farmland. Wind energy developments are also an established land use within the central and wider study area. An existing wind farm development at Greenoge is situated immediately east of the site, whilst several existing wind energy developments are located along the upper slopes of rolling hills and ridgelines in the eastern half of the study area in both Wicklow and Wexford.

Myshall is the nearest centre of population to the proposed wind farm development located 2km to the northwest. Situated just over 4km west of the Croaghaun Hill is the small village of Drumphea. The small settlement of Kildavin is located just over 4km northeast of the site whilst the modest-sized settlement of Bunclody is situated along the meandering corridor of the River Slaney and is just over 5km east of the proposed wind farm. The wider study area also comprises of numerous modest sized towns and village. In terms of larger settlements in the wider surrounds of the study area, Carlow town is located on the northern periphery, whilst Ennischorthy is located just over 20km south east of the site.

The most notable major route within the study area is the M9 motorway which occurs on the outer northwest quadrant of the study area. Within the central study area, the most notable major route in relation to the main wind farm site is the N80 national secondary route which passes just over 3.5km east of the proposed development. Other notable major routes within the central study area include the R724 regional road which links the settlements of Kildavin, Myshall, Fenagh, and Bagenlstown and is situated just over 2km north of the site. In terms of local roads the nearest and most relevant to the main wind farm site L2026 and L3005 local roads which both occur immediately south of the main wind farm site and host sections of the Mount Leinster Heritage drive.

Recreation within the study area is primarily associated with the uplands, most notably the Blackstairs Mountains which are noted in the current county development plan as “one of the most important natural attractions in the country”. The Blackstairs Mountains host numerous walking, cycling trails and scenic driving routes including the South Leinster Way and Mount Leinster Heritage Drive. The Blackstairs Mountains are also a popular launch location for hang gliders and paragliders in Ireland.

Other notable walks within the wider study area included the Wicklow Way and the Barrow Way, whilst numerous heritage features are also dotted throughout the wider study area and include Huntington Gardens and Ballymoon Castle. Another notable amenity and heritage feature is Vinegar Hill which is situated just over 22km southeast of the site.

15.2 Landscape Impact Assessment

There will be physical impacts on the land cover of the site as a result of this development, but these will be relatively minor in the context of the already modified context of the conifer forest plantations that typically carpet the main wind farm site. Furthermore, a high proportion of the existing track network from forest plantations will be utilised in the construction and operational phases of the development.

The principal landscape impact will be the change in character of the immediate area due to the introduction of large scale structures with moving components. These will be a prominent and defining landscape feature within the local landscape as would be the case for a commercial scale wind farm placed into almost any landscape context. Nonetheless, this is a broad landscape context of upland mountains cloaked in moorland, broad rolling ridgelines and large scale conifer plantations. In this respect, the proposed wind farm will be well assimilated in terms of its scale and function surrounded by these large scale landscape features and broad land cover patterns of the central study area. The proposed wind farm will be a defining feature of the landscape character in the central study area, but it is not considered to be an unfamiliar feature within this robust and productive landscape setting that comprises of several other wind energy developments, most notably the neighbouring Greenoge Wind Farm. There will also be some minor landscape impacts associated with the construction of the on-site and off-site substation in addition to the grid connection.

Overall, it is not considered that the proposed wind farm will give rise to significant landscape impacts. Instead, the significance of landscape impacts is considered to be Moderate- within the immediate context of the site (<5km). Thereafter, significance will reduce to Slight and Imperceptible at increasing distances as the development becomes a progressively smaller component of the wider landscape fabric.

15.3 Visual Impact Assessment

The visual impacts of the proposed Croaghaun Wind Farm development were assessed across 37 different viewpoints where the sensitivity of each receptor varied widely from Low to High. The higher levels of sensitivity often related to elevated views from the uplands, which afford vast panoramas over the landscape or alternatively, represent outdoor recreationalists. Medium-low sensitivity tends to be attributed to less remarkable views that contain a varied mix of anthropogenic land uses.

