5. POPULATION AND HUMAN HEALTH

5.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) identifies, describes and assesses the potential effects of the Proposed Project on population and human health and has been completed in accordance with the Environmental Impact Assessment (EIA) guidance and legislation set out in Ch. 1: Introduction. The full description of the Proposed Project is provided in Ch. 4: Description of the Proposed Project of this EIAR.

As detailed in Section 1.1.1 in Ch. 1: Introduction, for the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Project', 'Site', 'Proposed Wind Farm site', 'Proposed Wind Farm' and 'Proposed Grid Connection'.

One of the principal concerns during the development process is that human beings, as individuals or communities, should experience no significant diminution of their quality of life from the direct, indirect or cumulative effects arising from the construction, operation and decommissioning of a development. Ultimately, all the effects of a development impinge on human beings, directly and indirectly, positively and negatively. The key issues examined in this chapter of the EIAR include population, human health, employment and economic activity, land use, residential amenity (including visual amenity, shadow flicker and noise), community facilities and services, tourism, property values, traffic and health and safety.

5.1.1 Statement of Authority

This section of the EIAR has been prepared by Ciarán Fitzgerald and Robert Kennedy and reviewed by Eoin McCarthy, all of MKO. Ciarán Fitzgerald is an Environmental Scientist who has been working with MKO since June 2024. Ciarán holds a B.Sc. (Honours) in Marine Science from the National University of Ireland Galway and a First-Class Honours PG. Dip in Geographic Information Systems from University College Cork. Ciarán works as part of the Environmental Renewables team as well as a larger multidisciplinary team. Ciarán's role involves undertaking tasks such as report writing, EIAR chapter writing, and QGIS mapping. Prior to joining MKO, Ciarán spent time aboard the research vessel "Celtic Explorer," working as part of a team undertaking chemical water data, pelagic species abundance and sorting, bathymetric GIS mapping, data collection, and report writing. Ciarán's key strengths lie in GIS mapping and communication. Since joining the company, Ciarán has been involved in a range of projects, including onshore wind, offshore wind, and solar, contributing by reviewing EIAR chapters and assisting with project development. Ciarán holds a membership from the Institute of Sustainability and Environmental Professionals (ISEP). Robert is a Project Environmental Scientist working as part of MKO's Renewables Team, having joined the company in June 2022. Robert holds a BSc in Environmental Biology and an MSc in Environmental Policy, both from University College Dublin. Robert's key strengths and areas of expertise are in project management, environmental impact assessment, renewable energy, report writing, and research. Since joining MKO, Robert has worked with and coordinated large multi-disciplinary teams involved in the production of EIA Reports for large-scale renewable energy developments. Robert's experience spans a broad range of wind energy developments, including applications for new onshore and offshore wind farms, lifetime extension projects, and substitute consent. Robert also played a role in developing MKO's new service offering around Biodiversity Net Gain and other nature-positive mechanisms. Prior to taking up his position with MKO, Robert worked in various roles in Canada and Ireland, giving him a broad mix of skills and experience to apply to his current role with MKO. Robert also holds a membership with the Institute of Sustainability and Environmental Professionals (ISEP). Eoin is a Project Director within the Environment Renewables team of MKO with over 14 years of environmental consultancy experience. Eoin holds a B.Sc. (Hons) in Environmental Science from NUI, Galway. Eoin took up his position with McCarthy Keville O'Sullivan in June 2011. Eoin's key strengths and areas of expertise are in project

management, environmental impact assessment, wind energy site selection and feasibility assessment. Since joining MKO, Eoin has progressed from Graduate to Senior level and has been heavily involved on a significant range of energy infrastructure, tourism, waste permit, flood relief scheme and quarrying projects. He has overseen the design phase and applications of some of the largest wind energy projects in Ireland. In his role as project manager, Eoin works with and co-ordinates large multidisciplinary teams including members from MKO's Environmental, Planning, Ecological and Ornithological departments as well as sub-contractors from various fields in the preparation and production of EIARs. Eoin is also involved in the development of project strategy for the projects that he manages. He has held the role of project manager and EIAR co-ordinator on over 700MW worth of wind energy projects. Within MKO Eoin plays a large role in the management of and sharing of knowledge with junior members of staff and works as part of a large multi-disciplinary team to produce EIA Reports.

5.1.2 Relevant Guidelines and Data Sources

In addition to the guidelines referred to in Section 1.2.1 and Section 1.2.2 of Ch. 1: Introduction of this EIAR, and Directive 2011/92/EU as amended by Directive 2014/52/EU, the following guidelines, plans and reports have also influenced the preparation of this chapter:

- Department of Health – Health in Ireland: Key Trends 2024[1];
- Environmental Impact Assessment of National Road Schemes- A practical Guide, National Roads Authority/ Transport Infrastructure Ireland, Revision 1, November 2008;[2]
- Fáilte Ireland EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects, July 2023[3];
- Health Impact Assessment Resource and Tool Compilation, United States Environmental Protection Agency 2016[4];
- Health Impact Assessment Guidance, Institute of Public Health Ireland. 2021[5];
- Framework for Human Health Risk Assessment to Inform Decision Making developed by the United States Environmental Protection Agency (US EPA) 2014[6];
- Institute for Environmental Management and Assessment (2022) Health In Environmental Impact Assessment: A Primer for a Proportionate Assessment[7];
- Institute for Environmental Management and Assessment (2022) Determining Significance for Human Health in Environmental Impact Assessment[8];

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[1] *Department of Health – Health in Ireland: Key Trends. Available at:* https://www.gov.ie/en/press-release/8168c-minister-for-health-publishes-health-in-ireland-key-trends-2024/#:~:text=the%20number%20of%20people%20in,perceived%20good%20health%20in%202022 *[Accessed on 06.03.2025]*

[2] *National Roads Authority - Environmental Impact Assessment of National Road Schemes – A Practical Guide* https://www.tii.ie/media/joodyduf/environmental-impact-assessment-of-national-road-schemes-practical-guide.pdf

[3] *Failte Ireland - EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects -* https://www.failteireland.ie/

[4] *United States Environmental Protection Agency- The Health Impact Assessment (HIA) Resource and Tool Compilation -* https://www.epa.gov/sites/default/files/2017-07/documents/hia_resource_and_tool_compilation.pdf.

[5] *Health Impact Assessment Guidance, Institute of Public Health Ireland. Available at:* https://www.publichealth.ie/sites/default/files/resources/HIA%20Guidance%20A%20Manual_0.pdf *[Accessed on 06.03.2025]*

[6] *United States Environmental Protection Agency -Framework for Human Health Risk Assessment to Inform Decision Making -* https://www.epa.gov/sites/default/files/2014-12/documents/hhra-framework-final-2014.pdf

[7] *IEMA Health In Environmental Impact Assessment: A Primer for a Proportionate Assessment. Available at:* https://www.researchgate.net/publication/358589092_Health_in_Environmental_Impact_Assessment_A_Primer_for_a_Proportionate_Approach *[Accessed on 06.03.2025]*

[8] *Institute of Environmental Management and Assessment (IEMA) Guide to – Effective Scoping of Human Health in Environmnetal Impact Assessment-* https://www.iema.net/media/s35fughe/iema-eia-guide-to-effective-scoping-of-human-health-nov-2022.pdf

- Central Statistics Office (CSO): Census of Ireland 2016; Census of Ireland 2022; Census of Agriculture 2020[9];
- Cork County Development Plan 2022-2028[10];
- The World Health Organisation (WHO) Environmental Noise Guidelines for the European Region (WHO, 2022 Update)[11]
- The World Health Organisation (WHO) Environmental Noise Guidelines for the European Region (WHO, 2018 Update)[12].

5.1.3 Scoping

Ch. 2: Background of the Proposed Project of this EIAR describes the scoping and consultation exercise undertaken for the Proposed Project. Relevant to this chapter, responses were received from the Health Service Executive (HSE), Uisce Éireann & Fáilte Ireland. As part of the EIAR scoping and consultation exercise, MKO contacted the relevant national and regional broadcasters, fixed and mobile telephone operators, aviation authorities and other relevant consultees in January 2025 including the IAA and 2RN; please see Section 15.2.4 of Ch. 15: Material Assets for further details.

Health Service Executive

A scoping response was received from the Health Service Executive (HSE) on 4th February 2025. The HSE requested a shadow flicker assessment is undertaken to identify any sensitive receptors which may be impacted by shadow flicker and noted that the environmental impact assessment must include all proposed mitigation measures, including air quality due to the nature of the proposed construction works generation of airborne dust has the potential to have significant impacts on "*sensitive receptors*". The response stated that a Construction Environmental Management Plan (CEMP) should be included in the EIAR which details dust control and mitigation measures. The HSE further stated that the EIAR should examine all likely significant impacts and provide the following information for each:

- Description of the receiving environment;
- The nature and scale of the impact;
- An assessment of the significance of the impact;
- Proposed mitigation measures; and,
- Residual effects

Directive 2014/52/EU has an enhanced requirement to assess likely significant impacts on Population and Human Health. It is the experience of the Environmental Health Service (EHS) that impacts on human health are often inadequately assessed in EIAs in Ireland. It is recommended that the wider determinants of health and wellbeing are considered in a proportionate manner when considering the EIA. Guidance on wider determinants of health can be found at www.publichealth.ie

The HSE advised that in addition to any likely significant negative impacts from the Proposed Project, any positive likely significant impacts should also be assessed.

The Environmental Health Service (EHS) recommends that the following matters are included and assessed in the EIAR:

- Public Consultation

[9] *Central Statistics Office – Census* - https://www.cso.ie/en/census/
[10] *Cork County Council – Cork County Development Plan 2022-2028* - https://www.corkcoco.ie/en/resident/planning-and-development/cork-county-development-plan-2022-2028
[11] *World Health Organization -Environmental Noise Guidelines for the European Region* - https://iris.who.int/bitstream/handle/10665/279952/9789289053563-eng.pdf?sequence=1
[12] *World Health Organization -Environmental Noise Guidelines for the European Region* - https://iris.who.int/bitstream/handle/10665/279952/9789289053563-eng.pdf?sequence=1

- Decommissioning phase of the proposed wind farm
- Siting and location of turbines
- Noise & Vibration
- Shadow Flicker
- Air Quality
- Surface and Groundwater Quality
- Geological Impacts
- Ancillary facilities
- Cumulative impacts

Impacts from shadow flicker are assessed in Section 5.3.6 and 5.4.3.2.7. An assessment of effects on human health as a result of impacts to air quality are assessed in Section 5.4 and in more detail within Ch. 10: Air Quality. An assessment of effects on human health as a result of impacts to water quality are assessed in Section 5.4 and in more detail within Ch. 9: Hydrology and Hydrogeology. An assessment of effects on human health as a result of impacts from noise and vibration are assessed in Section 5.4 and in more detail within Ch. 12: Noise and Vibration.

Uisce Éireann

Uisce Éireann (UE) provided a response to a scoping request on 10th February 2025, outlining that the Proposed Wind Farm site as described is unlikely to have a negative impact on UE's abstraction regime. MKO requested further information regarding the drinking water abstraction area. Further information was received on 21st of February 2025. Please see Section 9.1.3 of Ch. 9: Hydrology and Hydrogeology for further information on scoping with Uisce Éireann.

Fáilte Ireland

A scoping response was received from Fáilte Ireland on the 25th of October 2024 and provided the '*Fáilte Ireland's Guidelines for the Treatment of Tourism in an EIA 2023*', to inform the preparation of the EIAR for the Proposed Project. The report provides guidance for those conducting EIA and compiling an EIAR, or those assessing EIARs, where the project involves tourism or may have an impact upon tourism (see Section 5.3.2, Section 5.4.2.1.5, and Section 5.4.3.1.5 for further detail).

5.2 Assessment Methodology

5.2.1 Population

A desk-based assessment using sources and guidelines referenced in 5.2.2 below was undertaken to examine relevant information pertaining to the population impact assessment. Information on population statistics, employment and social data for the relevant Electoral Divisions (EDs) were obtained from the Central Statistics Office (CSO) for census years 2016 and 2022. Fáilte Ireland's EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects was also considered in this assessment. See Section 5.3 below.

In order to assess the population in the vicinity of the Proposed Wind Farm, the Population Study Area for this population assessment focuses on the EDs within which the Proposed Wind Farm site is within and adjacent to, namely Douce, Kealkill and Mealagh, but it also refers to county and national statistics.

In order to assess the population in the vicinity of the Proposed Grid Connection, a review of properties and planning applications in the vicinity of the underground electrical cabling route was carried out. There are 79 no. properties located within 250m of the Proposed Grid Connection.

The active construction area for the Proposed Grid Connection will be small, approximately 100 metres in length at any one time, and it will be transient in nature. Should separate crews be used during the construction phase, they will generally be separated by one to two kilometres.

5.2.2 Human Health

This human health analysis section was assessed using guidelines set out in Section 5.1.2 above.

The World Health Organisation's (WHO) defines health as:

> "*A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*".[4]

5.2.2.1 National Guidance

The '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*[13]' (EPA, 2022) advise that "*in an EIAR, the assessment of impacts on population and human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in this EIAR e.g., under the environmental factors of air, water, soil etc.*" Environmental Impacts from the Proposed Project which may also have an impact on population and human health are discussed in this chapter but addressed in more detail in the following chapters: Ch. 8: Land, Soils and Geology, Ch. 9: Hydrology and Hydrogeology, Ch. 10: Air Quality, Ch. 11: Climate, Ch. 12: Noise and Vibration, Ch. 13: Landscape and Visual, Ch. 15: Material Assets (including Traffic and Transport and Telecoms and Aviation).

As referenced in the Department of Housing, Planning and Local Government (2018) *Guidelines for Planning Authorities and An Bord Pleanála*, (taken from the European Commission's Environmental Impact Assessment of Projects: Guidance on the Preparation of the Environmental Impact Assessment Report (2017)), human health is, "*a very broad factor that would be highly project dependent.*" The report continues:

> '** The notion of human health should be considered in the context of the other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population.*'

EPA, 2022 also states that "*while no specific guidance on the meaning of the term Human Health has been issued in the context of Directive 2014/52/EU, the same term was used in 3.3.6 the SEA Directive (2001/42/EC). The Commission's SEA Implementation Guidance states 'The notion of human health should be considered in the context of the other issues mentioned in paragraph (f)'*" of the Directive, where paragraph f lists environmental factors such as soils, water, landscape, air etc. EPA, 2022 states that this approach is "*consistent with the approach set out in the 2002 EPA Guidelines where health was considered through assessment of the environmental pathways through which it could be affected, such as air, water or soil".* EPA, 2022 note that the above approach follows the 2002 EPA guidelines already in place which details the following:

[13] *EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports* <https://www.epa.ie/publications/monitoring–assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment.php>

'The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect or risk. This practice of reliance upon limits, doses and thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment'.

5.2.2.2 IEMA Guidance 2017

The Institute for Environmental Management and Assessment (IEMA) published 'Health In Environmental Impact Assessment: A Primer for a Proportionate Assessment' in 2017 examining what a proportionate assessment of the impacts on health should be in Environmental Impact Assessments. The document states that Health Impact Assessment (HIA) and EIA are separate processes.

'HIA is defined as a combination of procedures, methods and tools that systematically judges the potential, and sometimes unintended, effects of a policy, plan, programme or project on both the health of a population and the distribution of those effects within the population. HIA identifies appropriate actions to manage those effects... [...] ... HIA can inform EIA practice in relation to population and human health but conducting a HIA will not necessarily meet the EIA population and human health requirement. By the same token, conducting an EIA will not automatically meet the requirements of a HIA.'

The Primer Assessment Report acknowledges that *'disproportionate burdens maybe placed on developers if HIA is applied as a proxy for the consideration of population and human health in every future UK EIA'.* The focus of EIA should be on predicting health and wellbeing outcomes, rather than focusing on changes in determinants of health e.g., expected changes in noise levels. Determining the significance of impacts on population and human health should include a professional judgement, scientific literature; consultation responses; comparison with baseline conditions; local health priorities; and national/international regulatory standards and guidelines. The primer report refers to the WHO 2014 which provides and overview of health in different types of assessment:

"The health sector, by crafting and promoting HIA, can be regarded as contributing to fragmentation among impact assessments. Health issues can, and need to, be included [in impact assessment] irrespective of levels of integration. At the same time, from a civic society perspective, it would be unacceptable for HIA to weaken other impact assessments. A prudent attitude suggests optimizing the coverage of health along all three avenues:

- *better consideration of health in existing impact assessments other than HIA;*
- *dedicated HIA;*
- *and integrated forms of impact assessment."*

As such, the WHO does not support a stand-alone HIA unless it could be demonstrated to be of advantage over an EIAR. Therefore, given that this human health assessment is part of the EIAR; there is no stand-alone HIA.

5.2.2.3 EIA Significance Matrix for Human Health, IEMA Guidance 2022

The IEMA Working Group 2022 published *Determining Significance For Human Health In Environmental Impact Assessment'* [14] in response to gaps and inconsistencies across existing guidance documents as to how health is assessed in EIA, particularly with regard to significance. The aim of this

[14] *IEMA Working Group (2022) Determining Significance For Human Health In Environmental Impact Assessment. Available at: https://www.iema.net/media/yljb2nbs/iema-eia-guide-to-determining-significance-for-human-health-nov-2022.pdf*

report is to assist and streamline discussions for consultants producing the assessments and for the decision makers who are reviewing the assessments. The report states that an EIA must identify, describe and assess the direct and indirect significant effects in an appropriate manner of a proposed development on human health. It must include the information that may reasonably be required for reaching a reasoned conclusion on the significant effects, taking into account current knowledge and methods of assessment.

A wind farm is not a recognised source of pollution. It is not an activity which requires Environmental Protection Agency licensing under the Environmental Protection Agency Act 1992, as amended. As such, a wind farm is not considered to have ongoing significant emissions to environmental media and the subsequent potential for human health effects. In this context, and aligned with the above noted IEMA Guidance, this EIAR provides sufficient information that may reasonably be required for reaching a reasoned conclusion on the significance of effects, without providing the level of detail, for example through the use of the significance matrix set out in the IEMA Guidance, which might be required for an assessment of effects on human health arising from a type of development with a potential for emissions-related human health effects.

5.2.3 Shadow Flicker

5.2.3.1 Background

Shadow flicker is an effect that occurs when rotating wind turbine blades cast shadows over a window in a nearby property. Shadow flicker is an indoor phenomenon, which may be experienced by an occupant sitting in an enclosed room when sunlight reaching the window is momentarily interrupted by a shadow of a wind turbine's blade. Outside in the open, light reaches a viewer (person) from a much less focused source than it would through a window of an enclosed room, and therefore shadow flicker assessments are typically undertaken for the nearby adjacent properties around a proposed wind farm site.

The frequency of occurrence and the strength of any potential shadow flicker effect depends on several factors, each of which is outlined below.

1. ***Whether the sunlight is direct and unobstructed or diffused by clouds:***

If the sun is not shining, shadow flicker cannot occur. Reduced visibility conditions such as clouds, haze, and fog greatly reduce the chance of shadow flicker occurring.

Cloud amounts are reported as the number of eights (okta) of the sky covered. Irish skies are completely covered by cloud (8 oktas) for over 50% of the time. The mean cloud amount for each hour is between five and six okta. This is due to Ireland's geographical position off the northwest of Europe, close to the path of Atlantic low-pressure systems which tend to keep the country in humid, cloudy airflows for much of the time. A study at 12 stations over a 25-year period showed that the mean cloud amount was at a minimum in April and maximum in July. Cloud amounts were less at night than during the day, with the mean minimum occurring roughly between 2100 and 0100 GMT and the mean maximum occurring between 1000 and 1500 GMT at most *stations.*'[15]

2. ***The presence of intervening obstructions between the turbine and the observer:***

For shadow flicker to occur, the windows of a potentially affected property must have direct visibility of a wind turbine, with no physical obstructions such as buildings, trees and hedgerows, hills or other structures located on the intervening land between the window and the turbine.

[15] *Met Éireann,* www.met.ie

Any obstacles such as trees or buildings located between a property and the wind turbine will reduce or eliminate the occurrence and/or intensity of the shadow flicker.

3. ***How high the sun is in the sky at a given time:***

At distances of greater than approximately 500m between a turbine and a receptor, shadow flicker generally occurs only at sunrise or sunset when the shadow cast by the turbine is longer. iterates that at distances greater than ten rotor diameters from a turbine, the potential for shadow flicker is very low.

Figure 5-1 illustrates the shadow cast by a turbine at various times during the day; the red shading represents the area where shadow flicker may occur. When the sun is high in the sky, the length of the shadow cast by the turbine is significantly shorter.

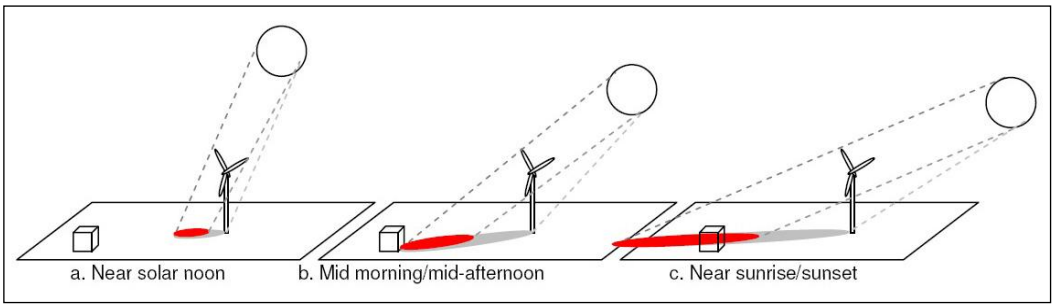

Figure 5-1-Shadow-Prone Area as Function of Time of Day (Source: Shadow Flicker Report, Helimax Energy, Dec 2008)

4. ***Distance and bearing, i.e. where the property is located relative to a turbine and the sun:***

The further a property is from the turbine the less pronounced the effect will be. There are several reasons for this: there are fewer times when the sun is low enough to cast a long shadow; when the sun is low it is more likely to be obscured by either cloud on the horizon or intervening buildings and vegetation; and the centre of the rotor's shadow passes more quickly over the land reducing the duration of the effect.

At a distance, the turbine blades do not cover the sun but only partly mask it, substantially weakening the shadow. This impact occurs first with the shadow from the blade tip, the tips being thinner in section than the rest of the blade. The shadows from the tips extend the furthest and so only a very weak impact is observed at distance from the turbines. (Source: Update of Shadow Flicker Evidence Base, UK Department of Energy and Climate Change, 2010).

5. ***Property usage and occupancy:***

Where shadow flicker is predicted to occur at a specific location, this does not imply that it will be witnessed. Potential occupants of a property may be sleeping or occupying a room on another side of the property that is not subject to shadow flicker or completely absent from the location during the time of shadow flicker events. As shadow flicker usually occurs only when the sun is at a low angle in the sky, i.e. very early in the morning after sunrise or late in the evening before sunset, even if there is a bedroom on the side of the property affected, the shadow flicker may not be witnessed if curtains or blinds in the bedroom are closed. It should be noted that the below assessment considers a worst-case assessment as detailed in Section 5.2.3 below.

6. ***Wind direction, i.e. position of the turbine blades:***

The direction of wind turbine blades changes according to wind direction, as the turbine rotor turns to face the wind. In order to cast a shadow, the turbine blades must be facing directly toward or away from the sun, so they are moving across the source of the light relative to the observer. This is demonstrated in Figure 5-2 below.

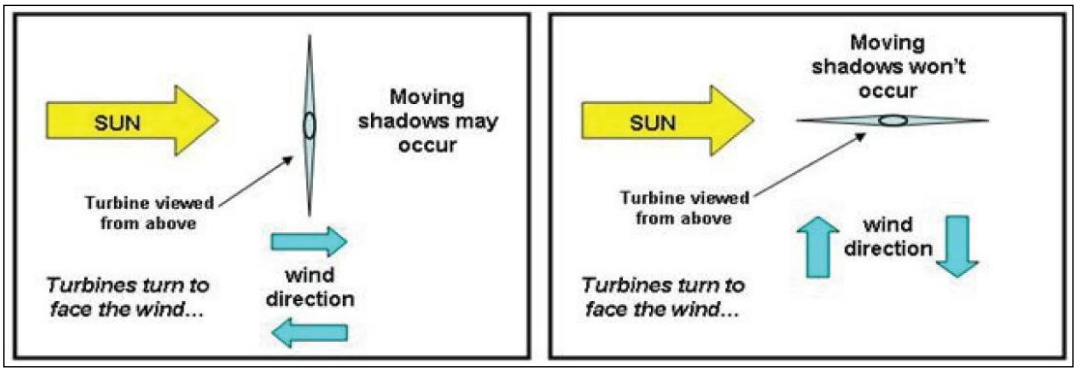

Figure 5-2 Turbine Blade Position and Shadow Flicker Impact (Source: Wind Fact Sheet: Shadow Flicker, Noise Environment Power LLC)

7. *Rotation of turbine blades:*

Shadow flicker occurs only if there is sufficient wind for the turbine blades to be continually rotating. Wind turbines begin operating at a specific wind speed referred to as the 'cut-in speed', i.e. the speed at which the turbine produces a net power output, and they cease operating at a specific 'cut-out speed'. Therefore, even during the sunlight hours when shadow flicker has been predicted to occur, if the turbine blades are not turning due to insufficient wind speed, then no shadow flicker will occur.

5.2.3.2 Guidance

The current guidance for shadow flicker in Ireland is derived from the Guidelines (DoEHLG, 2006), and the '*Best Practice Guidelines for the Irish Wind Energy Industry'* (Irish Wind Energy Association, 2012).

The Guidelines (DoEHLG, 2006) set out a threshold of 30 hours per year or 30 minutes per day of shadow flicker at dwellings within 500 metres of a proposed turbine location. As detailed in the Guidelines (DoEHLG, 2006), there is a low probability of any shadow flicker effects occurring beyond 10 rotor diameters. Therefore, a study area of 10 rotor diameters was selected based on the low probability of effects beyond 10 rotor diameters as outlined in the Guidelines (DoEHLG, 2006). In this case, the maximum potential rotor diameter proposed for this project is 133m. As such, the shadow flicker study area in this case is 1,330mkm. A significant minimum separation distance of 676m from third-party dwellings has been achieved with the project design. There are 79 no. properties located within 1,330m (i.e., the shadow flicker study area of ten times the maximum rotor diameter, 10 x 133m = 1,330m as per the Guidelines (DoEHLG, 2006) of the proposed turbines, of which 79 are inhabited dwellings, 1 is an uninhabited derelict building.

The Guidelines (DoEHLG, 2006) state that shadow flicker lasts for only a short period of time and occurs only during certain specific combined circumstances, as follows:

- the sun is shining and is at a low angle in the sky, i.e. just after dawn and before sunset, **and**
- the turbine is located directly between the sun and the affected property, **and**
- there is enough wind energy to ensure that the turbine blades are moving, **and**
- the turbine blades are positioned so as to cast a shadow on the receptor.

The Guidelines (DoEHLG, 2006) are currently under review. The DoHPLG released the '*Draft Revised Wind Energy Development Guidelines'* (hereafter referred to as the Draft Guidelines (DoHPLG, 2019) for public consultation in December 2019. The consultation period closed February 2020; however, no update or final guidelines was released. The Draft Guidelines (DoHPLG, 2019) recommend local planning authorities and/or An Coimisiún Pleanála impose conditions to ensure that:

"no existing dwelling or other affected property will experience shadow flicker as a result of the wind energy development subject of the planning application and the wind energy development shall be installed and operated in accordance with the shadow flicker study submitted to accompany the planning application, including any mitigation measures required."

The Draft Guidelines (DoHPLG, 2019) are based on the recommendations set out in the '*Proposed Revisions to Wind Energy Development Guidelines 2006 – Targeted Review'* (December 2013) and the '*Review of the Wind Energy Development Guidelines 2006 – Preferred Draft Approach'* (June 2017).

In the Annex of Actions[16] for the Climate Action Plan 2025 (CAP25), published in April 2025, Action EL/24/5 states that revised wind energy development guidelines for onshore wind will be published in Q1 2025. The shadow flicker methodology and assessment within this chapter are based on compliance with the Guidelines (DoEHLG, 2006), which remain to be the current adopted guidelines, under Section 28 of the Planning Development Act 2000 (as amended). However, it should also be noted the proposed turbines can be brought in line with the requirements of the Draft Guidelines (DoHPLG, 2019) through the stricter implementation of the mitigation measures outlined in Section 5.4.3.2.7.

5.2.3.3 Shadow Flicker Prediction Methodology

Shadow flicker occurs only under certain, combined circumstances, as detailed above. Where shadow flicker does occur, it is generally short-lived. The Guidelines (DoEHLG,2006) state that careful site selection, design and planning, and good use of relevant software can help avoid the possibility of shadow flicker, all of which have been employed in the design of the Proposed Wind Farm. Proper siting of wind turbines is key in eliminating shadow flicker.

The occurrence of shadow flicker can be precisely predicted using specialist computer software programmes specifically developed for the wind energy industry, such as Wind Farm (ReSoft) or WindFarmer (DNV.GL) or AWS OpenWind or WindPRO: Shadow. The computer modelling of the occurrence and magnitude of shadow flicker is made possible by the fact that the sun rises and sets in the same position in the sky on every day each year.

Any potential impact can be precisely modelled to give the start and end time of any incidence of shadow flicker, at any location, on any day or all days of the year when it might occur. Where a shadow flicker impact is predicted to occur, the total maximum daily and annual durations can be predicted, along with the total number of days. Any incidence of predicted shadow flicker can be attributed to a particular turbine or group of turbines to allow effective mitigation strategies to be planned and proposed as detailed further below.

For the purposes of this shadow flicker assessment, the software package WindPRO: Shadow – Version 4.0.552 has been used to predict the level of shadow flicker associated with the Proposed Wind Farm development. WindPRO is a commercially available software tool that enables developers to analyse, design and optimise proposed wind farms. It allows proposed turbine layouts to be optimised for maximum energy yield whilst taking account of environmental, planning and engineering constraints.

5.2.3.4 Shadow Flicker Assessment Criteria

The proposed wind turbines to be installed on the Proposed Wind Farm site will have a ground-to-blade tip height, hub height and blade length of the following dimensions:

- Tip Height: 169 metres
- Hub Height: 102.5 metres
- Rotor Diameter: 133 metres

[16] *Department of the Environment Climate and Communications (2025) CAP25 Annex of Actions. Available at: https://assets.gov.ie/static/documents/Climate_Action_Plan_2025_-_Annex_of_Actions.pdf*

With the benefit of the mitigation measures outlined in Section 5.4.3.2.7, any turbine to be installed onsite will comply with the Guidelines (DoEHLG, 2006) thresholds of 30 minutes per day or 30 hours per year, and if necessary, with the Draft Guidelines (DoHPLG, 2019). This will be achieved through the use of turbine control software during the entire operational period of the Proposed Wind Farm. Any references to the turbine dimensions in this shadow flicker assessment should be considered in the context of the above.

5.2.3.5 Shadow Flicker Study Area

At the outset of the Proposed Project, during the constraints mapping process detailed in Ch. 3: Site Selection & Reasonable Alternatives of this EIAR, all sensitive receptors within c.2.5km of the area suitable for siting wind turbines within the EIAR Site Boundary were identified and mapped. This included all occupied and unoccupied dwellings. In addition, a planning history search to identify properties that may have been granted planning permission, but not yet been constructed, was carried out. Any property with a valid planning permission for a dwelling house was also added to the sensitive receptors' dataset.

The Shadow Flicker Study Area for the shadow flicker assessment is ten times rotor diameter (133m rotor diameter x 10 = 1,330m). The Guidelines (DoEHLG 2006) note that, at distances greater than 10 times the rotor diameter of a proposed turbine, the potential for shadow flicker is very low, and therefore the shadow flicker study area is set at 1,330km from the proposed turbines. All inhabitable dwellings within 1,330m of the proposed turbines have been considered as part of the following shadow flicker assessment. There are 79 no. properties located within 1,330m of the proposed turbine locations. Of these, a total of 31 no. properties are theoretically predicted to experience shadow flicker. There are no sensitive receptors less than 500 metres of the proposed turbine locations.

The Shadow Flicker Study Area and sensitive receptor locations are shown in Figure 5-3, with all properties detailed in Table 5-11 in Section 5.2.3.5 below.

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H074 H070 H063 H073 H052 H033 H055 H010 H001 H009 H060 H048 H031 H020 H017 H005 H023 H015 H013 H049 H019 H012 H016 H011 H036 H045 H025 H068 H067 H072 H034 H051 H044 H030 H027 H022 H018 H039 H007 H006 H004 H003 H035 H002 H008 H014 H024 H029 H077 H050 H053 H054 H066 H021 H028 H026 H032 H040 H037 H058 H042 H065 H075 H062 H057 H087 H078 H047 H043 H046 H069 H064 H056 H071 H076

Mass Rock
Standing Stone
Cummerlibawn
Cillin
Stone Row and Standing Stones
Cappaboy More
Ford
Standing Stone
Derryfadda
Foilmore
Cappabo Br
Kilnaknappoge
Gortloughra Br
Gortloughra
Stone Row
Maulavanig
Meall an Mhanaigh
Owenteg River
Cahermuckee
Coomclogh
Lackareagh
Beara Gougane Barra Cycling Route
Ballynamougl
Standing Stone
R584
Owngar River
Cahermoanteen Br
Cousane Gap
Cousane
An Cuasán
Carrigacorra Br
Beatha an Chuasáin
Stone Circle
Standing Stone
R585
Maughanaclea
Machaire na Cléibhe
Standing Stones
Lough Nabirree
Lough Carrignaneare
Maughanaclea Hills
Cnoic Mhacha na Cléibhe
Goulacullin
Barrboy
Maularaha
Gortnacowlty
Goomleagh
Coomleagh East
Laharanshermeen
Sheep's Head Way - East
Standing Stones
Stone Row
Stone Circle
Burial Ground
Ardrah Br
Ardrah
0
1
2 km

Map Legend

- EIAR Site Boundary
- Proposed Project Shadow Flicker Study Area
- Proposed Turbines Locations
- Dwellings within Shadow Flicker Study Area

SITE LOCATION - NOT TO SCALE

Drawing Title: Shadow Flicker Study Area

Project Title: Maughanaclea Renewable Energy Development

Project No.	Drawing No.	Scale
240225	Figure 5-3	1:26,000
Drawn By	Checked By	Date
SOR	RK	11/03/2026

MKO
Email: info@mkoireland.ie/ Website: www.mkoireland.ie

5.2.4 Assumptions and Limitations

A precautionary approach has been taken in relation to the orientation of each individual property in relation to the location of the proposed wind turbines through the use of a feature called 'greenhouse mode' within the WindPRO software. This feature assumes shadows can be seen from 360 degrees at a property as opposed to only through windows facing the wind turbines.

No screening due to trees or other buildings or vegetation is assumed. It was not considered necessary or practical to measure the dimensions of every window on every property in the Shadow Flicker Study Area. While the actual size of a window will marginally influence the incidence and duration of any potential shadow flicker impact, with larger windows resulting in slightly longer shadow flicker durations, any additional incidences or durations or shadow flicker over and above those predicted in this assessment can be countered by extending the mitigation strategies outlined in Section 5.4.3.2.7.

Due to the latitude of Ireland shadow flicker impacts are only possible at properties 130 degrees either side of north (i.e., a shadow flicker event can occur within a 260-degree span), as turbines do not cast shadows on their southern side[1]. As such properties located outside of this potential shadow flicker zone (50 degrees either side of south) will not be impacted. However, in taking a precautionary approach for this assessment, all 79 no. properties within 360 degrees of the proposed turbine locations out to 1,330m were assessed for shadow flicker impact.

The use of computer models to predict the amount of shadow flicker that will occur is known to produce an over-estimate of possible impact, referred to as the 'worst-case impact', due to the following limitations:

- The sun is assumed to be shining during all daylight hours such that a noticeable shadow is cast. This will not occur in reality.
- The wind is always assumed to be within the operating range of the turbines such that the turbine rotor is turning at all times, thus enabling a periodic shadow flicker. Wind turbines only begin operating at a specific 'cut-in speed', and cease operating at a specific 'cut-out speed'. In periods where the wind is blowing at medium to high speeds, the probability of there being clear or partially clear skies where the sun is shining and could cast a shadow, is low.
- The wind turbines are assumed to be available to operate, i.e. turned on at all times. In reality, turbines may be switched off during maintenance or for other technical or environmental reasons.
- The turbine rotor is considered (as a sphere) to present its maximum aspect to observers in all directions. In reality, the wind direction and relative position of the turbine rotor would result in a changing aspect being presented by the turbine. The rotor will actually present as ellipses of varying sizes to observers from different directions. The time taken for the sun to pass across the sky behind a highly elliptical rotor aspect will be shorter than the modelled maximum aspect.

The total annual shadow flicker calculated for the property assumes 100% sunshine during daytime hours, as referred to above. However, weather data for this region shows that the sun shines on average for 33.40% of the daylight hours per year. This percentage is based on Met Éireann data recorded at Cork over the 30-year period from 1981 to 2010 (www.met.ie). The actual sunshine hours at the Site and therefore the percentage of time shadow flicker could actually occur is 33.40% of daylight hours. Where the annual shadow flicker is calculated for each property, it is corrected for the regional average of 33.40% sunshine, to give an accurate annual average shadow flicker prediction. Table 5-11 below outlines whether a shadow flicker mitigation strategy is required for any property within the Shadow Flicker Study Area which may be impacted by shadow flicker.

5.3 Receiving Environment

5.3.1 Population

The socio-economic study of the receiving environment included an examination of the population and employment characteristics of the area. The relevant methodology pertaining to the population and human health assessment relates to the assessment of desk-based data sourced from the following locations. Information regarding population and general socio-economic data were sourced from the Central Statistics Office (CSO), the Cork County Development Plan 2022-2028, Fáilte Ireland, and any other literature pertinent to the area. The study included an examination of the population and employment characteristics of the area. This information was sourced from the Census of Ireland 2022, which is the most recent census for which a complete dataset is available, and also from the Census of Ireland 2016, the Census of Agriculture 2010, and the CSO website (www.cso.ie). Census information is divided into State, Provincial, County, Major Town, and Electoral Division (ED) level.

The Proposed Wind Farm site is located within a rural setting in west Co. Cork, approximately 2.3 km east of the village of Kealkill, 9.5 km northeast of the town of Bantry, and 12.2 km west of Dunmanway. The Site is made up of two turbine clusters, a northern and southern turbine cluster. The R585 regional road runs in an east-west direction between the northern and southern turbine cluster of the Proposed Wind Farm, passing within approximately 890 metres of the nearest turbine. Please refer to Ch. 1: Introduction for the Site location context. The Site covers an area of approximately 1,175 hectares in total. The proposed site entrance for the Proposed Wind Farm's northern turbine cluster will consist of a new access point off the R585, while the southern turbine cluster is accessed via an existing forestry road off the R585. The Proposed Wind Farm site is also served by a number of existing agricultural and forestry tracks. The Proposed Wind Farm falls within the townlands listed in Table 1-1 of Ch. 1: Introduction. All townlands are located in Co. Cork.

In order to assess the population in the vicinity of the Proposed Wind Farm, the 'Population Study Area' for the population section of this EIAR was defined in terms of Electoral Divisions (EDs). The Proposed Wind Farm site lies within three EDs: Douce, Kealkill and Mealagh, as shown in Figure 5-3. These EDs will collectively be referred to hereafter as the Population Study Area for this chapter. Current land-use within the Proposed Wind Farm site primarily comprises commercial forestry and small-scale agriculture. Current land-use along the Proposed Grid Connection comprises public road corridor. The predominant surrounding land use within the Population Study Area is agriculture, commercial forestry and one-off rural housing.

The Population Study Area has a population of 1,249 persons as of 2022, with the populations of each electoral division as follows:

- Douce (260 persons)
- Kealkill (588 persons)
- Mealagh (401 person)

The total land area of the Population Study Area totals 96.57km^2, and comprises Douce 37.25km^2, Kealkill 30.30km^2, and Mealagh 29.02km^2.

The Population Study Area is compared to the state and the county below using data sourced from the Central Statistics Office (CSO) Census data from 2016 and 2022. The County refers to the extent of the Cork County Council Area, rather than the entire county. The extent of the Cork City Council Area was excluded as results of the effects on those living in the County would be skewed by the high-density population of Cork City. It should also be noted that the extent of the Cork County Council Area decreased between the 2016 Census and the 2022 Census due to the expansion of Cork City. Table 5-1 below outlines the extents of each area.

Table 5-1 Extent (km2) of Study Areas

	Area (km^2)		Area (km^2) Change
	2016	2022	2016-2022
State	70,273	70,273	0
Cork County	19,451	19,246	205
Population Study Area	96.57	96.57	0

There are 79 no. sensitive receptors located within 1,330m of the proposed turbines, with 21 no. of those properties belonging to landowners who are participating in the Proposed Project. Of the 79 no. sensitive receptors located within 1,330m of the proposed turbines, 1 no. dwelling is derelict. The closest sensitive receptor, belonging to an involved landowner, is located approximately 682m from the nearest turbine (T03). The closest third-party sensitive receptor is located approximately 682.6m from the nearest proposed turbine (T01), i.e. over the recommended 4x tip height setback (676m) from properties not involved in the project (as recommended in the Draft Guidelines (DoHPLG, 2019)).

In order to assess the population in the vicinity of the Proposed Grid Connection, a review of properties and planning applications in the vicinity of the underground electrical cabling route was carried out. There are 83 no. properties located within 250m of the Proposed Grid Connection underground cable route.

The active construction area for the Proposed Grid Connection underground cable route will be small, approximately 100 metres in length at any one time, and it will be transient in nature as it moves along the route. Should separate crews be used during the construction phase, they will generally be separated by one to two kilometres.

For the shadow flicker assessment, which is further detailed in Section 5.2.3 above, the Shadow Flicker Study Area is defined as ten times rotor diameter from each turbine. The Shadow Flicker Study Area for this assessment is 1,330m based on a rotor diameter of 133 metres as seen in Figure 5-3.

For the purposes of the population baseline assessment, the Proposed Wind Farm will be examined primarily from a population perspective due to the reasons outlined above. Where the Proposed Wind Farm and the Proposed Grid Connection are required to be considered separately, this is identified within the baseline assessment.

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550000

DOUCE

KEALKILL

MEALAGH

0 2.5 5 km

Map Legend

- EIAR Site Boundary
- Population Study Area
- Maughanaclea EDs: Douce, Kealkill, and Mealagh

SITE LOCATION - NOT TO SCALE

Drawing Title

Population Study Area

Project Title

Maughanaclea Renewable Energy Development

Project No.	Drawing No.	Scale
240225	Figure 5-4	1:56,000
Drawn By	Checked By	Date
SOR	RK	11/02/2026

Email: info@mkoireland.ie/ Website: www.mkoireland.ie

5.3.1.1 Population Trends

In the period between the 2016 and the 2022 Census, the population of Ireland increased by 8.1%. During this time the population of Co. Cork decreased by 13.7%. Population statistics for the State, County Cork cand the Population Study Area have been obtained from the Central Statistics Office (CSO) and are presented in Table 5-2 below.

Table 5-2 Population 2016 - 2022 (Source: CSO)

Area	Population Change		% Population Change
	2016	2022	2016-2022
State	4,761,865	5,149,139	8.1%
Co. Cork (excl. Cork City)	417211	360152	-13.7%
Population Study Area	1,180	1,249	5.8%

The data presented in Table 5-2 shows that the population of the Population Study Area increased by 5.8% between 2016 and 2022. This rate of population growth is lower than that recorded at State level, and is in contrast to the decline in population seen at the County level. When the population data is examined in closer detail, it shows that the population of all three EDs increased in the period between the 2016 and 2022 Census, albeit the rate of population increase varies between the three EDs. Douce grew in population size by the largest amount, with a population growth of 16%, with Mealagh experiencing a population increase of 7.2%, and Kealkill growing marginally by 1.2%. Of the EDs that make up the Population Study Area for this assessment, the highest population was recorded in Kealkill ED, with 588 persons recorded during the 2022 Census. The lowest population was recorded in Douce ED, with 280 persons recorded during the 2022 Census.