The highest impact significance typically relates to views from the Blackstairs Mountains within the central parts of the study area. Route Screening Analysis also identified this area as the area most likely to afford clear views of up to 7 of the proposed turbines. Many of these views are representative of a mix of scenic designations and amenity and heritage features such as the highly sensitive Nine Stones Viewpoint. The nearest viewpoint to the main wind farm site is VP24 and will afford a clear view of the proposed development at a near distance. Whilst the turbines present here at a substantial scale and have a highly dominant visual presence from this near distance, they will be viewed in a relatively clear and legible manner and will not have a notable bearing on the most sensitive aspect of this panorama which is to the west across the central Carlow lowlands.

A range of viewpoints were also selected to represent the local community. These are the people who live, work and move around the area within approximately 5km of the site (the central study area) and are the people most likely to have their visual amenity affected by a wind energy proposal due to their proximity to the turbines. The nearest of the local community views are represented by VP19 and VP30 where the proposed turbines will typically present in a prominent manner which is accentuated by the uphill nature of these views. Nevertheless, the turbines will not be visually overbearing and generally appear well spaced with little or no turbine overlap.

It is also important to note that a large portion of the study area will afford no visibility of the main wind farm site, most notably the southern extent of the Blackstairs Mountains in addition to the corridor of the River Barrow in the western half of the study area. Even where the proposed turbines are visible, significant visual impacts are not considered to occur in respect of the proposed Croaghaun Wind Farm. This is on the basis that the proposed turbines are considered to be well sited in a robust and transitional part of the study area that can accommodate a development of this scale and nature.

15.4 Cumulative Impact Assessment

With regard to cumulative effects, wind energy development has been an established landscape feature within the study area for the past decade, although it is typically contained in its eastern half. The nearest development to the main wind farm site is that of Greenoge Wind Farm and comprises of 5 turbines located across Kilbrannish Hill. As a result of its near proximity to the main wind farm site, both the proposed Croaghaun and existing Greenogue turbines will more often than not be viewed in combination. Whilst there will be some parts of the study area that will afford slightly cluttered views of both the proposed and existing developments, for the most part, the existing and proposed turbines will generally appear together in a clear and comprehensible manner with little scale confusion, despite the fact that the proposed turbines are considerably larger in scale.

The most notable area of existing wind farm development occurs to the east of the site in the northern areas of Wexford and south-western parts of County Wicklow. In all instances where the proposed Croaghaun development is visible from the eastern and northern portions of the study area, it will be viewed in combination with the existing Greenoge development and/or the existing wind energy developments to the east/southeast of the proposed Croaghaun Wind Farm. As wind energy development is a notable established feature in the eastern and south-eastern portions of the study area, the proposed Croaghaun Wind Farm will only add marginally to the intensity of such development without materially contributing to a sense of proliferation.

In terms of sequential cumulative views, the proposed development will theoretically be visible in combination with existing wind energy developments along a number of key linear receptors within the study area, most notably the N80 national secondary route, the South Leinster Way walking route and the Mount Leinster Heritage Drive.

Overall, it is considered that the proposed Croaghaun turbines will often be viewed in combination with other wind energy developments, most notably the existing Greenoge turbines. However, rather than contributing to a sense of dispersal and proliferation they serve to consolidate and intensify the wind energy development already present on the Greenoge – Croaghaun ridgeline resulting in a combined development that still remains characteristic of medium-sized developments in this area.

16. TELECOMMUNICATIONS AND AVIATION

16.1 Telecommunications

In the context of wind farm development, electromagnetic interference is the impact of a wind farm on existing telecommunication services resulting in an unacceptable negative impact. 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 telecommunication links
- Television broadcasts

Wind Farms, their cable routes and the delivery of components to site can also impact on underground telecommunications and overhead lines.

As part of the EIAR scoping and consultation exercise, FT contacted the relevant national and regional broadcasters, fixed and mobile phone operators, aviation authorities and other relevant consultees.

The Broadcasting Authority of Ireland, Three, Eir and ESB all responded confirming that the wind farm will not impact on their services. No existing telecommunications infrastructure was found by the project team during a desk based survey within proximity of the proposed wind farm. According to the Comreg siteviewer[1], the nearest telecommunication masts are located at Mount Leinster where 4 no. masts are located, approximately 5.4km southwest of the proposed turbines. There are 6 no. masts located at Bunclody, approximately 8km southeast of the proposed turbines. The combination of the findings of the consultation and desk based study confirms there will be no significant electromagnetic interference effect caused by the proposed project.