5.3.1.2 Population Density

The population densities recorded within the State, County Cork and the Population Study Area during the 2016 and 2022 Census are shown in Table 5-3.

Table 5-3 Population Density in 2016 and 2022 (Source: CSO)

Area	Population Density (Persons per square km)	
	2016	2022
State	67.8	73.3
Co. Cork (excl. Cork City)	21.7	18.7
Population Study Area	12.2	12.9

The population density of the Population Study Area recorded during the 2022 Census is 12.9 persons per square kilometre, which is considerably lower than the national population densities of 73.3 persons per square kilometre (km^2), and lower than the population density of County Cork, recorded at 18.7 persons per km^2 respectively. In the period between the 2016 and 2022 Census, the population density of the Population Study Area increased from 12.2 persons per square kilometre, to 12.9 persons per square kilometre. When these figures are examined on a closer level, it shows that the population

density of Douce increased from 6.0 to 7.0 persons per square km, the population density of Kealkill increased from 19.2 to 19.4 persons per square kilometre, and the population density of Mealagh increased from 12.9 to 13.8 persons per square kilometre.

5.3.1.3 Household Statistics

The number of households and average household size recorded within the State, County Cork, and the Population Study Area during the 2016 and 2022 Censuses are shown in Table 5-4.

Table 5-4 Number of Household and Average Household Size 2016 – 2022 (Source: CSO)

Area	2016		2022	
	No. of Households	Avg. Size (persons)	No. of Households	Avg. Size (persons)
State	1,702,289	2.75	1,841,152	2.74
County Cork	146,442	2.83	127,971	2.79
Population Study Area	436	2.75	459	2.72

The figures above show that while the number of households within the State, County and the Population Study Area increased, the average number of people per household remained broadly the same due to the proportionate increase in population during this period. During the period between the 2016 and 2022 Census, the average household size was recorded for the Population Study Area as decreasing marginally from 2.75 persons per household, to 2.72 persons per household. The average household size decreased in Kealkill and Mealagh but increased in Douce. The average persons per household decreased by 2.7% in Kealkill, decreased by 0.8% in Mealagh, and increased by 3.2% in Douce during this period.

5.3.1.4 Age Structure

Table 5-5 presents the population percentages of the State, County Cork, and the Population Study Area within different age groups as defined by the Central Statistics Office during the 2022 Census. This data is also displayed in Figure 5-4.

Table 5-5 Population per Age Category in 2022 (Source: CSO)

Area	Age Category				
	0 - 14	15 – 24	25 - 44	45 - 64	65 +
State	19.7%	12.5%	27.6%	25.1%	15.1%
County Cork	21.0%	11.74%	24.84%	26.55%	15.6%
Population Study Area	23.62%	10.41%	20.02%	28.42%	17.5%

The population of County Cork in April 2022 was 360,152. The average age of Cork's population in April 2022 was 39.1 years, compared with 37.5 years in April 2016. Nationally, the average age of the population was 38.8, up from 37.4 in April 2016. The number of people aged 65 and over continues to grow. This age group increased by 3.76% to 56,189 in Cork, and by 19.63% to 776,315 at a national level since 2016. The proportion of the Population Study Area population within each age category is similar to those recorded at national and county level for most categories. The population aged 65+ is slightly

higher in the Population Study Area, while the population aged 15-24 is slightly lower in comparison to national and county records. Within the Population Study Area, the highest population percentage occurs within the 45-64 age category.

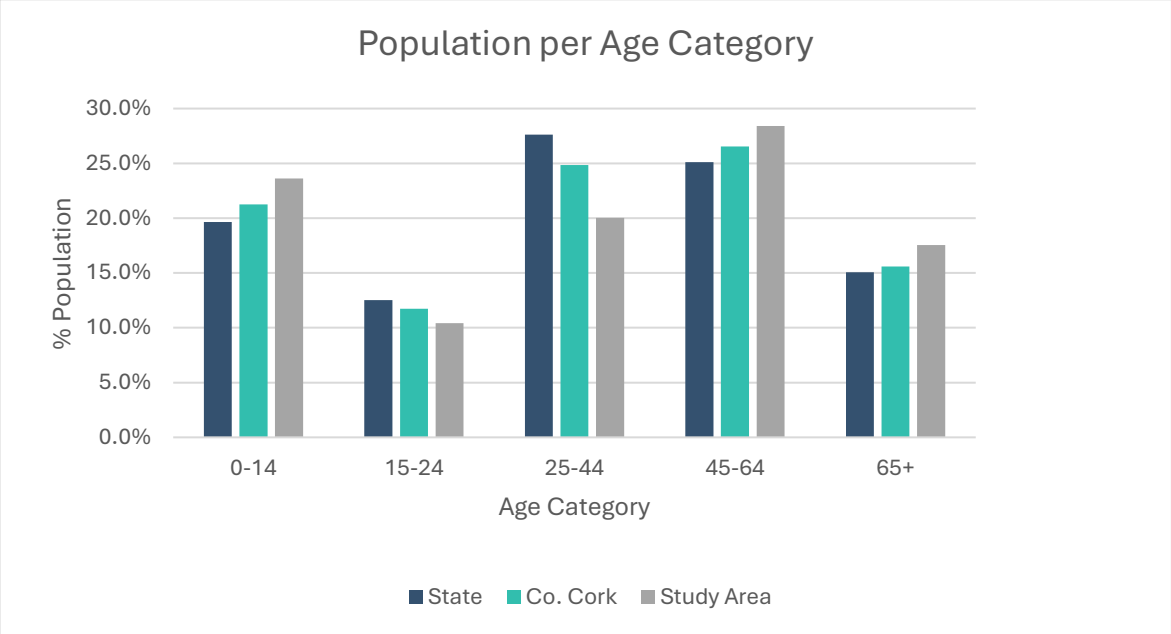

Figure 5-5 Population per Age Category in 2022 (Source: CSO)

5.3.1.5 Employment and Economic Activity

5.3.1.5.1 *Economic Status of the Population Study Area*

The labour force consists of those who are able to work, i.e. those who are aged 15+, out of full-time education and not performing duties that prevent them from working. In 2022, there were 2,531,099 persons in the labour force in the State. Table 5-6 shows the percentage of the total population aged 15+ who were in the labour force in the State during the 2022 Census. This figure is further broken down into the percentages that were at work or unemployed. It also shows the percentage of the total population aged 15+ who were not in the labour force, i.e., those who were students, retired, unable to work or performing home duties. In Census 2022, for the first time, two categories of unemployment detail were included, Long-term Unemployment and Short-term Unemployment, for the purpose of this assessment, both categories have been grouped into one Unemployment group.

Table 5-6 Economic Status of the Total Population Aged 15+ in 2022 (Source: CSO)

Status		State	County Cork	Population Study Area
% of population aged 15+ who are in the labour force		61.2%	60.5%	57.9%
% of which are:	At work	91.7%	93.9	93.3%
	First time job seeker	1.4%	1.00%	0.7%
	Unemployed	7.0%	5.1%	6.00%
% of population aged 15+ who are not in the labour force		38.8%	39.5%	42.1%

Status		State	County Cork	Population Study Area
% of which are:	Student	28.6%	27.7%	24.6%
	Home duties	17.0%	18.7%	17.9%
	Retired	41.0%	40.6%	45.5%
	Unable to work	11.8%	11.2%	10.7%
	Other	1.7%	1.7%	1.2%

Overall, the principal economic status of those living in the Population Study Area is broadly similar to that recorded at the state and county level. During the 2022 Census, the percentage of people over the age of 15 who were in the labour force was similar at both state and county level, but slightly lower in the Population Study Area at 57.9% of the population. Of those who were not in the labour force during the 2016 Census, the highest percentage of the Population Study Area population were 'Retired' individuals, similar to state and county populations.

5.3.1.5.2 *Employment by Socio Economic Group*

Socio-economic grouping divides the population into categories depending on the level of skill or educational attainment required. The 'Higher Professional' category includes scientists, engineers, solicitors, town planners and psychologists. The 'Lower Professional' category includes teachers, lab technicians, nurses, journalists, actors and driving instructors. Skilled occupations are divided into manual skilled such as bricklayers and building contractors; semi-skilled such as roofers and gardeners; and unskilled, which includes construction labourers, refuse collectors and window cleaners. Figure 5-6 shows the percentages of those employed in each socio-economic group in the State, County Cork, and the Population Study Area during 2022.

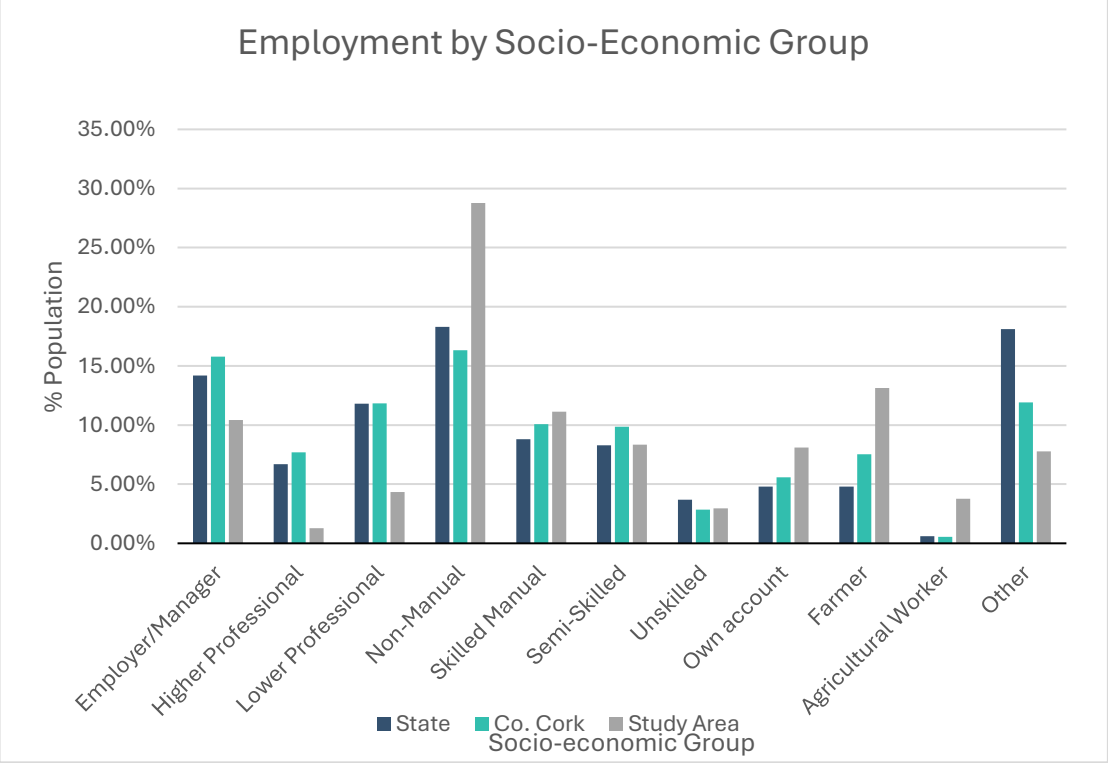

Figure 5-6 Employment by Socio- Economic Group in 2022 (Source CSO)

The highest level of employment within the Population Study Area was recorded in the 'Non-Manual' category, at 28.8% of all workers. The levels of employment within the Skilled Manual, Semi-Skilled, Unskilled, Own Account, Farmer and Agricultural Worker categories are either higher than or level with the figures recorded at State level. On the other hand, the figures recorded at Employer/Manager, Higher Professional, Lower Professional, and Other were lower than National figures. The CSO employment figures grouped by socio-economic status includes the entire population for the Population Study Area, County and State in their respective categories. As such, the socio-economic category of 'Other' is skewed to include those who are not in the labour force.

5.3.1.5.3 *Employment and Investment Potential in the Irish Wind Energy Industry*

Background

A report entitled '*Jobs and Investment in Irish Wind Energy – Powering Ireland's Economy'* was published in 2009 by Deloitte, in conjunction with the Irish Wind Energy Association (IWEA). This report focused on the ability of the Irish wind energy industry to create investment and jobs. In terms of the overall economic benefit to be obtained from wind energy, the report states in its introduction:

> *"Ireland is fortunate to enjoy one of the best wind resources in the world. Developing this resource will reduce and stabilise energy prices in Ireland and boost our long-term competitiveness as an economy. It will also significantly reduce our dependence on imported fossil fuels."*

More recently, a report published in 2014 by Siemens entitled '*An Enterprising Wind - An economic analysis of the job creation potential of the wind sector in Ireland'*, also in conjunction with the Irish Wind Energy Association (IWEA), concluded that, *'a major programme of investment in wind could have a sizeable positive effect on the labour market, resulting in substantial growth in employment.'* The report considers the three potential types of direct employment created, as a result of increased investment in wind energy, to be:

- Wind Energy Industry Employment:
- Installation
- Development
- Planning
- Operation and Maintenance
- Investor activity
- Electricity Grid Network Employment
- Potential Wind Turbine Manufacturing Employment

The Sustainable Energy Authority of Ireland[17] demonstrates in their '*Wind Energy Roadmap 2011-2050'*, that '*the wind energy resource represents a significant value to Ireland by 2050. This value is presented in terms of its ability to contribute to our indigenous energy needs, the benefits of enhanced employment creation and investment potential, and the ability to significantly abate carbon emissions to 2050.'*

Energy Targets

The Climate Action Plan 2025 (CAP 25) was launched in April 2025. Building on Climate Action Plans 2019, 2021, 2023, and 2024, CAP 25 sets out the roadmap to deliver on Ireland's climate ambition. It aligns with the legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by Government in July 2022 following the Climate Action and Low Carbon Development (Amendment) Act 2021, which commits Ireland to a *legally binding target of net-zero greenhouse gas emissions no*

[17] *SEAI (2019), https://www.seai.ie/publications/Wind_Energy_Roadmap_2011-2050.pdf*

later than 2050, and a reduction of 51% by 2030. CAP25 sets out indicative ranges of emissions reductions for each sector of the economy.

Further information on energy and climate change targets is detailed in Section 1.5 of Ch. 1: Introduction, Sections 2.2 to 2.4 of Ch. 2: Background to the Proposed Project and Ch. 11: Climate of this EIAR.

Employment Potential

The 2014 report *"An Enterprising Wind: An economic analysis of the job creation potential of the wind sector in Ireland"* published by the Irish Wind Energy Association (IWEA) predicted that the wind energy sector in Ireland would result in 6,659 direct jobs in a scenario where 4GW capacity is achieved by 2020. This figure of 6,659 is broken down further; 5,596 of these jobs are associated directly with the construction and installation of windfarms, while the remaining 1,063 jobs are associated with the national grid. Under this scenario this contributes 1.66 direct jobs per Megawatt (MW) of wind capacity throughout the various stages of installation. According to Wind Energy Ireland, the installed wind capacity in Ireland is over 4.3GW as of February 2021, which would support employment during the last decade. Ireland needs to achieve a total of 9GW of onshore wind by 2030 which will further support further employment.

The Sustainable Energy Authority of Ireland[18] estimates, in their '*Wind Energy Roadmap 2011-2050*', note that '*Onshore and offshore wind could create 20,000 direct installation and O&M jobs by 2040'.* Furthermore, '*wind energy resource represents a significant value to Ireland by 2050. This value is presented in terms of its ability to contribute to our indigenous energy needs, the benefits of enhanced employment creation and investment potential, and the ability to significantly abate carbon emissions to 2050'.*

The 2014 report '*The Value of Wind Energy to Ireland*', published by Pőyry, stated that growth of the wind sector in Ireland could support 23,850 jobs (construction and operational phases) by 2030. The report states that if Ireland instead chooses to not develop any more wind, then by 2030 the country will be reliant on natural gas for most of our electricity generation, at a cost of €671 million per annum in fuel import costs.

Internationally, a report issued by WindEurope in September 2017, entitled '*Wind energy in Europe: Scenarios for 2030'* details various scenarios in Europe in respect to the EU target for renewable energy. According to WindEurope's High Scenario, which assumes favourable market and policy conditions including the achievement of a 35% EU renewable energy target (slightly higher than the 32% EU target for renewables), '*397 GW of wind energy capacity would be installed in the EU by 2030, 298.5 GW onshore and 99 GW offshore. In this scenario, the wind energy industry would invest €351bn by 2030, and it would create 716,000 jobs.*

A new report published by MaREI, the SFI Research Centre for Energy, Climate and Marine, hosted by University College Cork[19] (March 2021) details that in order to meet the government target of net-zero carbon emissions by 2050, at least 25,000 jobs will be created in the development of onshore and offshore wind to meet our zero carbon targets.

A more recent report which was issued by WindEurope in February 2022, titled '*Wind Energy in Europe: 2021 Statistics and the Outlook for 2022-2026'* details various scenarios in Europe in respect to the EU target for renewable energy. According to WindEurope's report, '*Europe installed 17GW (11 GW in the EU-27) of new wind capacity in 2021. This is not even half of what the EU should be building to be on track to deliver its 2030 Climate Energy Goals*.' The report continued on to state that '*We expect Europe to install 116 GW of new wind farms over the period from 2022-2026. Three quarters of these new capacity additions will be onshore wind*.' The report also states that '*The*

[18] *SEAI (2019), https://www.seai.ie/publications/Wind_Energy_Roadmap_2011-2050.pdf*
[19] *https://www.marei.ie/our-climate-neutral-future-zeroby50/*

European Commission modelling shows that we need at least 79 GW offshore wind but National Government have pledged to build at least 92 GW offshore wind capacity by 2030.'

As of January 2026, there were 6.48GW of wind energy capacity installed on the island of Ireland[20]. Of this, 4.9GW was installed in the Republic of Ireland. The majority of the Republic of Ireland's installed wind energy capacity is located in Counties Donegal, Galway, Cork, Clare and Kerry, contributing to employment potential on the island of Ireland.

Economic Value

A 2019 report by Baringa, '*Wind for a Euro: Cost-benefit analysis of wind energy in Ireland 2000-2020'*, has analysed the financial impact for end consumers of the deployment of wind generation in Ireland over the period 2000-2020. The report calculates how the costs and benefits for consumers would have differed if no wind farms had been built. The analysis indicated that the deployment of 4.1 GW of wind generation capacity in Ireland between 2000 and 2020 (2018-2020 results being projective) 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 since 2000. Further cost benefit analysis noted that wind energy has delivered €2.3 billion in savings in the wholesale electricity market. As such, the economic benefit of renewable energy to consumers is greater than what would have been if Ireland did not invest in wind power. This corresponds with the Deloitte report which indicates that more wind energy feeding into the national grid will result in lower and more stable energy costs for consumers.

Furthermore, in May 2020, IWEA released its 70by30 Implementation Plan Reports which further details the savings that can be made from the continuation of onshore wind. The report, entitled '*Saving Money - 70 by 30 Implementation Plan'*, notes that '*Baringa calculated previously that if onshore wind in Ireland can be delivered at €60/MWh, on average, between 2020 and 2030, then the 70 per cent renewable electricity target set out in the Climate Action Plan will actually be cost neutral for the consumer. If we can achieve prices under €60/MWh then Ireland's electricity consumers will be saving money'.*

The Proposed Project will, if consent is granted, contribute to the economic value that renewable energy brings to the country.

5.3.1.6 Land-Use Patterns and Activities

Current land use on the Proposed Wind Farm site comprises of commercial forestry and small-scale pastoral agriculture. Current use along the Proposed Grid Connection comprises of public road corridor, discontinuous urban fabric and agriculture. The predominant surrounding land use within the Population Study Area is also farmland, commercial forestry, and one-off rural housing.

The total area of farmland within the three EDs, around the Site, measures approximately 6161.7 hectares, comprising 64% of the Population Study Area, according to the CSO Census of Agriculture 2020. There are 179 farms located within the three EDs, with an average farm size of 14.8 hectares. This is significantly lower than the average 38.7-hectare farm size for Co. Cork. Table 5-7 shows the breakdown of farmed lands within the three EDs.

Table 5-7 Farm Size and classification within the Population Study Area in 2020 (Source; CSO)

DED	No of holdings	Average size (hectares)	Median age of holder	Livestock units
Douce	56	2,137.4	57	1,332

[20] Eirgrid, https://www.eirgrid.ie/grid/system-and-renewable-data-reports

Kealkill	62	2,172.2	50	2,076
Mealagh	61	1,847.1	57	1,803
Total	220	41.7 (average)	57 (average)	5211
Size of 3 EDs		5,972 hectares		
Total Area Farmed within 3 EDs		6,161.7 hectares		
Farmland as % of EDs		64%		

5.3.1.7 Services

The Proposed Wind Farm site is located within a rural setting in west Co. Cork, approximately 2.3 km east of the village of Kealkill, 9.5 km northeast of the town of Bantry, and 12.2 km west of Dunmanway. It is proposed to access the northern turbine cluster of the Proposed Wind Farm via a new site entrance road off the R585 in the townland of Maughanaclea. The southern turbine cluster is accessed via an existing forestry road off the R585. The Proposed Wind Farm is served by a number of existing agricultural tracks.

Dunmanway town centre is located approximately 1.7km west of the Proposed Grid Connection terminus at the existing Dunmanway 110kV substation.

The main services for the Population Study Area are located within Kealkill, located approximately 2.3km northwest of the Proposed Wind Farm. Other settlement centres within the wider region include Bantry (approximately 9.5km to the southwest of the Proposed Wind Farm), and Dunmanway (approximately 12.2km to the east of the Proposed Wind Farm). Settlements provide retail, recreational, educational, and religious services.

5.3.1.7.1 *Education*

The nearest primary school to the Proposed Wind Farm is Mocomhog (Cappabue) National School, which is located approximately 1.9km north of the nearest turbine (T04). Kealkill National School is located approximately 2.6km west of the closest turbine (T14). The nearest secondary school is Scoil Mhuire, which is located approximately 8.4km northeast of the Proposed Project at its closest point. The nearest third-level institution to the Proposed Project is Munster Technological University (Bishopstown Campus) which is located approximately 52km east of the Proposed Wind Farm site at its closest point.

5.3.1.7.2 *Access and Public Transport*

It is proposed to access the northern turbine cluster of the Proposed Wind Farm via a new site entrance off the R585 in the townland of Maughanaclea. The southern cluster is accessed via an existing forestry road off the R585. The R585 travels in an east-west direction between the northern and southern turbine clusters. There is no public transport access to the Proposed Wind Farm. The nearest public transport access (public bus stop) is in Ballylickey, located approximately 6.4km southwest of the Site.

5.3.1.7.3 *Amenities and Community Facilities*

There are no amenity or community facilities located within or adjacent to the Proposed Wind Farm site, however there are several in the surrounding area. Most of the amenities and community facilities, including sports clubs, and recreational facilities are situated in the nearby settlements of Kealkill, Mealagh, and Ballylickey. The towns of Bantry and Dunmanway also offer a large selection of

amenities and community facilities. There are a number of GAA clubs surrounding the Proposed Wind Farm and the Proposed Grid Connection, some of which are the St Colum's (Cork) GAA Club and the Doheny's GAA Club (Sam Maguire Park). Located near Kealkill Village is the Bay Rovers A.F.C., located approximately 4km west of the Proposed Wind Farm site. The Mealagh Valley Community Centre is located approximately 1.9km southwest of the Proposed Wind Farm site.

The varied environment of this area of County Cork provides many opportunities for walking and cycling. The entrance to Nowen Hill Forest Recreational Area is located approximately 3.2km southeast of the Proposed Wind Farm site and provides opportunities for walking and running along its trail. Although this is not a waymarked walking trail, it is popular among locals. The Bearra Gougane Barra cycle route is a 318-km-long cycle route between Cork City and Beara-Gougane Barra, which at its closest point passes the Proposed Wind Farm site 0.4km to the north.

Community Benefit proposals, which would enhance local amenities and community facilities are described in Ch. 4: Description of the Proposed Project.

5.3.2 Tourism

For the purposes of this section, the Proposed Wind Farm is considered solely in relation to the tourism baseline assessment. Due to the temporary nature of the works and any potential effects associated with the Proposed Grid Connection underground cabling route, it has been screened out from the tourism assessment that follows. A standalone Tourism Impact Assessment of the Proposed Project has also been completed and included in Appendix 5-3 of this EIAR

5.3.2.1 Tourism and Revenue

Tourism is one of the major contributors to the national economy and is a significant source of full time and seasonal employment. *Key Tourism Facts 2023* [21], pertaining to domestic and international tourism volumes for Ireland, was published by Fáilte Ireland in 2024 for the year 2023. In 2023, out-of-state (overseas and Northern Ireland) tourist expenditure amounted to €6 billion. With a further €970 million spent by overseas visitors on fares to Irish carriers, foreign exchange earnings were €7 billion. Domestic tourism trips amounted to €3.1 billion, making tourism a €10 billion industry. The Central Statistics Office's estimates the number of people employed in 'Tourism Industries' to be 226,700 in Q3 2023 through an alternative method of estimating employment using PAYE tax data. Note that self-employed and primarily pensioners are excluded from the headcount.

Key Tourism Facts 2024, published in 2025 does not provide the same level of detail in terms of tourist numbers and expenditure as previous years of the same report as a result of a change in the CSO's data collection methodology, however, it does note that:

> *"Every €1m of tourist expenditure helps to support 22 employees in tourism industries."*

The Republic of Ireland is divided into seven tourism regions. Table 5-8 shows the total revenue and breakdown of overseas tourist numbers to each region in Ireland during 2023 ('*Key Tourism Facts 2024*, Fáilte Ireland, October 2025).

Table 5-8 Overseas Tourists Revenue and Numbers 2023 (source Fáilte Ireland)

Region	Total Revenue (€m)	Total Number of Non-Domestic Tourists (000s)

21 Failte Ireland Key Tourism Facts 2023, October 2024. Available at: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/FI_Key-Tourism-Facts-2023_v1-October-1.pdf?ext=.pdf

Dublin	2,283	4,094
Mid-East/Midlands	536	804
South-East	323	530
South-West	**1168**	**1,442**
Mid-West	536	827
West	847	1,226
Border	376	525
Total	**5,117**	**9,448**

The South-West Region, in which the Site is located, comprises Counties Cork and Kerry. This Region benefited from approximately 21% of the total number of overseas tourists to the country and approximately 23% of the total tourism income generated in Ireland in 2022.

5.3.2.2 Tourist Attractions

There are no key identified tourist attractions pertaining specifically to the Proposed Wind Farm site.

Tourism Attractions within the surrounding landscape

Key tourist attractions within County Cork include Cork City, Blarney Castle and Gardens, Spike Island, The English Market, Fota Wildlife Park, and Gougane Barra National Forest Park. Many additional tourist attractions can also be found within the county, particularly in the towns, villages and surrounding areas of West Cork.

The Discover Ireland website (www.discoverireland.ie) lists the following attractions within the vicinity of the Proposed Wind Farm site:

- **Kealkill Stone Circle** is a megalithic site located approximately 1.6km west of the Proposed Wind Farm site. The complex consists of a five stone axial circle with two large standing stones and a cairn nearby.
- **Carriganass Castle**, a restored 16th century tower house, is located approximately 2.4km to the northwest of the Proposed Wind Farm site in the village of Kealkill. Kealkill Stone Circle and Breeny More Stone Circle are two megalithic archaeological sites also located within the village of Kealkill. A number of walking routes are located within the village of Kealkill.
- **West Cork Experiences** is located approximately 2.7km west of the Proposed Project at its closest point. West Cork Experiences offer guided tours, where visitors can enjoy local food, learn new skills and experience the Wild Atlantic Way.
- **O'Donovan's Castle** was built originally by the Donal 'of the Hides' O'Donovan in 1560 and is situated on the east bank of the River llen, approximately 5.9km south of the Proposed Wind Farm site.
- **Bumblebee Flower Farm** is located approximately 7.2km southwest of the Proposed Wind Farm site at its closest point, near the town of Drimoleague. It is a provider of bouquets and a sanctuary for wildlife, and hosts on-farm experiences.
- **Glounaclohy Walk (Drimoleague)** is a hill walk from Castledonovan to Coomanore Lake, located approximately 7.3km south of the Proposed Wind Farm site.

A number of amenities and tourist attractions can be found in the nearby town of Bantry, located approximately 9.6km southwest of the Proposed Wind Farm site, including Bantry Bay Golf Club.

Archaeological sites and monuments are part of Irish national heritage and are recognised tourist attractions across the country. National Monuments within 10km of the nearest turbine are listed below. It should be known that not all of these National Monuments are publicly accessible. Please see Ch. 14: Cultural Heritage for further details.

- Breeny More Stone Circle & boulder burials;
- Breeny More Stone Circle -Multiple Stone;
- Derryarkane Stone Circle & Standing Stone;
- Maughanasilly Stone Row;
- Kealkill Stone circle - five-stone; and,
- Derryarkane Stone Circle & Standing Stone.

The potential for visual effects arising from the Proposed Project on the wider landscape and scenic roads is assessed in Ch. 14: Cultural Heritage of this EIAR.

5.3.2.3 Proposed Project Tourism Impact Assessment

The Tourism Impact Assessment (TIA) for the Proposed Project assesses tourism based on the supply and distribution of accommodation, visitor demand levels, and visitor attractions provide further methods of quantifying tourism activity in an area in order to assess significance.

According to the TIA, there is one registered tourist accommodation premises (Wild Hideaways Eco Retreat in Meelagh Valley) and an additional 11 no. Airbnb premises within 5 km of the Site. This suggests that the immediate area is not highly significant in tourism terms, although it does indicate that there is a certain level of tourism. In the wider Bantry/Ballylickey/Glengarriff area, approximately 8-10 km away from the Site, is the closest hub of tourism activity as gauged by the clustering of tourist accommodation. It can be noted that a significant proportion of accommodation in this area is accounted for by caravan and camping, suggesting a thriving domestic family market that is more interested in coast and sea than in inland touring.

A review of visitor attractions across County Cork (excluding the City) identifies that the top attractions are located at a considerable distance from the Site, with Blarney, Carrigtwohill, and Doneraile listed as the most visited. According to the desk study undertaken by the TIA, recognised sources - Fáilte Ireland, the Association of Visitor Experiences and Attractions (AVEA) and the Office of Public Works (OPW) - does not identify any visitor attraction in the immediate vicinity of the Proposed Project. Therefore, the absence of any visitor attraction in the immediate area identifiable through official data sources indicates that the area is not of high tourism significance.

However, the TIA also recognises the importance of considering the existence of other potential tourism assets that may not be captured through official sources of accommodation and visitor attractions data, including St. Fin Barre's Oratory & Gougane Barra Forest Park. It was found that while there is no visitor number data available for St. Fin Barre's Oratory, most recent data for the Forest Park, which is over ten years old, indicates approx. 63,000 visitors to the Park (Fáilte Ireland, 2010). This makes it a relatively significant tourism asset.

The Sheep's Head Way is also an identified tourist attraction in the TIA. Although, it is noted that, due to the strenuous nature of the trail, it is more likely that experienced walkers utilise these trails, which would not be considered part of a mainstream tourism market. The vast majority of walkers (85%) prefer short walks of 1km-5kms.

In addition to the two recognised tourism assets, a number of scenic routes are also identified in the TIA which may also be taken into consideration. One of which passes by the entrance to the Site: this is the R585 to Kealkill via the Cousane Gap to Derragh Bridge. A second route also needs to be

considered, which is the R548, a few kilometres north of Kealkill through the Pass of Keimaneigh to Gougane Barra.

The TIA observes that, upon review of the immediate development area through the Government's Historic Environment Viewer identifies a number of small archaeological sites (further discussed in Ch. 14: Cultural Heritage) but does not identify any tourism significance.

The TIA assess the potential impacts of the Proposed Project through a review of datasets on whether tourists' experiences are affected by the nature of the development – wind farms and turbines. With regard to higher end tourism, the assessment of the tourism character and significance of the Proposed Project location is considered to be of low tourism significance. The closest tourism hub is Bantry is over 10kms away and beyond the range of potential impact.

The TIA also assess the potential impacts of the Proposed Project on a small number of tourism assets identified in the immediate area, namely Sheep's Head Way/St.Finbarr's Way, and the scenic routes. The TIA concludes it is not considered that the Proposed Project will have an impact on the Sheep's Head Way/St.Finbarr's Way. As a result, it can be considered to also have no impact on its tourism value.

According to the TIA it is considered that the Proposed Project will have a negative impact on the local section of the Sheeps Head Way. However, as the impact is not expected to be significant due to the low visitor numbers using the trail and the lack of evidence that wind farms are perceived as negative by tourists, the impact on the tourism value of the trail is considered not to be significant.

Finally, it is not considered that the Proposed Project will have a limited impact on 1 no. scenic route identified in the area: the S29 - R585 Kealkill and Cousane Gap. Due to the modest length of the route, low level of tourism in the area and the lack of evidence that wind farms are perceived as negative by tourists, the impact on the tourism value of the route is considered not to be significant.

The TIA concludes that the Proposed Project as described will not have any significant negative impact on tourism in the area nor on the value of tourism asset.

The full TIA is contained in Appendix 5-3.

5.3.2.4 Tourist Attitudes to Wind Farms

5.3.2.4.1 *Scottish Tourism Study 2021*

BiGGAR Economics undertook an independent study in 2021, entitled '*Wind Farms & Tourism Trends in Scotland: Evidence from 44 Wind Farms'* to understand the relationship, if any, that exists between the development of onshore wind and the sustainable tourism sector in Scotland. In recent years, the onshore wind sector and sustainable tourism sector have grown significantly in Scotland. However, it could be argued that if there was any relationship between the growth of onshore wind energy and tourism, it would be at a more local level. This study therefore considered the evidence at a local authority level and in the immediate vicinity of constructed wind farms.

Since 2009, the onshore wind sector has expanded considerably in Scotland. Employment in tourism-related sectors in Scotland also grew during the years since 2009, an overall increase of 20%.

Analysis of the rates of change in the number of onshore wind turbines and in tourism-related employment in local authority areas, found that there is no correlation between the two factors. This applies to whether the analysis covers the decade between 2009 – 2019, or the more recent 2015 to 2019 period.

The research also analysed trends in tourism employment within the immediate vicinity of wind farm developments. This included 16 no. wind farms with a capacity of at least 10MW that became

operational between 2015 and 2019. Analysis of trends in tourism employment in the locality of these wind farms (study areas were based on a 15km radius) found that 11 of these 16 areas had experienced more growth in tourism employment than for Scotland as a whole. For 12 of the 16 wind farms, trends in tourism employment in the locality had outperformed the local authority area in which they were based.

The research also re-examined 28 wind farms constructed between 2009 and 2015 that had been analysed in a previous study published in 2017, finding that the localities in which they were based had outperformed Scotland and their local authority areas in the majority of cases. Moreover, the analysis, found that in the seven areas which had underperformed their local authority areas in the 2017 study, four had done better than their local authorities in the 2015 to 2019 period.

This research analysed trends in tourism employment in the localities of 44 no. wind farms developed in recent years, providing a substantial evidence base.

Overall, the conclusion of this study is that published national statistics on employment in sustainable tourism demonstrate that there is no relationship between the development of onshore wind farms and tourism employment at the level of the Scottish economy, at local authority level, nor in the areas immediately surrounding wind farm development. However, the report also concluded that:

> "*Although this study does not suggest that there is any direct relationship between tourism sector growth and wind farm development, it does show that wind farms do not cause a decrease in tourism employment either at a local or a national level.*"

5.3.2.4.2 *Fáilte Ireland Surveys 2007 and 2012*

In 2007, Fáilte Ireland in association with the Northern Ireland Tourist Board carried out a survey of domestic and overseas holidaymakers to Ireland in order to determine their attitudes to wind farms. The purpose of the survey was to assess whether the development of wind farms impacts on the enjoyment of the Irish scenery by holidaymakers. The survey involved face-to-face interviews with 1,300 tourists (25% domestic and 75% overseas). The results of the survey are presented in the Fáilte Ireland Newsletter 2008/No.3 entitled '*Visitor Attitudes on the Environment: Wind Farms*'.[22]

The Fáilte Ireland survey results indicate that most visitors are broadly positive towards the idea of building wind farms in Ireland. There exists a sizeable minority (one in seven) however who are negative towards wind farms in any context. In terms of awareness of wind farms, the findings of the survey include the following:

- Almost half of those surveyed had seen at least one wind farm on their holiday to Ireland. Of these, two thirds had seen up to two wind farms during their holiday.
- Typically, wind farms are encountered in the landscape while driving or being driven (74%), while few have experienced a wind farm up close.
- Of the wind farms viewed, most contained less than ten turbines and 15% had less than five turbines.

Regarding the perceived impact of wind farms on sightseeing, the Fáilte Ireland report states:

> *"Despite the fact that almost half of the tourists interviewed had seen at least one wind farm on their holiday, most felt that their presence did not detract from the quality of their sightseeing, with the largest proportion (45%) saying that the presence of the wind farm had a positive impact on their enjoyment of sightseeing, with 15% claiming that they had a negative impact."*

[22] *Fáilte Ireland (2008) Visitor Attitudes on the Environment – Wind Farms* <https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/Visitor-Attitudes-on-the-Environment.pdf?ext=.pdf>

In assessing the perceived impact of wind farms on beauty, visitors were asked to rate the beauty of five different landscape types: Coastal, Mountain, Farmland, Bogland and Urban Industrial, and then rate on a scale of 1-5 the potential impact of a wind farm being sited in each landscape. The survey found that each potential wind farm must be assessed on its own merits. Overall, however, in looking at wind farm developments in different landscape types, the numbers claiming a positive impact on the landscape due to wind farms were greater than those claiming a negative impact, in all cases.

Regarding the perceived impact of wind farms on future visits to the area, the Fáilte Ireland survey states:

> *"Almost three quarters of respondents claim that potentially greater numbers of wind farms would either have no impact on their likelihood to visit or have a strong or fairly strong positive impact on future visits to the island of Ireland. Of those who feel that a potentially greater number of wind farms would positively impact on their likelihood to visit, the key driver is their support for renewable energy and potential decreased carbon emissions."*

The report goes on to state that while there is a generally positive disposition among tourists towards wind development in Ireland, it is important also to take account of the views of the one in seven tourists who are negatively disposed towards wind farms. This requires good planning on the part of the wind farm developer as well as the Local Authority. Good planning has been an integral component of the Proposed Project throughout the design and assessment processes. Reference has been made to the Guidelines (DoEHLG, 2006) and the Draft Guidelines (DoHPLG, 2019) in addition to WEI (previously IWEA) best practice guidance, throughout all stages, including pre-planning consultation and scoping.

The 2007 survey findings are further upheld by a more recent report carried out by Fáilte Ireland on tourism attitudes to wind farms in 2012. The results of the updated study were published in the Fáilte Ireland Newsletter 2012/No.1 entitled '*Visitor Attitudes on the Environment: Wind Farms – Update on 2007 Research*'[23]. The updated survey found that of 1,000 domestic and foreign tourists who holidayed in Ireland during 2012, over half of tourists said that they had seen a wind turbine while travelling around the country. Of this number of tourists, 21% claimed wind turbines had a negative impact on the landscape. However, 32% said that it enhanced the surrounding landscape, while 47% said that it made no difference to the landscape. Almost three quarters of respondents claim that potentially greater numbers of wind farms would either have no impact on their likelihood to visit or have a strong or fairly strong positive impact on future visits to the island of Ireland.

Further details regarding the general public perception of wind energy, including those living in the vicinity of a wind farm, are presented in Section 5.3.3 below.

5.3.3 Public Perception of Wind Energy

5.3.3.1 Sustainable Energy Authority of Ireland Surveys on Opinions Towards Wind Farms

5.3.3.1.1 *Irish National Survey of Households Near New Commercial Wind and Solar Farms*

Background

In May 2023 the Sustainable Energy Authority of Ireland (SEAI) published a report on the national survey they commissioned of people's opinions of new commercial solar or wind farm projects in

[23] *Fáilte Ireland (2008) Visitor Attitudes on the Environment: Wind Farms – Update on 2007. Available at* <https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/WindFarm-VAS-(FINAL)-(2).pdf?ext=.pdf>

Ireland.[24] In 2022, surveyors conducted in-person interviews on the doorstep across rural Ireland. The survey included 1,764 households which included 1,116 households within 5km of a new commercial wind or solar project sites, of which 219 live within 1km of a project site.

2023 Findings

The results of this survey revealed that 67% of respondents hold positive or very positive views towards wind energy, while 73% of respondents who live less than 1km away from a Renewable Electricity Support Scheme (RESS) wind project hold positive or very positive attitudes towards wind energy, while 70% of those in the control group hold such views.

The attitude of the residents toward wind energy showed that 59% of all respondents, and 65% of respondents living less than 1km away from a RESS wind project, felt Ireland has too few wind farms, the same proportion as the control group. A few respondents feel Ireland has too many wind farms, regardless of how close they live to a new wind farm.

The results of this survey will form part of a long-term study to understand the effects of government policies under the RESS on the publics support for Ireland's energy transition.

5.3.3.1.2 *Sustainable Energy Ireland Survey 2003*

Background

The first wind farm in Ireland was completed in 1992 at Bellacorrick, Co. Mayo, by mid-2007 there were 67 wind farms and in 2024 there are almost 400 wind farms on the island of Ireland. Since 1992 wind farms have elicited a range of reactions from the Irish people.[25] In response, the SEAI (formerly SEI) commissioned a survey aimed at identifying public attitudes to renewable energy and to wind energy in Ireland. The results of which were published in 2003 and updated in 2017 as a national survey entitled '*Attitudes Towards the Development of Wind Farms in Ireland'*. A catchment area survey was also carried out by to focus specifically on people living with a wind farm in their locality or in areas where wind farms are planned.

2003 Findings

The SEAI survey published in 2003, found that the overall attitude to wind farms is very positive, with 84% of respondents rating it positively or very positively. One percent rates it negatively and 14% had no opinion either way. Approximately two thirds of respondents (67%) were found to be positively disposed to having a wind farm in their locality. Where negative attitudes were voiced towards wind farms, the visual effect of the turbines on the landscape was the strongest influence. The report also notes however that the findings obtained within wind farm catchment areas showed that effect on the landscape is not a major concern for those living near an existing wind farm.

With regards to the economic and environmental effects of wind farm development, the national survey reveals that attitudes towards wind energy are influenced by a perception that wind is an attractive source of energy:

> *"Over 8 in 10 recognise wind as a non-polluting source of energy, while a similar number believe it can make a significant contribution to Ireland's energy requirements."*

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[24] *SEAI Irish national survey of households near new commercial wind and solar farms. Available at:* <https://www.seai.ie/publications/SEAI-RESS-National-Survey.pdf>

[25] *Fáilte Ireland (2008) Visitor Attitudes on the Environment – Wind Farms. Available at:* https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/Visitor-Attitudes-on-the-Environment.pdf?ext=.pdf

The study reveals uncertainty among respondents with regards to the issues of noise levels, local benefits and the reliability or otherwise of wind power as an energy source. It goes on to state however that the finding that people who have seen wind farms rate these economic and environmental factors more favourably is a further indication that some experience of the structures tends to translate into positive attitudes towards wind energy.

Similar to the national survey, the surveys of those living within the vicinity of a wind farm also found that the findings are generally positive towards wind farms. Perceptions of the effect of the development on the locality were generally positive, with some three-quarters of interviewees believing it had impacted positively.

In areas where a wind farm development had been granted planning permission but was not yet under construction, three quarters of the interviewees expressed themselves in favour of the wind farm being built in their area. Four per cent were against the development. The reasons cited by those who expressed themselves in favour of the wind farm included the fact that wind energy is clean (78%), it would provide local jobs (44%), it would help develop the area (32%) and that it would add to the landscape (13%). Those with direct experience of a wind farm in the locality are generally impressed with it as an additional feature in the landscape. The report states:

> *"It is particularly encouraging that those with experience of wind turbines are most favourable to their development and that wind farms are not solely seen as good in theory, but are also seen as beneficial when they are actually built."*

Few of those living in proximity either to an existing wind farm or one for which permission has been granted believe that the development damages the locality, either in terms of damage to tourism potential or to wildlife. The survey found that there is a clear preference for larger turbines in smaller numbers over smaller turbines in larger numbers.