The temporary disconnection of overhead lines for the delivery of turbine components to the site will result in a temporary disruption to power and telecommunications services for existing residents and businesses.
For the cable route, in advance of construction all underground cables will be identified and the installation of the wind farm cabling works will minimise conflicts with other services by achieving a minimum 300mm separation from existing services.

As there is no potential for electromagnetic interference from the proposed project on telecommunications, there are no mitigation measures proposed for the construction, operation or decommissioning phase of the proposed project

The proposed grid connection will be left in situ underground within the public roadway. There are no telecommunications or broadcasting mitigation measures proposed.

[1] Comreg Siteviewer. https://siteviewer.comreg.ie/#explore

In advance of the main grid connection works an assessment will be carried out to define the precise alignment of the cable route within the corridor which has been assessed. This will include slit trenching with the aim of avoiding existing services in the road.

Overhead telecommunication lines will be placed underground or reinstated following turbine delivery to the site at the end of the construction phase. No mitigation measures are required.

16.2 Aviation

There is potential for aviation impacts during the late construction phase of a wind farm project and prior to the commissioning of the proposed project as the wind turbines are constructed and placed in situ. The turbines could be considered to be an obstacle to low flying craft. No scoping response was received by the IAA or DAA citing any concerns with the proposed project, the closest airport to the proposed wind farm is Kilkenny Airport, a private licenced facility, c. 33.6km west, followed by Waterford Airport, c. 55.6km southwest. Noting the presence of existing adjacent turbines to the proposed wind farm and the distances to existing airports, it is considered therefore that there will be no significant effect on aviation from the proposed project during the construction and operational phase.

As the proposed grid connection will be constructed underground within the public roadway, there are no construction related impacts on aviation interests in the area.

No mitigation measures are required for aviation. In line with standard practice with wind farm developments the coordinates and elevations for turbines will be supplied to the IAA and DAA at the end of the construction phase. If aviation lighting is required by IAA or DAA for some turbines the developer commits to installing same.

17. INTERACTIONS OF THE FOREGOING

The requirement for the identification of interactions between the various aspects of the environment as detailed throughout the EIAR is set out in Article 3(1) of the amended EIA Directive 2011/92/EU as amended by the Directive 2014/52/EU, which states the following:

The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

a) population and human health;
b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;
c) land, soil, water, air and climate;
d) material assets, cultural heritage and the landscape;
e) the **interaction between the factors referred to in points (a) to (d).**

This Chapter considers the potential for interactions and inter-relationships between one aspect of the environment and another which can result in an impact being either positive or negative, as well as having varying significance. The chapter considers potential significant environmental effects that may occur in terms of Air Quality & Climate, Noise & Vibration, Biodiversity, Land, Soils & Geology, Hydrology & Water Quality, Population & Human Health, Material Assets, Shadow Flicker, Traffic & Transportation, Archaeology, Architectural & Cultural heritage, Landscape & Visuals and Telecommunications & Aviation, as a result of the proposed project as described in Chapter 3 of this EIAR.

Direct, indirect, cumulative, and interactive impacts were considered during the siting of the proposed turbines and associated infrastructure in order to minimise impacts on the environmental aspects mentioned above. The interactions and inter-relationships of the potential impacts as set out throughout this EIAR are detailed in this Chapter.

Each individual chapter of the EIAR has had regard to interactions between different potential impacts. For example, Hydrology & Water Quality has had regard to potential impacts on Biodiversity; and Land, Soils and Geology has had regard to potential impacts on both Biodiversity , Hydrology & Water Quality and Traffic & Transportation.

The proposed Croaghaun Wind Farm project has potential to impact on various environmental aspect as detailed throughout the EIAR. There are interactions and inter-relationships between these aspects. The EIAR has considered these interactions and inter-relationships throughout the assessment, firstly through the design of the wind farm site, grid connection route and turbine delivery route, to avoid impacts where possible and also in the definition of suitable mitigation measure to minimise potential impacts. It is therefore considered that the significant impacts associated with the interactions of environmental effects will be avoided due to the implementation of mitigation measures as detailed throughout the EIAR.

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