Survey Update 2017

Additionally, a survey carried out by Interactions in October 2017, published by the SEAI, show 47% of Irish adults polled said they were strongly in favour of wind power in Ireland while a further 38% favour it. Overall, this is a 4% increase in favourable attitudes towards wind power compared with similar research in 2013.

The SEAI survey found that the overall attitude to wind farms is very positive, with 84% of respondents in favour of the use of wind energy in Ireland. Approximately two thirds of respondents (70%) would prefer to power their home with renewable energy over fossil fuels, and 45% would be in favour of a wind farm development in their area.

The survey also captured the perceived benefits of wind power among the public. Of those surveyed three quarters selected good for the environment and reduced Carbon Dioxide emissions while fewer people, just over two in three, cited cheaper electricity.

Conclusions

The main findings of the SEAI Surveys from 2003, 2017, and 2023 show consistently strong public support for wind energy in Ireland. In 2003, 84% of respondents viewed wind energy positively, with 67% open to having a wind farm nearby and concerns mainly limited to visual impact. The 2017 SEAI survey reported a similar 84% favourability, with 70% preferring renewable energy for their homes and 45% supporting local wind farm development, citing environmental and cost benefits. By 2023, support remained high, with 67% overall and 73% of those living near RESS-supported projects holding positive views, suggesting that proximity and direct experience with wind farms continue to reinforce favourable attitudes. These studies highlights that two-thirds of Irish adults are generally favourable to having a

wind farm built in their locality, with little evidence of a "Not In My Back Yard" (NIMBY) effect. The final section of the 2017 report states:

> *"The overwhelming indication from this study is that wind energy enjoys great support and, more specifically, that the development of wind farms is supported and welcomed. The single most powerful indicator of this is to be found among those living in proximity to an existing wind farm: over 60% would be in favour of a second wind farm or an extension of the existing one. This represents a strong vote in favour of wind farm developments – especially important since it is voiced by those who know from direct experience about the impact of such developments on their communities."*

5.3.3.2 Public Perceptions of Wind Power in Scotland and Ireland Survey 2005

Background

A survey of the public perception of wind power in Scotland and Ireland was carried out in 2003/2004 by researchers at the School of Geography & Geosciences, University of St. Andrews, Fife and The Macaulay Institute, Aberdeen ('*Green on Green: Public Perceptions of Wind Power in Scotland and Ireland*', Journal of Environmental Planning and Management, November 2005). The aims of the study were to ascertain the extent to which people support or oppose wind power, to investigate the reasons for these attitudes and to establish how public attitudes relate to factors such as personal experience of operational wind farms and their proximity to them.

Study Area

Surveys were carried out at two localities in the Scottish Borders region, one surrounding an existing wind farm and one around a site at which a wind farm had received planning permission but had not yet been built. Surveys were also carried out in Ireland, at two sites in Counties Cork and Kerry, each of which had two wind farms in proximity to each other.

Findings

The survey of public attitudes at both the Scottish and Irish study sites concluded that large majorities of people are strongly in favour of their local wind farm, their personal experience having engendered positive attitudes. Attitudes towards the concept of wind energy were described as "overwhelmingly positive" at both study sites in Scotland, while the Irish survey results showed almost full support for renewable energy and 92% support for the development of wind energy in Ireland.

The results of the survey were found to agree with the findings of previous research, which show that positive attitudes to wind power increase through time and with proximity to wind farms. With regards to the NIMBY effect, the report states that where NIMBY-ism does occur, it is much more pronounced in relation to proposed wind farms than actual wind farms. The Scottish survey found that while positive attitudes towards wind power were observed among those living in proximity to both the proposed and existing wind farm sites, people around the proposed site were less convinced than those living in proximity to the existing site. Retrospective questioning regarding pre- and post-construction attitudes at the existing site found that attitudes remained unchanged for 65% of respondents. Of the 24% of people who altered their attitudes following experience of the wind farm, all but one became more positive. The report states:

> *"These results support earlier work which has found that opposition to wind farms arises in part from exaggerated perceptions of likely impact, and that the experience of living near a wind farm frequently dispels these fears. Prior to construction, locals typically expect the*

landscape impacts to be negative, whereas, once in operation, many people regard them as an attractive addition."

The reasons that people gave for their positive attitude to the local wind farm were predominantly of a global kind, i.e. environmental protection and the promotion of renewable energy, together with opposition to a reliance on fossil fuels and nuclear power. Problems that are often cited as negative effects of wind farms, such as interference with telecommunications and shadow flicker were not mentioned at either site. With regards to those who changed to a more positive attitude following construction of the wind farm, the reasons given were that the wind farm is *"not unattractive (62%), that there was no noise (15%), that community funding had been forthcoming (15%) and that it could be a tourist attraction (8%)".*

The findings of the Irish survey reinforce those obtained at the Scottish sites with regards to the increase in positive attitudes to wind power through time and proximity to wind farms. The survey of public attitudes at the sites in Cork and Kerry found that the highest levels of support for wind power were recorded in the innermost study zone (0 – 5 km from a point in between the pair of wind farms). The data also suggests that *"those who see the wind farms most often are most accepting of the visual impact"*. The report also states that a previous Irish survey found that most of those with direct experience of wind farms do not consider that they have had any adverse effect on the scenic beauty of the area, or on wildlife, tourism or property values. Overall, the study data reveals *"a clear pattern of public attitudes becoming significantly more positive following personal experience of operational wind farms".*

With regards to wind farm size, the report notes that it is evident from this and previous research that wind farms with small numbers of large turbines are generally preferred to those with large numbers of smaller turbines.

Conclusions

The overall conclusions drawn from the survey findings and from the authors' review of previous studies show that local people become more favourable towards wind farms after construction, that the degree of acceptance increases with proximity to them, and that the NIMBY effect does not adequately explain variations in public attitudes due to the degree of subjectivity involved.

5.3.3.3 Wind Energy Ireland National Polls on Wind Energy

IWEA Interactions Opinion Poll on Wind Energy 2019

Published in January 2020, Wind Energy Ireland (IWEA) undertook a national opinion poll on Wind Energy November 2019 with the objective to "*measure and track public perceptions and attitudes around wind energy amongst Irish adults*." Between November 20th – 30, a nationally represented sample of 1,019 adults and a booster sample of 200 rural residents participated in an online survey. The 2019 results indicate that 79% of both the nationally represented sample and rural sample strongly favour or favour wind power while 16% of both samples neither favour or oppose it. Amongst those in favour of wind power, the majority cited environmental and climate concerns as their main reasons for supporting such developments. Other reasons cited for supporting wind energy developments include: "economic benefits," "reliable/efficient," "positive experience with wind energy" and recognise it as a "safe resource." When questioned about wind developments in their local area, 55% of nationally represented sample favour or tend to favour such proposals and 51% of the rural population reported the same. Reasons cited for supporting wind developments in their local area include: "good for the environment," "social responsibility," "create jobs," "good for the community."

The IWEA November 2019 survey follows previous national opinion polls on wind energy undertaken in October 2017 and November 2018. The 2019 survey results are consistent with the 2017 and 2018

figures and thus indicate that approximately 4 out of 5 Irish adults have continued to support for wind energy in recent years.

Wind Energy Ireland Public Attitudes Monitor 2022

Published in December 2022, IWEA undertook a national opinion poll on Wind Energy in Q4 of 2022 with the objective '*to measures & track the perceptions and attitudes around wind energy amongst Irish adults*. Between November 23rd and December 8th, 2022, a nationally represented sample of 1,017 and a booster sample of 201 rural dwellers participated in the survey. The 2022 results indicate that 80% of the nationally representative sample and 85% of the rural sample strongly favour or favour wind power. Almost half (45%) of those surveyed ranked cheaper electricity as the top wind energy benefit. Amongst rural residents, the percentage of people producing negative feedback is reducing year on year. Nationally, 58% of people said that they would be in favour of a wind farm in their area, which is the highest number in favour since tracking began. Amongst rural residents, just 1 in 10 people registered being opposed to having a wind farm in their local area.

The IWEA December 2022 survey follows previous national opinion polls on wind energy undertaken by IWEA in November 2019 and November 2018. The 2022 survey results are consistent with the 2019 and 2018 figures and thus indicate that 4 out of 5 Irish adults have continued to support wind energy in recent years.

WEI Interactions Opinion Poll on Wind Energy 2023

In early 2023, Wind Energy Ireland (WEI) published the results of their most recent nationwide annual poll on attitudes to wind energy, the Public Attitudes Monitor.[26] The objective of the poll was to '*measure and track public perceptions and attitudes around wind energy amongst Irish adults*.'

Between 23rd November and 8th December 2022, a nationally representative sample of 1,017 Irish adults together with a booster sample of 201 rural residents participated in the survey. The 2022 results reported that 4 in 5 (80%) are now in favour of wind power which is a 6% increase on the 2021 results (54% of those in favour were 'strongly in favour'). Amongst rural residents, 4 in 5 (85%) were recorded as having favourable attitudes towards wind power. The survey has been run annually since 2017 and while there has been a marginal decrease in those in favour of wind power nationally during this time (from 85% to 80%) there has been an increase in those in favour from the rural population (from 79% to 85%).

Amongst those in favour of wind power, the majority cited the fact that Ireland was a windy country with a readily available renewable resource and environmental and climate concerns as their main reasons for supporting such developments. Other reasons cited for supporting wind energy developments include: 'free/cheap/costs less', 'reliable/efficient', 'economy/jobs', and view that it as a 'safe resource'.

When questioned about wind energy developments in their local area, 58% of the nationally representative sample either 'favour' or 'tend to favour' such proposals compared to 56% of the rural population reporting the same.

The Wind Energy Ireland 2023 survey follows the structure of previous national opinion polls on wind energy undertaken since 2017. The 2023 survey results are consistent with previous year's figures and thus indicate that approximately 4 out of 5 Irish adults have continued to support wind energy in recent years.

[26] https://windenergyireland.com/about-wind/more-resources/annual-wind-survey

Wind Energy Ireland Public Attitudes Monitor 2024

In late 2024, WEI published the results of their most recent nationwide annual poll on attitudes to wind energy, the Public Attitudes Monitor[27]. The objective of the poll was to "*measure and track public perceptions and attitudes around wind energy across ROI*".

Between 17th November and 1st December 2024, a nationally representative sample of 1,070 Irish adults together with a booster sample of 210 rural residents participated in the survey. The 2024 results reported that 4 in 5 (80%) are now in favour of wind power (55% of those in favour were 'strongly in favour'). Amongst rural residents, 80% were recorded as having favourable attitudes towards wind power. The survey has been run annually since 2017 and while there has been a marginal decrease in those in favour of wind power nationally during this time (from 85% to 80%) there has been a minor increase in those in favour from the rural population (from 79% to 80%).

Amongst those in favour of wind power, the majority cited that the reduction in electricity prices as their primary perceived benefit of wind energy. Other reasons cited for supporting wind energy developments include: 'reduces CO_2 emissions", "good for the environment", "supports energy independence", "creates employment", and "good for local communities".

When questioned about wind energy developments in their local area, 62% of the nationally representative sample either 'favour' or 'tend to favour', an increase from 54% in 2020.

The Wind Energy Ireland 2024 survey follows the structure of previous national opinion polls on wind energy undertaken since 2017. The 2024 survey results are consistent with previous year's figures and thus indicate that approximately 4 out of 5 Irish adults have continued to support wind energy in recent years.

Conclusion

The WEI national opinion polls from 2019 to 2024 consistently demonstrate strong and sustained public support for wind energy among Irish adults. Across all years, approximately 80% of respondents nationally, and increasingly among rural residents, expressed favourable attitudes towards wind energy. Support is driven primarily by environmental concerns, the perception of wind as a safe and reliable resource, and its potential to lower electricity costs. Notably, acceptance of local wind energy developments has also grown, with 62% of the national sample supporting such projects in 2025, the highest level recorded to date. These findings highlight a stable and positive public attitude towards wind energy in Ireland, reinforcing its role in the country's renewable energy strategy.

5.3.3.4 University College Cork study, 2024

A 2024 study published by University College Cork researchers le Maitre et al. (2024) *titled 'Do concerns about wind farms blow over with time? Residents' acceptance over phases of project development and proximity'* similarly investigates the relationship between 'near neighbours' of Wind Farms, and provides descriptive statistics on the profiling and opinions of wind farm 'near neighbours'. This Republic of Ireland based study employed a large scale experimental survey of 1109 participants within 10km of an existing wind farm in Ireland, to assess public perception to accept further onshore wind energy developments. Data was collected through an online survey conducted in May–July 2021 and July–August 2022. The survey focused on residents living near to existing wind farms at the various project stages(planning, construction and operational). The study looked to understand residents attitudes towards another (new) wind farm located near to their home. The survey screened respondents on the basis of their age, gender, and region to identify a suitable sample living with 10km of a wind farm. The survey investigates whether residents would prefer to maintain the "status quo" (i.e.

[27] *Wind Energy Attitudes Monitor, 2024. Wind Energy Attitudes Monitor. Available at:* https://windenergyireland.com/images/files/wind-energy-ireland-2024-report-key-slides-website.pdf

no further wind farm developments in the area) or have willingness to accept further development in the area. Please see Figure 5-5 below which details how distance, as well as the phase of the wind farms the residents are 'near neighbours' to, dictates their preference for additional developments.

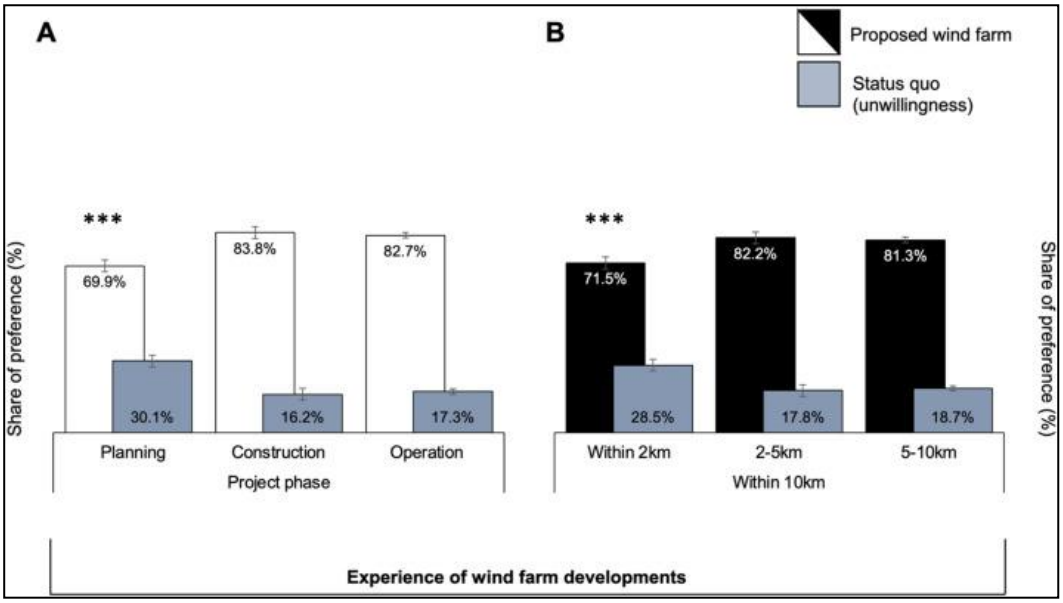


Figure 5-7: Share of preference for a 'best-case' combination of wind development features and the status quo (A) over phase of project development; and (B) over proximity to the wind farm. (Le Maitre et al. 2024)

Firstly, it should be highlighted that only 13% of the 1109 respondents (c. 144 persons) were unwilling to accept further wind farm development, with the remaining 87% being in favour of additional wind energy developments in their area. Similarly, it should be noted that a majority of respondents living next to operational wind farms were from the south-west region (i.e. Cork and Kerry) which have the largest number of operational turbines. Counties such as Dublin have fewer participants within the study due to the lack of turbines within 10km of the region As showcased in Figure 5-5 above, the survey findings suggest that residents who live within 10km of a wind farm development within the planning phase are more likely to be unwilling to accept further wind energy developments than those who live in proximity to a wind energy development either under construction, or within the operational phase. In all cases, a majority of respondents display moderate to strong willingness for additional wind energy developments in the area. Similarly, respondents living within 2km of a wind energy development are less likely to accept further wind energy developments than those within the 2-10km near neighbour zone.

Regarding respondents' opinions concerning wind electricity, 62% of 'status quo' respondents believed that wind energy was a "clean renewable source", when compared to 89% respondents with willingness to accept. Furthermore 65% of 'status quo' respondents believe that wind farm developments can negatively impact tourism. Similarly, 'status quo' respondents were very unlikely to trust information from a website run by the wind farm developer (only 20% very likely to trust), however, this sentiment was common amongst all latent classes, with 54% and 69% of respondents with moderate and strong willingness to accept further renewable energy developments respectively, being very likely to trust a developer run website. Worth noting is the fact that for each latent class, respondents were more likely to trust a community liaison officer or an information pack provided by a developer.

To conclude, this study illustrates that whilst negative sentiment towards wind energy developments are common at the planning phases, these sentiments generally subside during the construction and operational phases of the development. Similarly, respondents unwilling to accept wind energy development held negative personal opinions on wind energy generation when compared to those with willingness to accept. This report also highlights the importance of a strong community consultation process.

5.3.4 Health Effects of Wind Farms

5.3.4.1 Introduction

The 2022 Census of Ireland as carried out by the Central Statistics Office provides the general health conditions of the population of the EDs which make up the Population Study Area for the Proposed Wind Farm. The vast majority of those within the Population Study Area marked their general health as being 'very good' across all EDs. It is not anticipated that the general health of the population of the Population Study Area be altered due to the Proposed Project.

5.3.4.2 Health Impact Studies

While there are anecdotal reports of negative health effects on people who live very close to wind turbines, peer-reviewed research has not supported these statements. There is currently no published credible scientific evidence to positively link wind turbines with adverse health effects. The main publications supporting the view that there is no evidence of any direct link between wind turbines and health are summarised below.

1. ***'Wind Turbine Sound and Health Effects – An Expert Panel Review',*** *American Wind Energy Association and Canadian Wind Energy Association, December 2009*

This expert panel undertook extensive review, analysis and discussion of the large body of peer-reviewed literature on sound and health effects in general, and on sound produced by wind turbines in particular. The panel assessed the plausible biological effects of exposure to wind turbine sound. Following review, analysis, and discussion of current knowledge, the panel reached consensus on the following conclusions:

- "There is no evidence that the audible or sub-audible sounds emitted by wind turbines have any direct adverse physiological effects.
- The ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans.
- The sounds emitted by wind turbines are not unique. There is no reason to believe, based on the levels and frequencies of the sounds and the panel's experience with sound exposures in occupational settings, that the sounds from wind turbines could plausibly have direct adverse health consequences."

The report found, amongst other things, that:

- "Wind Turbine Syndrome" symptoms are the same as those seen in the general population due to stresses of daily life. They include headaches, insomnia, anxiety, dizziness, etc.
- Low frequency and very low-frequency 'infrasound' produced by wind turbines are the same as those produced by vehicular traffic and home appliances, even by the beating of people's hearts. Such 'infrasounds' are not special and convey no risk factors;
- The power of suggestion, as conveyed by news media coverage of perceived 'wind-turbine sickness', might have triggered 'anticipatory fear' in those close to turbine installations."

2. ***'Wind Turbine Syndrome – An independent review of the state of knowledge about the alleged health condition',*** *Expert Panel on behalf of Renewable UK, July 2010*

This report consists of three reviews carried out by independent experts to update and understand the available knowledge of the science relating to infrasound generated by wind turbines. This report was prepared following the publication of a book entitled '*Wind Turbine Syndrome'*, in 2009 by Dr. Pierpont, which received significant media attention at the time. The report discusses the methodology

and assessment carried out in the 2009 publication and assessed the impact of low-frequency noise from wind turbines on humans. The independent review found that:

- "The scientific and epidemiological methodology and conclusions drawn (in the 2009 book) are fundamentally flawed;
- The scientific and audiological assumptions presented by Dr Pierpont relating infrasound to WTD are wrong; and
- Noise from Wind Turbines cannot contribute to the symptoms reported by Dr. Pierpont's respondents by the mechanisms proposed."

Accordingly, the consistent and scientifically robust conclusion remains that there is no evidence to demonstrate any significant health effects in humans arising from noise at the levels of that generated by wind turbines.

3. ***'The Health Effects of 72 Hours of Simulated Wind Turbine Infrasound: A Double-Blind Randomized Crossover Study in Noise-Sensitive Health Adults'*** *Woolcock Institute for Medical Research, New South Wales Australia*

The purpose of this study was to examine the potential health effects of audible sound and inaudible infrasound has on noise sensitive adults over a period of 72 hours. Sufferers of wind turbine syndrome (WTS) have attributed their ill-health and particularly their sleep disturbance to the signature of infrasound. On this basis, the objectives of the study were to test the effects of 72 hours of infrasound exposure on human physiology, particularly sleep. The results of the study are outlined below:

- All staff and participants were asked whether they were able to differentiate in any way between infrasound and sham infrasound (the control), and none of them were able to.
- The study found that 72 hours of the simulated wind turbine infrasound (~90dB pk re 20 µPa) in controlled laboratory conditions did not worsen any measure of sleep quality compared with the same speakers being present but not generating infrasound (sham infrasound).
- The study found no evidence of that 72 hours of exposure to a sound level of ~90dB pk re 20 µPa of simulated wind turbine infrasound in double-blind conditions perturbed any physiological or psychological variable.
- None of the participants in the study who were exposed to infrasound developed what could be described as Wind Turbine Syndrome.
- This study suggests that the infrasound component of Wind Turbine Syndrome is unlikely to be a cause of any ill-health or sleep disruption, although this observation should be independently replicated.

4. ***'A Rapid Review of the Evidence',*** *Australian Government National Health and Medical Research Council (NHMRC) Wind Turbines & Health, July 2010*

The purpose of this paper was to review evidence from current literature on the issue of wind turbines and potential effects on human health and to validate the finding of the 'Wind Turbine Sound and Health Effects - An Expert Panel Review' (see Item 2 above) that:

- "There are no direct pathological effects from wind farms and that any potential impact on humans can be minimised by following existing planning guidelines."
- There is currently no published scientific evidence to positively link wind turbines with adverse health effects.
- 'This review of the available evidence, including journal articles, surveys, literature reviews and government reports, supports the statement that: There are no direct pathological effects from wind farms and that any potential impact on humans can be minimised by following existing planning guidelines."

5. ***'Position Statement on Health and Wind Turbines',*** *Climate and Health Alliance, February 2012*

The Climate and Health Alliance (CAHA) was established in August 2010 and is a coalition of health care stakeholders who wish to see the threat to human health from climate change and ecological degradation addressed through prompt policy action. In its Position Statement in February 2012, CAHA states that:

> *"To date, there is no credible peer reviewed scientific evidence that demonstrates a direct causal link between wind turbines and adverse health impacts in people living in proximity to them. There is no evidence for any adverse health effects from wind turbine shadow flicker or electromagnetic frequency. There is no evidence in the peer reviewed published scientific literature that suggests that there are any adverse health effects from infrasound (a component of low frequency sound) at the low levels that may be emitted by wind turbines."*

The Position Statement explores human perceptions of wind energy and notes that some people may be predisposed to some form of negative perception that itself may cause annoyance. It states that:

> *"Fear and anxious anticipation of potential negative impacts of wind farms can also contribute to stress responses, and result in physical and psychological stress symptoms... Local concerns about wind farms can be related to perceived threats from changes to their place and can be considered a form of "place-protection action", recognised in psychological research about the importance of place and people's sense of identity."*

CAHA notes the existence of *"misinformation about wind power"* and, in particular, states that:

> *"Some of the anxiety and concern in the community stems originally from a self-published book by an anti-wind farm activist in the United States which invented a syndrome, the so-called "wind turbine syndrome". This is not a recognised medical syndrome in any international index of disease, nor has this publication been subjected to peer review."*

CAHA notes that:

> *"Large scale commercial wind farms however have been in operation internationally for many decades, often in close proximity to thousands of people, and there has been no evidence of any significant rise in disease rates."*

This, it states, contrasts with the health effects of fossil fuel energy generation.

6. ***'Wind Turbine Health Impact Study -Report of Independent Expert Panel' –*** *Massachusetts Departments of Environmental Protection and Public Health (2012)*

An expert panel was established with the objective to, inter alia, evaluate information from peer-reviewed scientific studies, other reports, popular media and public comments and to assess the magnitude and frequency of any potential effects and risks to human health associated with the design and operation of wind energy turbines. In its final report, the expert panel set out its conclusions under several headings, including noise and shadow flicker.

In relation to noise, the panel concluded that there was limited or no evidence to indicate any causal link between noise from wind turbines and health effects, including the following conclusions:

> *"There is no evidence for a set of health effects, from exposure to wind turbines that could be characterized as a "Wind Turbine Syndrome."*
>
> *The strongest epidemiological study suggests that there is not an association between noise from wind turbines and measures of psychological distress or mental health problems. There*

were two smaller, weaker, studies: one did note an association, one did not. Therefore, we conclude the weight of the evidence suggests no association between noise from wind turbines and measures of psychological distress or mental health problems.

None of the limited epidemiological evidence reviewed suggests an association between noise from wind turbines and pain and stiffness, diabetes, high blood pressure, tinnitus, hearing impairment, cardiovascular disease, and headache/migraine."

In relation to shadow flicker, the expert panel found the following:

"Scientific evidence suggests that shadow flicker does not pose a risk for eliciting seizures as a result of photic stimulation.

There is limited scientific evidence of an association between annoyance from prolonged shadow flicker (exceeding 30 minutes per day) and potential transitory cognitive and physical health effects."

7. ***Wind Turbines and Health, A Critical Review of the Scientific Literature,*** *Massachusetts Institute of Technology (Journal of Occupational and Environmental Medicine Vol. 56, Number 11, November 2014)*

This review assessed the peer-reviewed literature regarding evaluations of potential health effects among people living in the vicinity of wind turbines. The review posed a number of questions around the effect of turbines on human health, with the aim of determining if stress, annoyance or sleep disturbance occur as a result of living in proximity to wind turbines, and whether specific aspects of wind turbine noise have unique potential health effects. The review concluded the following with regard to the above questions:

- Measurements of low-frequency sound, infrasound, tonal sound emission, and amplitude-modulated sound show that infrasound is emitted by wind turbines. The levels of infrasound at customary distances to homes are typically well below audibility thresholds.
- No cohort or case–control studies were located in this updated review of the peer-reviewed literature. Nevertheless, among the cross-sectional studies of better quality, no clear or consistent association is seen between wind turbine noise and any reported disease or other indicator of harm to human health.
- Components of wind turbine sound, including infrasound and low frequency sound, have not been shown to present unique health risks to people living near wind turbines.
- Annoyance associated with living near wind turbines is a complex phenomenon related to personal factors. Noise from turbines plays a minor role in comparison with other factors in leading people to report annoyance in the context of wind turbines.

A further 25 reviews of the scientific evidence that universally conclude that exposure to wind farms and the sound emanating from wind farms does not trigger adverse health effects, were compiled in September 2015 by Professor Simon Chapman, of the School of Public Health and Sydney University Medical School, Australia, and is included as Appendix 5-1 of this EIAR. Another recent publication by Chapman and Crichton (2017) entitled '*Wind turbine syndrome; A communicated disease'* critically discusses why certain health effects might often be incorrectly attributed to wind turbines.

8. ***Environmental Noise Guidelines for the European Region:*** *World Health Organisation Regional Office for Europe, 2018.*

The WHO Environmental Noise Guidelines provide recommendations for protecting human health from exposure to environmental noise originating from various sources such as transportation noise, wind turbine noise and leisure noise. The Guideline Development Group (GDG) defined priority health outcomes and from this were able to produce guideline exposure levels for noise exposure.

For average noise exposure, the GDG conditionally recommends reducing noise levels produced by wind turbines below 45 dB Lden. The GDG recognise the potential for increased risk of annoyance at levels below this value but cannot determine whether this increased risk can impact health. Wind turbine noise above this level is associated with adverse health effects.

The GDG points out that evidence on health effects from wind turbine noise (apart from annoyance) is either absent or rated low/very low quality. Furthermore, public perceptions towards wind turbines are hard to differentiate from reported effects related to noise and the two may be inextricably linked. The GDG also recognises that the percentage of people exposed to noise from wind turbines is far lower than other sources such as road traffic and state that any benefit from specifically reducing population exposure to wind turbine noise in all situations remains unclear.

That being said, the GDG recommends renewable energy policies include provisions to ensure noise levels from wind farm developments do not rise above the guideline values for average noise exposure. The GDG also provides a conditional recommendation for the implementation of suitable measures to reduce noise exposure, however, it states that no evidence is available to facilitate the recommendation of one type of intervention over another.

9. ***Infrasound Does Not Explain Symptoms Related to Wind Turbines:*** *Finnish Government's Analysis, Assessment and Research Activities (VN TEAS), 2020*

The study targeted to adverse health effects of wind turbine infrasound and was funded by the Finnish Government's Analysis, Assessment and Research Activities (VN TEAS).

It was found that the low-frequency, inaudible sounds made by wind turbines are not damaging to human health despite fears that they cause unpleasant symptoms. The project, which was carried out over two years, examined the impact of low-frequency—or infrasound—emissions which cannot be picked up by the human ear.

People in many countries have blamed the infrasound waves for symptoms ranging from headaches and nausea to tinnitus and cardiovascular problems, researchers said.

Interviews, sound recordings and laboratory tests were used to explore possible health effects on people living within 2km (12 miles) of the generators.

The report notes:

> *'...the behavioural findings of the current study suggest that wind turbine infrasound cannot be reliably perceived and it does not result in increased annoyance. Participants that showed health effects did not show signs of increased infrasound sensitivity and did not rate wind turbine sounds more annoying.*

As a result:

> *'These findings do not support the hypothesis that infrasound is the element in turbine sound that causes annoyance. Instead, they suggest that people who have health symptoms which they associate with wind turbine sound are not likely to have these symptoms because they perceive turbine sound more annoying than controls, at least in laboratory settings. It is more likely that these symptoms are triggered by other factors such as symptom expectancy'.*

10. ***Impact of Wind turbines on Human Health and Safety:*** *Proceedings of Socratic Lectures, University of Ljubljana, 2025*

The purpose of this paper was to review evidence from current literature with regards to effects on noise emissions, infrasound, ice throw and visual impacts. The paper demonstrates that these effects are either negligible or effectively mitigated by modern technologies and safety standards. It was noted that

misinformation and psychological factors such as nocebo effects (psychological phenomenon in which negative expectations of a particular stimulus or situation lead to the perception of negative effects, even if there is no direct physical cause).

The paper concluded that the health benefits of wind energy such as reduction of air pollution and associated diseases, along with benefits such as energy security, job creation, and climate change mitigation outweigh the potential risks.

The paper looks to promote informed public dialogue so that the potential of wind energy can be fully realised in line with global efforts to combat climate change and protect public health.

5.3.4.3 Turbine Safety

Turbines pose no threat to the health and safety of the general public. The Guidelines (DoEHLG, 2006) and Draft Guidelines (DoHPLG, 2019) state that there are no specific safety considerations in relation to the operation of wind turbines. Fencing or other restrictions are not necessary for safety considerations and should be kept to a minimum. People or animals can safely walk up to the base of the turbines.

The Guidelines (DoEHLG, 2006) and the Draft Guidelines (DoHPLG, 2019) state that there is a very remote possibility of injury to people from flying fragments of ice or from a damaged blade. Modern turbine blades are composite structures with no bolts or separate components; therefore, danger is minimised. Furthermore, the proposed wind turbines will be fitted with anti-vibration sensors which will detect any imbalance caused by icing of the blades. These sensors will cause the turbine to wait until the blades have been de-iced prior to beginning operation. As such, turbines are designed in such a way that ice throw/projection is not a significant risk. Furthermore, the Site (and the State) falls within the International Energy Agency (IEA) Ice Class 1 Category, which correlates to a *Low* icing frequency.

The International Electrotechnical Commission (IEC) is a global organization that develops and publishes international standards for electrical and electronic technologies. One of the areas where the IEC has played a significant role is in the standardization of wind turbines. The IEC has developed a series of standards specifically for wind turbines, which cover various aspects such as design, testing, and performance. The IEC 61400-1 '*Wind turbines – Part 1: Design requirements'* provides guidelines and requirements for the design of wind turbines, including considerations for environmental conditions[3]. This standard covers a range of conditions that wind turbines may encounter, including those related to icing. It sets out criteria for the structural design, safety systems, and other aspects to ensure that wind turbines can operate safely and effectively in various environments. As such, the Proposed Project, and like those across Ireland and in many other countries, is generally designed and assessed according to international standards, with the IEC standards being frequently employed in this process. Additionally, regulatory entities and energy authorities at the national level, such as the SEAI, often refer to and align their guidance with internationally recognized standards, including those established by the IEC, such as IEC 61400-1 for wind turbines. In conclusion, the Proposed Project adheres to the criteria specified in both the IEC 61400-1 design requirements and the SEAI guidance.

Turbine blades are manufactured of fiberglass. Each turbine will incorporate lightning protection conduits which will be integral to the construction of the turbines. Lightning conduction cables, encased in protection conduits, will follow the electrical cable run, from the nacelle to the base of the turbine. The conduction cables will be earthed adjacent to the turbine base. The earthing system will be installed during the construction of the turbine foundations.

5.3.4.4 Electromagnetic Interference

The provision of underground electric cables of the capacity proposed is common practice throughout the country and installation to the required specification does not give rise to any specific health concerns.

The extremely low frequency (ELF) electric and magnetic fields (EMF) associated with the operation of the proposed cables fully comply with the international guidelines for ELF-EMF set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), a formal advisory agency to the World Health Organisation, as well as the EU guidelines for human exposure to EMF. Accordingly, there will be no operational impact on properties (residential or other uses) as the ICNIRP guidelines will not be exceeded at any distances even directly above the cables.

The ESB document 'EMF & You' (ESB, 2017)[28] provides further practical information on EMF.

The lowest EMF frequency covered in the report is 110kV. The internal wind farm cable proposed on the Proposed Wind Farm site constitutes 33kV underground cables, and so the EMF from this infrastructure will be of an even lower magnitude.

Further details on the potential effects of electromagnetic interference to telecommunications and aviation are presented in Ch. 15: Material Assets.

5.3.4.5 Effects on Human Health

As set out in the Department of Housing, Planning, Community and Local Government '*Key Issues Consultation Paper on the Transposition of the EIA Directive 2017*' and the guidance listed in Section 1.2.1 of Ch. 1: Introduction, the consideration of the effects on populations and on human health should focus on health issues and environmental hazards arising from the other environmental factors, for example water contamination, air pollution, noise, accidents, disasters.

Ch. 5: Population and Human Health (including Shadow Flicker), Ch. 8: Land, Soils and Geology, Ch. 9: Hydrology and Hydrogeology, Ch. 10: Air Quality, Ch. 11: Climate, Ch. 12: Noise and Vibration, and Ch. 15: Material Assets (Traffic and Transport) provide an assessment of the effects of the Proposed Project on these areas of consideration. There is the potential for negative effects on human health during the wind farm construction phase related to potential emissions to air of dust, potential emissions to land and water of hydrocarbons, release of potentially silt-laden runoff into watercourses and noise emissions.

The Proposed Project design and mitigation measures outlined in Ch. 8: Land, Soils and Geology and Ch. 9: Hydrology and Hydrogeology ensures that the potential for effects on the water environment are not significant. No effects on local water supplies are anticipated.

As set out in Ch. 9: Hydrology and Hydrogeology potential health effects are associated with negative effects on public and private water supplies and potential flooding. The Proposed Wind Farm overlies the drinking water abstraction catchment for Zone 1 Kealkill water Supply, with the Site located 1.3km from the abstraction point in the Owengar River (Owengar (Cork)_10).

The detailed Flood Risk Assessment in Appendix 9-1 has also shown that the risk of the Proposed Project contributing to flooding is very low.

A wind farm is not a recognised source of pollution. It is not an activity which requires Environmental Protection Agency licencing under the Environmental Protection Agency Act 1992, as amended. As such, a wind farm is not considered to have ongoing significant emissions to environmental media and the subsequent potential for human health effects.

The Proposed Project is for the development of a renewable energy project, a wind farm, capable of offsetting carbon emissions associated with the burning of fossil fuels. During the operational stage, the

[28] *EMF & You: Information about Electric & Magnetic Fields and the electricity network in Ireland Available at:* https://esb.ie/docs/default-source/default-document-library/emf-public-information_booklet_v9.pdf?sfvrsn=0.

Proposed Wind Farm will have a long-term, significant, positive effect on air quality as set out in Ch. 10: Air Quality, which will contribute to positive effects on human health.

The provision of aviation lighting on permitted turbines is a standard and accepted part of any wind farm development. This is a safety requirement of the Irish Aviation Authority (IAA). The standard lighting required by the IAA are medium intensity lights. Such lighting is designed specifically for aviation safety and is not intended to be overbearing or dominant when viewed from the ground thus striking a reasonable balance between aviation safety and visual effect. The IAA confirm lighting arrangements required for wind farm developments once a consent is in place.

It is considered that aviation lighting on the proposed turbines will have no significant effect on human health, beyond increasing aircraft safety in the context of the Proposed Project. The applicant will continue its engagement with IAA as required in relation to aviation lighting. An assessment of impacts on aviation assets is included in Ch. 15: Material Assets.

The assessments show that the residual effects are not significant and do not have the potential to cause negative health effects for human beings. On this basis, the potential for negative health effects associated with the Proposed Project is imperceptible.

5.3.4.6 Vulnerability of the Project to Natural Disasters and Major Accidents

As outlined in Section 5.2.2 above, a wind farm is not a recognised source of pollution. Should a major accident or natural disaster occur, the potential sources of pollution onsite during the construction, operational and decommissioning phases, are limited. Sources of pollution with the potential to cause significant environmental pollution and associated negative effects on health, such as bulk storage of hydrocarbons or chemicals, storage of wastes etc., are limited.

In the context of the Proposed Project, there is limited potential for significant natural disasters to occur. Ireland is a geologically stable country with a mild temperate climate. The potential natural disasters that may occur are therefore limited to peat instability, flooding and fire. The risk of flooding and potential for contamination of groundwater and drinking water due to the construction of the Proposed Project is addressed in Ch. 9: Hydrology and Hydrogeology, with no significant effects due to the proposed mitigation measures and site drainage plan, meaning there is limited risk to human health. It is considered that the risk of significant fire occurring, affecting the Proposed Wind Farm and causing the wind farm to have significant environmental effects is limited and therefore a significant effect on human health is similarly limited.

The risk of peat instability and failure (landslide) occurring on the Site is addressed in the Geotechnical and Peat Stability Assessment Report (PSRA) included in Appendix 8-1 of this EIAR. It is concluded that the Proposed Wind Farm site has an acceptable margin of safety and is suitable for wind farm development.

Mapping provided by the Geological Survey of Ireland (GSI) indicates the presence of small pockets of peat soils mapped along the Proposed Grid Connection However, peat depth probing undertaken by Hydro Environmental Services Ltd. (HES) during a site visit in April 2025 did not record the presence of any peat along the Proposed Grid Connection. Due to the nature of the proposed works and the fact that the underground cable is to be located fully within the road corridor, there is no risk of peat instability - even in the unlikely event that peat not mapped by the GSI exists elsewhere along the Proposed Grid Connection.

As previously described, there are no significant sources of pollution in the wind farm with the potential to cause environmental or health effects. Also, the spacing of the turbines and distance between the proposed turbines and properties limits the potential for effects on human health. The issue of turbine safety is addressed in Section 5.2.3.

Major industrial accidents involving dangerous substances pose a significant threat to humans and the environment; such accidents can give rise to serious injury to people or serious damage to the environment, both on and off the site of the accident. The Site is not regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations i.e. SEVESO sites and so there are no potential effects from this source. A Major Accidents and Natural Disasters assessment is included as Ch. 16: Major Accidents and Natural Disasters.

5.3.5 Property Values

5.3.5.1 Property Values and Wind Farm

This section summarises the largest and most recent studies from the United States and the UK and also provides a summary of an Irish working paper by the Centre for Economic Research on Inclusivity and Sustainable (CERIS).

In 2023, CERIS published a working paper entitled *'Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach'*.[29] This paper looked at wind turbine developments in Donegal, Leitrim, Sligo, Mayo, Galway, Kerry and Cork and associated property values. This working paper utilised satellite imagery to identify individual turbines and sourced its housing data from www.daft.ie; while the published price on Daft is not equivalent to the final agreed sale price, it was assumed that the listing and transaction prices are correlated. The findings of this research revealed a potential decrease in property values of -14.7% within a 0-1km radius of a wind turbine. However, the sample size of only 225 houses within this range does not adequately represent the broader landscape of Irish rural housing and the distribution of wind turbines. The author states that there are "*no significant reductions in house prices beyond 1km*" and that the effects seen within the 1km band were not persistent and diminished over the operational lifetime of the turbines. Considering that this is a working paper, based on a small sample size where local conditions have the potential to disproportionately impact on the local housing market, further research is required before relying on its findings.

One of the largest studies of the impact of wind farms on property values has been carried out in the United States. '*The Impact of Wind Power Projects on Residential Property Values in the United States: A multi-Site Hedonic Analysis'*, December 2009, was carried out by the Lawrence Berkley National Laboratory (LBNL) for the U.S Department of Energy. This study collected data on almost 7,500 sales of single-family homes situated within ten miles of 24 existing wind farms in nine different American states over a period of approximately ten years. The conclusions of the study are drawn from eight different pricing models including repeat sales and volume sales models. Each of the homes included in the study was visited to demonstrate the degree to which the wind facility was visible at the time of the sale, and the conclusions of the report state that "*The result is the most comprehensive and data rich analysis to date on the potential impacts of wind energy projects on nearby property values.*"

The main conclusion of this study (as detailed on Page XVII) is as follows:

> *"Based on the data and analysis presented in this report, no evidence is found that home prices surrounding wind facilities are consistently, measurably, and significantly affected by either the view of wind facilities or the distance of the home to those facilities. Although the analysis cannot dismiss the possibility that individual or small numbers of homes have been or could be negatively impacted, if these impacts do exist, they are either too small and/or too infrequent to result in any widespread and consistent statistically observable impact.*"

[29] *Centre for Economic Research on Inclusivity and Sustainability (2023) Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach.* <https://www.universityofgalway.ie/media/researchsites/ceris/files/WP-2023-01.pdf>

This study was updated by LBNL who published a further paper entitled '*A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States'*, in August 2013. This study analysed more than 50,000 home sales near 67 wind farms in 27 counties across nine U.S. states, yet was unable to uncover any effects to nearby home property values. The homes were all within 10 miles of the wind energy facilities - about 1,100 homes were within 1 mile, with 331 within half a mile. The report is therefore based on a very large sample and represents an extremely robust assessment of the effects of wind farm development on property values. It concludes that:

> *"Across all model Specifications, we find no statistical evidence that home prices near wind turbines were affected in either the post-construction or post announcement/pre-construction periods."*

The LBNL studies both note that their results do not mean that there will never be a case of an individual home whose value goes down due to its proximity to a wind farm – however if these situations do exist, they are considered to be statistically insignificant.

In September 2023, the Energy Policy Journal published '*Commercial wind turbines and residential home values: new evidence from the universe of land-based wind projects in the United States'*.[30] This study targeted urban counties in the United Stated with populations over 250,000 persons, and found that on average, after a commercial wind energy project is announced, houses located within 1 mile of a proposed wind energy project experience a decrease in value of 11% relative to homes located within 3-5 miles of the proposed wind energy project. The decline in property values was found to recover post construction with property value impacts becoming relatively small (~2%) and statistically insignificant 9 years or more after project announcement (roughly 5 years after operation begins). This suggests that the housing market is reacting negatively to the expectation of likely impacts (after announcement) and the heightened activity during construction, but after operation begins, those negative perceptions and related home price impacts appear to fade.

A study published in the Proceedings of the National Academy of Sciences of the United States of America journal entitled '*The visual effect of wind turbines on property values is small and diminishing in space and time*' found that that the visual impact of wind turbines on nearby residential property values is small, declines with distance, and diminishes over time. By creating a large database to model wind turbine visibility, the demonstrate that any negative effect on home prices is modest, with the largest effect on houses in immediate proximity of wind turbines, and fades over time as communities adjust post-construction. The findings suggest that visual disamenities from wind turbines should not significantly hinder wind energy development or influence long-term property values.

The US-based scientific literature on the topic is therefore inconclusive, with the studies summarised above providing contradictory conclusions. The text below summarises the UK studies on the topic.

A study was commissioned by RenewableUK and carried out by the Centre for Economics and Business Research (Cebr) in March 2014. The findings of the study were produced in a report titled '*The effect of wind farms on house prices'* and its main conclusions are:

- Overall, the analysis found that the county-wide property market drives local house prices, not the presence or absence of wind farms.
- The econometric analysis established that construction of wind farms at the five Sites examined across England and Wales has not had a detectable negative impact on house price growth within a five-kilometre radius of the Sites.

A study issued in October 2016 'Impact of wind Turbines on House Prices in Scotland' (2016) was published by Climate Exchange. Climate Exchange is Scotland's independent centre of expertise on

[30] *Energy Policy (2023) Commercial wind turbines and residential home values: new evidence from the universe of land-based wind projects in the United States. Available at:* https://www.sciencedirect.com/science/article/pii/S0301421523004226

climate change which exists to support the Scottish Governments policy development on climate and the transition to a low carbon economy. A copy of the report is included as Appendix 5-2 of this EIAR.

The report presents the main findings of a research project estimating the impact on house prices from wind farm developments. It is based on analysis of over 500,000 property sales in Scotland between 1990 and 2014. The key findings from the study (p.3) are:

- No evidence of a consistent negative effect on house prices: Across a very wide range of analyses, including results that replicate and improve on the approach used by Gibbons (2014), we do not find a consistent negative effect of wind turbines or wind farms when averaging across the entire sample of Scottish wind turbines and their surrounding houses. Most results either show no significant effect on the change in price of properties within 2km or 3km or find the effect to be positive.
- Results vary across areas: The results vary across different regions of Scotland. Our data does not provide sufficient information to enable us to rigorously measure and test the underlying causes of these differences, which may be interconnected and complex.

The UK scientific literature is strong in its conclusions that there are no significant effects on the change in price of properties close to wind farm developments, and that generally the county-wide property market drives local house prices, not the presence or absence of wind farms. This literature is contradictory to the working paper containing the only Irish study on the topic.

The literature described above demonstrates that there is insufficient evidence from the scientific literature and studies conducted to determine that there is the potential for a significant effect on property values as a result of the Proposed Wind Farm.

5.3.5.2 Property Values and Grid Infrastructure

In May 2016, EirGrid conducted a literature review and evidence-based field study on the effects of high voltage transmission development on patterns of settlement and land use. The objectives of EirGrid Evidence Based Environmental Studies Study 9: Settlement and land use were to:

- To gather information on patterns of settlement and land use near to existing transmission infrastructure.
- To establish the effects of existing transmission infrastructure on patterns of settlement and land use.
- To review land use planning policy in various Development Plans to determine whether any policy change has arisen as a result of the construction and operation of existing transmission projects.

A literature review of transmission projects from around the world was carried out, including review of Environmental Impact Assessments (EIAs). To investigate effects of transmission projects on patterns of land use and settlement, 31 case studies were chosen; 17 with existing overhead line (OHL) circuits, 10 with substations and 4 in construction. Sites were located in rural, rural/urban and urban areas. Land uses included agricultural, commercial and amenity. Four control Sites had no infrastructure. Coexistence, development density, planning policy and planning application history were all investigated. Planning and land use policy over the last twenty years was reviewed to see if it has influenced, or been influenced, by recent programmes of transmission infrastructure development. This study has established no evidence of any significant impact arising from the construction or existence of transmission infrastructure in terms of patterns of settlement and land use; however, transmission infrastructure can be a local physical constraint on development.

The literature review and evidence-based field study described above concludes that is unlikely that the Proposed Grid Connection will have a significant effect on property values.

5.3.5.3 Residential Amenity

Residential amenity relates to the human experience of one's home, derived from the general environment and atmosphere associated with the residence. The quality of residential amenity is influenced by a combination of factors, including setting and local character, land-use activities in the area and the relative degree of peace and tranquillity experienced in the residence.

The Proposed Wind Farm site is located within a rural setting in west Co. Cork, approximately 2.3 km east of the village of Kealkill, 9.5 km northeast of the town of Bantry, and 12.2 km west of Dunmanway. As noted previously, the current land-use for the Site is predominantly forestry, with agricultural pastures and rough grazing also present. Land-use on the wider landscape comprises a mix of agriculture, commercial forestry, low-density residential, and small-scale commercial properties. The identified land uses within and around the Site will be retained in the surrounding landscape during the operational phase of the Proposed Project. This continuation of existing activities and land use will assist in the assimilation of the Proposed Project into the current receiving environment. The closest occupied third-party dwelling to the proposed turbines is located 682m from T01.

When considering the amenity of residents in the context of a proposed wind farm, there are four main potential effects of relevance: 1) Shadow Flicker, 2) Noise, and 3) Visual Amenity and 4) Telecommunications. Shadow flicker and noise are quantifiable aspects of residential amenity while visual amenity is more subjective. Detailed shadow flicker and noise modelling have been completed as part of this EIAR (Section 5.2.3 addresses shadow flicker, and Ch.12: Noise and Vibration addresses noise and vibration). A comprehensive landscape and visual impact assessment has also been carried out, as presented in Ch.14: Cultural Heritage of this EIAR. Effects on human beings during the construction, operational and decommissioning phases of the Proposed Project is assessed in relation to each of these key issues and other environmental factors such as noise, traffic and dust; see likely significant effects in Section 5.4 below. The impact on residential amenity is then derived from an overall judgement of the combination of effects due to shadow flicker, changes to land-use and visual amenity, noise, traffic, telecommunications, dust and general disturbance.

There are 79 sensitive receptors located within 1,330m of the proposed turbine locations. Of these 79 sensitive receptors, 21 no. are involved landowners. All involved and non-involved sensitive receptors achieve the minimum distance of 500m from any proposed turbine in compliance with the Guidelines (DoEHLG, 2006)

CAP25 was published in April 2025 by the Department of Environment, Climate and Communications. The associated Annex of Actions (Action EL/24/5) identifies the aim of publishing revised onshore wind energy guidelines in Q1 2025. At time of writing, the Draft Guidelines (DoHPLG, 2019) have not yet been adopted, and the relevant guidelines for the purposes of Section 28 of the Planning and Development Act 2000, as amended, remain to be the Guidelines (DoEHLG, 2006). Notwithstanding this, however, due to the timelines associated with the planning process for renewable energy projects and the commitment within the CAP25 to publish new wind energy guidelines for onshore wind in Q1 2025 it is possible that the Draft Guidelines (DoHPLG, 2019) may be adopted during the consideration period for the current planning application. Without benefit of the revised wind energy development guidelines for onshore wind, it is considered that since noise emissions and shadow flicker are controllable via inbuilt turbine technologies, therefore, the Proposed Wind Farm is capable of compliance with any future guideline limits in this regard.

5.3.6 Shadow Flicker Assessment Results

5.3.6.1 Daily and Annual Shadow Flicker

WindPro computer software (version number 4.0.552) was used to model the predicted daily and annual shadow flicker levels in significant detail, identifying the predicted daily start and end times, maximum daily duration and the individual turbines predicted to give rise to shadow flicker.

The model results assume worst-case conditions, including:

- 100% sunshine during all daylight hours throughout the year,
- An absence of any screening (vegetation or other buildings),
- That the sun is behind the turbine blades,
- That the turbine blades are facing the property, and
- That the turbine blades are moving.

The maximum daily shadow flicker model assumes that daylight hours consist of 100% sunshine. This is a conservative assumption which represents a worst-case scenario. Following the detail provided above on sunshine hours, a sunshine factor of 33.40% has been applied to the annual shadow flicker results as detailed above. Taking this information into consideration, the predicted shadow flicker which is estimated to occur at nearby sensitive receptors is presented in Table 5-11.

The predicted maximum daily and annual shadow flicker levels are then considered in the context of the Guidelines' (DoEHLG, 2006) daily threshold of 30 minutes per day and annual threshold of 30 hours per year. If there is any predicted exceedance of shadow flicker at any property, the turbines that contribute to the exceedance are also identified, with mitigation measures required for these contributing turbines.

The Guidelines (DoEHLG, 2006) recommend that shadow flicker at dwellings within 500 metres of a proposed turbine location should not exceed a total of 30 minutes per day or 30 hours per year. There are no sensitive receptors located less than 500 metres away from any of the proposed turbine locations.

The predicted shadow flicker levels have been modelled for all 102 no. sensitive receptors located within the Shadow Flicker Study Area. The predicted shadow flicker model results indicate:

- 38 no. sensitive receptors are theoretically predicated to experience zero shadow flicker;
- 41 no. sensitive receptors are theoretically predicated to experience some shadow flicker;
    - Of the 41 sensitive receptors, 30 sensitive receptors are theoretically predicted to experience shadow flicker that exceeds the Guideline thresholds for daily and/or annual shadow flicker It should be noted that 9 no. of these 30 no. sensitive receptors are involved landowners and 1 no. is in a derelict condition. As a result, no mitigation measures are required for these 10 no. properties. Please see Table 5-11 below for details.
- The annual threshold of over 30 hours for shadow flicker Guidelines (DoEHLG, 2006) is predicted to be exceeded at 8 no. sensitive receptors once the regional sunshine average factor of 33.40% has been considered. It should be noted that 2 no. of these 8 no. sensitive receptors are involved landowners, and 1 no. is in a derelict condition.

Figure 5-3 illustrates the houses that are potentially impacted by shadow flicker exceedances from the Proposed Wind Farm.

It is worth noting that the predicted exceedances of shadow flicker listed in Table 5-12 is considered conservative and in reality, the occurrence and/or duration of shadow flicker at these properties is likely to be eliminated or significantly reduced as the following items are not considered by the model:

- Receivers may be screened by topography, cloud cover and/or vegetation/built form i.e. adjacent buildings, farm buildings, garages or barns;
- Each receiver will not have windows facing in all directions onto the wind turbines.

Section 5.4.3.2.7 below details the mitigation measures which will be employed at the potentially affected properties to ensure that the current adopted Guidelines (DoEHLG, 2006) are complied with at any property within the Shadow Flicker Study Area. The same mitigation measures (with stricter implementation of shadow flicker controls) also demonstrate that the proposed turbines can be

operated in accordance with the shadow flicker requirements of the Draft Guidelines (DoHPLG,2019), should they be adopted as currently proposed, while the planning application is being determined.

Table 5-8 Maximum Potential Daily & Annual Shadow Flicker – Proposed Maughanaclea Renewable Energy Development

Enerco House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
H001	507591	556536	Dwelling	692	T13	01:16:00	92:03:00	30:44:50	T12, T13	Yes	Yes
H002*	512576	558153	Dwelling*	682	T03	00:48:00	59:57:00	20:01:30	T03	Yes	Yes
H003	512610	558530	Dwelling	683	T01	00:42:00	55:55:00	18:40:40	T03	Yes	Yes
H004*	510409	559003	Dwelling*	724	T04	00:56:00	72:34:00	24:14:21	T04, T05	Yes	Yes
H005	507882	556595	Dwelling	727	T13	01:39:00	111:27:00	37:13:39	T11, T12, T13	Yes	Yes
H006	510577	559091	Dwelling	746	T04	00:31:00	39:51:00	13:18:40	T05	Yes	Yes
H007*	510316	558973	Dwelling*	748	T04	00:58:00	73:15:00	24:28:03	T04, T05	Yes	Yes
H008	510806	557553	Dwelling	708	T05	00:31:00	19:47:00	6:36:29	T06	Yes	Yes
H009*	508037	556587	Dwelling*	753	T13	01:33:00	103:43:00	34:38:39	T11, T12, T13	Yes	Yes
H010*	507994	556607	Dwelling*	759	T13	01:34:00	101:49:00	34:00:35	T11, T12, T13	Yes	Yes
H011	510368	556529	Dwelling	749	T07	00:43:00	53:22:00	17:49:33	T07	Yes	Yes
H012	509005	556060	Dwelling	791	T10	01:43:00	176:43:00	59:01:42	T07, T08, T09, T10, T11, T12, T13	Yes	Yes
H013	509229	556134	Dwelling	800	T09	01:34:00	142:47:00	47:41:37	T08, T09, T10, T11	Yes	Yes
H014	510926	557408	Dwelling*	795	T05	00:00:00	0:00:00	0:00:00	N/A	No	No
H015	508269	556562	Dwelling	834	T13	00:55:00	70:46:00	23:38:17	T11, T12, T13	Yes	Yes
H016*	510884	556384	Dwelling*	838	T07	00:36:00	24:55:00	8:19:22	T07	Yes	Yes

Enerco House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
H017	507408	556640	Dwelling	861	T13	01:03:00	49:49:00	16:38:25	T12, T13	Yes	Yes
H018	512189	559937	Dwelling	909	T01	00:55:00	38:40:00	12:54:57	T01, T02	Yes	Yes
H019	509329	556215	Dwelling	871	T09	01:25:00	115:41:00	38:38:29	T08, T09, T10, T11	Yes	Yes
H020*	508161	556692	Dwelling*	896	T13	01:16:00	64:40:00	21:36:02	T11, T12, T13	Yes	Yes
H021	508984	554368	Dwelling	919	T10	00:00:00	0:00:00	0:00:00	N/A	No	No
H022	511636	559768	Dwelling	951	T01	00:34:00	26:17:00	8:46:46	T01	Yes	Yes
H023*	508202	556704	Dwelling*	923	T13	00:54:00	53:30:00	17:52:14	T12, T13	Yes	Yes
H024	511622	557153	Dwelling	819	T06	00:00:00	0:00:00	0:00:00	N/A	No	No
H025	511555	557165	Dwelling	802	T06	00:00:00	0:00:00	0:00:00	N/A	No	No
H026	509577	554339	Dwelling*	957	T08	00:00:00	0:00:00	0:00:00	N/A	No	No
H027	510918	559429	Dwelling	1032	T02	00:30:00	17:18:00	5:46:43	T02	No	No
H028	509366	554354	Dwelling	990	T09	00:00:00	0:00:00	0:00:00	N/A	No	No
H029	511972	557112	Dwelling	956	T06	00:00:00	0:00:00	0:00:00	N/A	No	No
H030*	510981	559534	Dwelling*	1057	T02	00:30:00	19:05:00	6:22:28	T02	No	No
H031	509370	556302	Dwelling	958	T09	01:22:00	98:44:00	32:58:47	T08, T09, T10, T11	Yes	Yes
H032	509867	554282	Dwelling*	988	T08	00:00:00	0:00:00	0:00:00	N/A	No	No
H033	508337	556701	Dwelling	987	T13	00:43:00	47:53:00	15:59:40	T12, T13	Yes	Yes
H034	511836	559975	Dwelling	1026	T01	00:32:00	32:27:00	10:50:21	T01	Yes	Yes
H035	513066	558537	Dwelling	966	T01	00:34:00	39:34:00	13:12:59	T01	Yes	Yes
H036*	510931	556526	Dwelling*	975	T07	00:32:00	21:40:00	7:14:14	T07	Yes	Yes

Enerco House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
H037	509067	554288	Dwelling	1011	T10	00:00:00	0:00:00	0:00:00	N/A	No	No
H038	508753	554274	Dwelling	1013	T10	00:00:00	0:00:00	0:00:00	N/A	No	No
H039	510708	559384	Dwelling	1019	T04	00:26:00	11:56:00	3:59:10	N/A	No	No
H040	508661	554280	Dwelling*	1023	T10	00:00:00	0:00:00	0:00:00	N/A	No	No
H041	509400	554295	Dwelling	1050	T09	00:00:00	0:00:00	0:00:00	N/A	No	No
H042	509994	554249	Dwelling	1036	T08	00:00:00	0:00:00	0:00:00	N/A	No	No
H043	509135	554275	Dwelling	1039	T10	00:00:00	0:00:00	0:00:00	N/A	No	No
H044	512582	560025	Dwelling*	1055	T01	00:00:00	0:00:00	0:00:00	N/A	No	No
H045	511163	556332	Dwelling	1023	T07	00:30:00	15:11:00	5:04:18	T07	No	No
H046	509938	554227	Dwelling	1049	T08	00:00:00	0:00:00	0:00:00	N/A	No	No
H047	508793	554224	Dwelling	1059	T10	00:00:00	0:00:00	0:00:00	N/A	No	No
H048	510126	556821	Dwelling	1053	T07	00:31:00	27:49:00	9:17:30	T07	Yes	Yes
H049	509908	556766	Dwelling	1058	T07	00:31:00	33:18:00	11:07:23	T07	Yes	Yes
H050	510115	556826	Dwelling	1060	T07	00:31:00	27:40:00	9:14:29	T07	Yes	Yes
H051*	511348	559869	Dwelling*	1153	T02	00:26:00	24:18:00	8:07:01	N/A	No	No
H052	507542	556920	Dwelling	1078	T13	00:28:00	17:46:00	5:56:04	N/A	No	No
H053	506953	554327	Dwelling	1049	T14	00:00:00	0:00:00	0:00:00	N/A	No	No
H054	507020	554319	Dwelling	1031	T14	00:00:00	0:00:00	0:00:00	N/A	No	No
H055	508459	556742	Dwelling	1092	T13	00:31:00	36:43:00	12:15:52	T12, T13	Yes	Yes
H056	509890	554160	Dwelling	1112	T08	00:00:00	0:00:00	0:00:00	N/A	No	No
H057	509948	554162	Dwelling	1115	T08	00:00:00	0:00:00	0:00:00	N/A	No	No
H058	509409	554169	Dwelling	1169	T08	00:00:00	0:00:00	0:00:00	N/A	No	No

Enerco House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
H059	509660	554122	Dwelling*	1155	T08	00:00:00	0:00:00	0:00:00	N/A	No	No
H060	508562	556775	Dwelling	1181	T13	00:27:00	31:30:00	10:31:19	N/A	No	No
H061	510056	554078	Dwelling	1215	T08	00:00:00	0:00:00	0:00:00	N/A	No	No
H062	508565	554094	Dwelling	1225	T10	00:00:00	0:00:00	0:00:00	N/A	No	No
H063	507687	557091	Dwelling	1223	T13	00:00:00	0:00:00	0:00:00	N/A	No	No
H064	508513	554101	Dwelling*	1233	T10	00:00:00	0:00:00	0:00:00	N/A	No	No
H065	506905	554158	Dwelling	1224	T14	00:00:00	0:00:00	0:00:00	N/A	No	No
H066	507547	554225	Dwelling*	1071	T14	00:00:00	0:00:00	0:00:00	N/A	No	No
H067	512535	560272.1135	Dwelling	1279	T01	00:00:00	0:00:00	0:00:00	N/A	No	No
H068	512510	560280	Dwelling	1281	T01	00:00:00	0:00:00	0:00:00	N/A	No	No
H069	510054	554012	Dwelling	1280	T08	00:00:00	0:00:00	0:00:00	N/A	No	No
H070*	509588	557802	Dwelling*	1294	T04	00:25:00	27:38:00	9:13:49	N/A	No	No
H071	510049	553996	Dwelling	1295	T08	00:00:00	0:00:00	0:00:00	N/A	No	No
H072	512561	560305	Dwelling	1317	T01	00:00:00	0:00:00	0:00:00	N/A	No	No
H073	506884	556790	Dwelling	1295	T13	00:25:00	12:09:00	4:03:30	N/A	No	No
H074*	509562	557807	Dwelling*	1315	T04	00:25:00	26:30:00	8:51:06	N/A	No	No
H075	508198	554103	Dwelling	1316	T11	00:00:00	0:00:00	0:00:00	N/A	No	No
H076	507156	554087	Dwelling	1219	T14	00:00:00	0:00:00	0:00:00	N/A	No	No
H077	509850	557016	Dwelling	1313	T07	00:25:00	18:04:00	6:02:05	N/A	No	No
H087	507807	554114	Dwelling	1244	T14	00:00:00	0:00:00	0:00:00	N/A	No	No

**Participating Landowner*

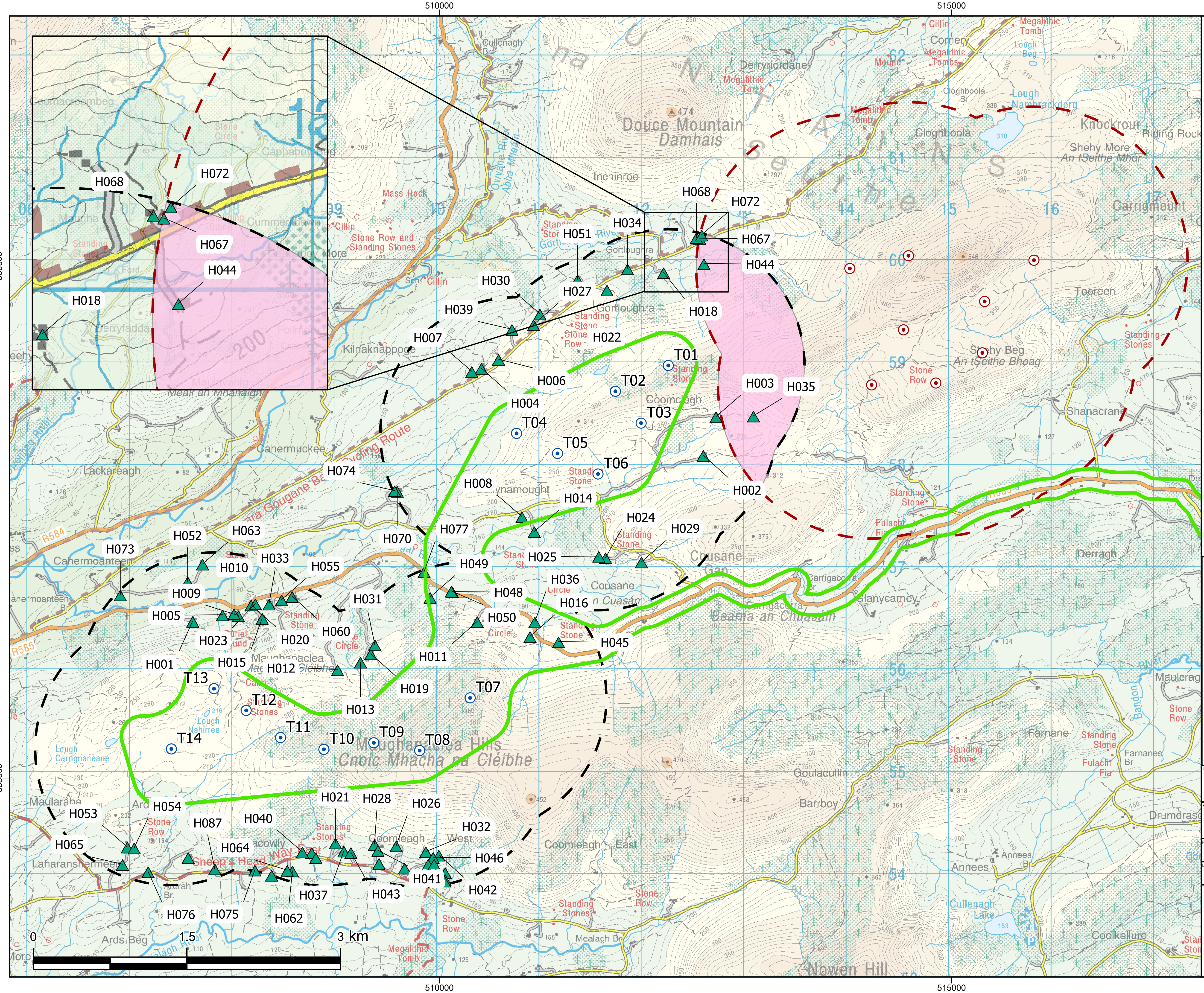
5.3.6.2 Cumulative Shadow Flicker

The cumulative assessment of shadow flicker arising from the Proposed Wind Farm and other wind farms was carried out based on the methodology, assumptions and criteria outlined in Section 5.2.3.4.

For the assessment of cumulative shadow flicker, any other existing, permitted, or proposed wind farms are considered where the project's 10 times rotor diameter shadow flicker study area is located within the Shadow Flicker Study Area of 10 times the rotor diameter for the Proposed Wind Farm. In this case, the only wind farm which has an intersecting shadow flicker study area is the proposed Gortloughra Wind Farm located approximately 2km northeast of the Proposed Wind Farm. As such, the 10 times rotor diameter shadow flicker study area for this Proposed Project would overlap with that of the Proposed Wind Farm 10 times rotor diameter Shadow Flicker Study Area.

Of the 79 no. properties within the Shadow Flicker Study Area of the Proposed Wind Farm, 3 no. dwellings fall within the cumulative Shadow Flicker Study Area. 1 no. property has the potential to experience cumulative shadow flicker impacts, when the proposed Gortloughra Wind Farm is assessed alongside the Proposed Wind Farm. Figure 5-8 illustrates the zone of potential for cumulative shadow flicker between the Proposed Project, and Gortloughra Wind Farm. Mitigation strategies are outlined in Section 5.4.3.2.7.

The results of the cumulative shadow flicker modelling are shown in Table 5-9 below.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Proposed Project Shadow Flicker Study Area
- Dwellings within Shadow Flicker Study Area

Cumulative Shadow Flicker

- Proposed Project Shadow Flicker Study Area
- Gortloughra Wind Farm
- Area with overlapping shadowflicker study areas

SITE LOCATION - NOT TO SCALE

Drawing Title	Cumulative Shadow Flicker Study
Project Title	Maughanaclea Renewable Energy Development
Project No.	240225
Drawing No.	Figure 5-8
Scale	1:34,000
Drawn By	SOR
Checked By	RK
Date	20/03/2026

MKO

Email: info@mkoireland.ie/ Website: www.mkoireland.ie

Table 5-9 Cumulative Shadow Flicker Results

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Status	Nearest Proposed Turbine No. *	Distance to Nearest Turbine (metres)	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Turbine(s) contributing to Cumulative Shadow Flicker impact*	Further Assessment Required
H035	513065.5149	558536.8829	Dwelling	T01	966	00:34	59:31:00	19:52:49	T01, GT06	Yes
H067	512539.831	560271.997	Dwelling	T01	1270	00:23	8:37:00	2:52:42	GT01	No
H072	512560.4851	560304.7324	Dwelling	T01	1317	00:23	8:37:00	2:52:42	GT01	No

Cumulative Results

Of the properties with the potential for a cumulative impact to arise, Table 5-9 above illustrates that only 1 no. property warrants further assessment, as this is the only third-party property that is modelled to have potential impacts as a result of the Proposed Wind Farm. Table 5-10 below provides further assessment in relation to this . property and details the results of the Proposed Wind Farm being brought in line with the Draft DoEHLG 2019 Guidelines requirement of zero shadow flicker through mitigation strategies outlined in Section 5.4.3.2.7. On this basis, there will be no cumulative shadow flicker impact.

As identified in Table 5-9 above, where there are daily shadow flicker occurrences, the culmination of these occurrences over a year correspond to annual shadow flicker occurrences at a given dwelling. Therefore, by presenting the maximum potential annual shadow flicker contributed by the Proposed Wind Farm after mitigation in Table 5-10 below, this also identified the culmination of daily shadow flicker occurrences over a year. As a result, Table 5-10 highlights only the cumulative annual shadow flicker occurrences. Table 5-10 below confirms that no additional mitigation is required as a result of cumulative impacts between the Proposed Project and the Gortloughra Wind Farm as there are no days that overlap between the two projects.

Table 5-10 Potential Cumulative Annual Shadow Flicker Results Following Draft DoEHLG 2019 Guidelines

Property No.	Max. Potential Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Turbine(s) contributing to Cumulative Shadow Flicker impact*	No. of Days 30min/day Threshold is Exceeded by Proposed Project and Gortloughra Wind Farm	No. of Days 30min/day Threshold is Exceeded by Proposed Project (Turbines 1-14)	No. of Days 30min/day Threshold is Exceeded by Gortloughra Wind Farm (Turbines GT01-GT08)	No. of Days where any levels of Shadow Flicker produced by the Proposed Project overlaps with that of Gortloughra Wind Farm	Mitigation Required by Proposed Project
H035	00:34:00	T01, GT06	101	38	7	0	No, there are no days that overlap.

5.4 Likely Significant Effects and Associated Mitigation Measures

5.4.1 'Do Nothing' Scenario

If the Proposed Project were not to proceed, the Site will continue to function as it does at present, with no changes made to the current land-use and potential for impacts on population and human health through the construction, operation and decommissioning of the Proposed Project would not occur.

If the Proposed Project were not to proceed, the opportunity to capture part of County Cork's valuable renewable energy resource would be lost, as would the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources by 2030 and the reduction of greenhouse gas emissions. The opportunity to generate local employment and investment and to diversify the local economy would also be lost.

Furthermore, as this application includes a Biodiversity Management and Enhancement Plan (Appendix 6-4) to be implemented during the development's operation, the opportunity to enhance the Site for biodiversity, at a local scale, would also be lost.

5.4.2 Construction Phase

Within this section, the impact will consider the Proposed Project i.e. both the Proposed Wind Farm and the Proposed Grid Connection will be considered as a whole. Where the Proposed Wind Farm and the Proposed Grid Connection are required to be considered separately, this is identified within the assessment.

5.4.2.1 Population

Those working on the construction phase of the Proposed Project will travel daily to the Site from the wider area. The construction phase will have no effect on the population of the area in terms of changes to the population trends or density, household size or age structure.

5.4.2.1.1 *Population Levels*

Pre-Mitigation Impacts

Proposed Wind Farm

Those working on the construction phase of the Proposed Wind Farm will travel daily to the Site from the wider area. The construction phase will have no impact on the population of the area in terms of changes to population trends or density, household size or age structure.

Proposed Grid Connection

Those working on the construction phase of the Proposed Grid Connection will travel daily to the Site from the wider area. The construction phase will have no impact on the population of the area in terms of changes to population trends or density, household size or age structure.

Mitigation and Monitoring Measures

No mitigation required.

Residual Effects

No residual effects.

Significance of Effects

The effects on population levels arising during the construction phase of the Proposed Project are considered to be Not Significant.

5.4.2.1.2 *Employment and Investment*

Pre-Mitigation Impacts

Proposed Wind Farm

The construction of the Proposed Wind Farm will provide employment for technical consultants, contractors and maintenance staff. It is proposed to construct the Proposed Wind Farm and Proposed Grid Connection infrastructure concurrently which would require approximately 100 employees in total, with an estimated 100 no. jobs focusing on the construction phase of the Proposed Wind Farm. The construction phase of the Proposed Wind Farm will last between 18-24 months. Where possible, construction workers and materials will be sourced locally, thereby helping to sustain employment in the construction trade. This will have a short-term moderate positive impact.

The Proposed Wind Farm will result in an influx of skilled people into the area, bringing specialist skills for both the construction and operational phases that could result in the transfer of these skills into the local workforce, thereby having a long-term positive effect on the local skills base. Up-skilling and training of local staff in the particular requirements of the wind energy industry is likely to lead to additional opportunities for those staff as additional wind farms are constructed in Ireland. This will have a long-term moderate positive indirect effect. Wind Energy Ireland estimates that there are over 5,000 people employed in roles related to wind energy in Ireland in 2023. This figure is anticipated to grow significantly in the coming years as the race to achieve the targets set out in CAP25 accelerates.

Proposed Grid Connection

The construction phase of the Proposed Grid Connection will provide employment for technical consultants, contractors and maintenance staff. As mentioned previously, it is proposed to construct the Proposed Wind Farm and Proposed Grid Connection infrastructure concurrently which would require approximately 100 employees in total, with an estimated 20 jobs focusing on the construction phase of the Proposed Grid Connection. Construction of the Proposed Grid Connection infrastructure is estimated to last approximately 9-12 months of the overall 18-24 month construction timeframe. This will have a short-term moderate positive impact.

The Proposed Grid Connection will result in an influx of skilled people into the area, bringing specialist skills for both the construction and operational phases that could result in the transfer of these skills into the local workforce, thereby having a long-term positive effect on the local skills base. Up-skilling and training of local staff in the particular requirements of the wind energy industry is likely to lead to additional opportunities for those staff as additional wind farms are constructed in Ireland. This will have a long-term, slight positive indirect effect.

Mitigation and Monitoring Measures

No mitigation required.

Residual Effects

The injection of money in the form of salaries and wages to those employed during the construction phase of the Proposed Project has the potential to result in an increase in household spending and demand for goods and services in the local area. This would result in local retailers and businesses experiencing a short-term positive effect on their cash flow. This will have a short-term moderate positive indirect effect.

Significance of Effects

The effects on employment and investment arising during the construction phase of the Proposed Project are considered to be Not Significant.

5.4.2.1.3 *Land Use Patterns & Activities*

Pre-Mitigation Impacts

Proposed Wind Farm

Current land use within the Proposed Wind Farm site comprises small scale agriculture and commercial forestry. Current land use in the wider landscape comprises of agricultural, forestry, commercial and residential activities. Please note, as stated in Section 4.4.1.10 of Ch. 4: Description of the Proposed Project, approximately 44ha (hectares) of forestry, comprising conifer plantation (WD4), will be felled as part of the Proposed Wind Farm. Whilst there will be a change of land use in these areas to facilitate the development of the wind turbines, associated infrastructure, and proposed enhancement measures, this is an acceptable and unavoidable part of the Proposed Project. Please note, the 44ha of conifer plantation to be felled as part of the Proposed Wind Farm will be the subject of a Limited Felling Licence (LFL) application to the Forest Service in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments. Current land-use practices, including commercial forestry, will continue throughout the remainder of the Site in conjunction with the operational phase of the Proposed Project. The small scale of the proposed 110kV onsite substation (relative to the Site) and Population Study Area, its ability to coexist with ongoing site activities and activities within the landscape indicate that the substation infrastructure will have no significant impact on other land-uses within the Site and the wider area.

During the construction phase there may be slight interference with agricultural practices where farm practices may be redirected to other fields temporarily. As well, the removal of 44ha of commercial forestry crop will result in a change of land use of these areas. The Proposed Wind Farm will therefore have a short-term slight negative direct effect, which is not significant, on land use.

Proposed Grid Connection

The current land use and activities of the Proposed Grid Connection comprises agriculture, commercial forestry and transport/access along the national and local road network. Within the Proposed Wind Farm site, the Proposed Grid Connection will follow along the existing commercial forestry internal access route.

Local temporary traffic disruptions are likely along the Proposed Grid Connection; however, once the construction of each element is complete traffic flow will resume as normal along public roads. This will have a short-term slight negative direct effect, which is not significant.

During the construction phase there may be slight interference with agricultural practices where farm practices may be redirected to other fields temporarily. This will have a short-term slight negative direct effect, which is not significant.

The proposed works will be rolling in nature; with 100m being constructed along the proposed underground cable at any one time. Potential impacts related to traffic and transport during the construction phase are assessed in Section 5.4.3.2.5 below and in Ch. 15: Material Assets of this EIAR.

Mitigation and Monitoring

The following measures will be adhered for the Proposed Project. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.

- The construction of the Proposed Grid Connection underground cabling route through the R585, L-4909 L-4609, L-4615, R587, R586 will be undertaken in a rolling construction method with 100m of cabling installed and backfilled each day, providing access in the evenings and night hours along the route.
- A Traffic Management Plan, agreed with the Local Authority, will be in place for the construction phase of the Proposed Grid Connection underground cabling route. The Traffic Management Plan is included as Appendix 15-2 to this EIAR.
- Local access for residents living along the Proposed Grid Connection will not be closed for the construction phase, along the R585 Regional Road the road carriageway is wide enough to have access solutions in place, and there are also alternative access roads into the area.
- The identified 44ha of commercial forestry that will be felled for the Proposed Wind Farm will be replaced or replanted through proposed enhancement measures or on a hectare for hectare basis as a condition of any felling licence that will be issued in respect of the Proposed Wind Farm felling (Section 4.4.1.10 of Ch. 4: Description of the Proposed Project of this EIAR).

Residual Effects

Based on the above assessment, there will be a negative, slight, short-term residual effect on land use, and is therefore Not Significant.

Significance of Effects

The effect on land use/activities due to the construction phase the Proposed Project infrastructure is Not Significant.

5.4.2.1.4 *Property Values*

Pre-Mitigation Impacts

Proposed Wind Farm

As noted in Section 5.3.4 above, the available scientific literature demonstrates that there is insufficient evidence from the scientific literature and studies conducted to determine that there is the potential for a significant effect on property values as a result of the Proposed Wind Farm. The impact assessment on property values outlined below takes a precautionary approach and assumes that based on the inconclusive evidence summarised above in Section 5.3.4, there is the potential for short-term slight negative impacts on property values, which is not significant, located within 1km of the proposed turbines during the construction phase of the Proposed Wind Farm.

Proposed Grid Connection

As noted in Section 5.3.4 above, the conclusions from available EirGrid studies indicate that property values (residential and agricultural) show no correlation with the presence of grid infrastructure in the area, with opinions on nearby grid infrastructure diminishing over time. In some cases, property values were demonstrated to increase however, causation with grid infrastructure cannot be determined. Therefore, there is no potential for the Proposed Grid Connection to impact on property values in the area.

Mitigation and Monitoring Measures

- All mitigation relevant to property values, outlined above and the corresponding chapters: Ch.10: Air Quality, Ch. 12: Noise and Vibration, Ch. 13: Landscape and Visual, and Ch. 15: Material Assets, will be implemented in order to reduce insofar as possible, impacts on property values at properties located in the vicinity of Proposed Wind Farm construction works. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.
- The Proposed Wind Farm has been designed in accordance with the parameters set out in the Guidelines (DoEHLG, 2006) and with cognisance of the Draft Guidelines (DoHPLG, 2019), adhering to the required setback distances from sensitive receptors set out in those documents.

Residual Effects

With the above mitigation and monitoring measures adhered to, it can be concluded that there is the uncertain potential for a short-term negative imperceptible residual effect on property values from the construction phase of the Proposed Project.

Significance of Effects

The effect on property values due to the construction of the Proposed Project is Not Significant.

5.4.2.1.5 *Tourism*

Pre-Mitigation Impact

Proposed Wind Farm

Given that there are currently no tourism attractions specifically pertaining to the Site, there is a short-term, negative, imperceptible effect impact on tourism associated with the construction phase of the Proposed Wind Farm.

The Proposed Wind Farm site has some rural aesthetic qualities given the relative lack of buildings and infrastructure present on the Proposed Wind Farm site. It is mostly fields and rough grazing associated agricultural farmland, as well as commercial forestry – views that are common throughout the local area. Given the predominance of agricultural and commercial forestry activities, the landscape has already been subject to substantial levels of human interference and modification.

With regard to tourist attractions and amenity use surrounding the Proposed Wind Farm site, as described in Section 5.3.2, traffic management safety measures will be in place, as outlined within the Traffic and Transport Assessment, included as Section 15.1 of this EIAR where required. Please see below for Traffic impact mitigation measures and Ch. 15: Material Assets for mitigation measures relating to the Proposed Wind Farm site.

Proposed Grid Connection

There are no tourist attractions located along the Proposed Grid Connection underground cabling route, and as such there are no impacts on tourism associated with the construction phase of the Proposed Grid Connection. The Proposed Grid Connection underground cabling route is located within the public road network for the majority of its length, however, tourists seeking to travel to various attractions in the wider landscape during the construction phase, can utilise other routes and therefore will not be impacted by the rolling construction phase of the underground cabling route on the R585, L4909, L4609, L4615, R587, and R586 . However, should tourists want to utilise portions of any of these roads, the laying of cables will be carried out in a rolling nature with approximately 100m of cable being constructed in one day. It is estimated that the Proposed Grid Connection, including the HDD works, will take 9-12 months to complete, as outlined within the Traffic and Transport Assessment, included as Section 15.1 of this EIAR. The location of the construction will be transient in nature with the extent of the section of road closed kept to a minimum.

Residual Effects

Based on the above it is concluded that there would be a short-term, negative, imperceptible effect on tourism, and the wider landscape due to the construction phase of the Proposed Project, which is not significant.

Significance of Effects

The effect on tourism in the wider landscape due to construction phase the Proposed Project is Not Significant.

5.4.2.1.6 *Residential Amenity*

Pre-Mitigation Impact

Proposed Wind Farm

The potential for impacts on residential amenity is discussed in Section 5.3 above. There is the potential for impacts on residential amenity during the construction phase of the Proposed Wind Farm site due to air, traffic, noise and vibration emissions due to the presence of additional traffic and plant machinery. Dust emissions will have a short-term moderate negative impact. Noise and vibration emissions will have a short-term moderate negative impact. Traffic will have a short-term moderate negative effect.

Proposed Grid Connection

There is potential for impacts on residential amenity due to the construction of the Proposed Grid Connection. The Proposed Grid Connection underground cabling route will be located within 2 no. local roads (L4909, L-4609 and L-4615) and 3 no. Regional Roads (R585, R587 and R586), with a total length of 20.5km, which has the potential to give rise to traffic disruptions. This will have a short-term slight negative effect, which is not significant.

Mitigation and Monitoring Measures

All mitigation as outlined above and the corresponding chapters: Ch. 10: Air Quality, Ch. 12: Noise and Vibration, and Ch. 15: Material Assets will be implemented in order to reduce insofar as possible, impacts on residential amenity at properties located in the vicinity of Proposed Project construction works. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

Based on the above it is concluded that there would be a short-term, negative, Slight effect on residential amenity due to the construction phase of the Proposed Project.

Significance of Effects

The effect on residential amenity due to construction phase the Proposed Project is Not Significant.

5.4.2.2 Health

The following impact assessment is produced in accordance with guidance as set out in Section 5.1.2.

5.4.2.2.1 *Health and Safety*

Pre-Mitigation Impacts

Proposed Wind Farm

Construction of the Proposed Wind Farm will necessitate the presence of a construction site and travel on the local public road network to and from the construction site. Construction sites and the machinery used on them pose a potential health and safety hazard to construction workers if site rules are not properly implemented. This will have a short-term potential significant negative impact on health and safety.

Proposed Grid Connection

The construction of the Proposed Grid Connection will include working under existing 110kV overhead transmission lines which may impact on electrical infrastructure and supply in the area and along a local road which may give rise to traffic impacts (Further detailed in Ch.15: Material Assets). Furthermore, working in the cavity of power lines and traffic flow is potential health and safety hazard for construction workers. This will have a short-term potential significant negative impact on health and safety.

Mitigation and Monitoring Measures

The Proposed Project will be constructed, operated and decommissioned in accordance with all relevant Health and Safety Legislation, including:

- Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005);
- Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2016 (S.I. No. 36 of 2016);
- S.I. No. 528/2021 - Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021; and,
- Safety, Health and Welfare at Work (Work at Height) Regulations 2006 (S.I. No. 318 of 2006).

The following measures below are also detailed in Appendix 4-3: Construction and Environment Management Plan. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.

- A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. This will be prepared on a preliminary basis at the procurement stage and developed further at construction stage.
- All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project. Safepass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required. The developer is required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety and Health Plan.

Public safety will be addressed by restricting Site access during construction. Fencing will be erected in areas of the Site where uncontrolled access is not permitted.
- The suitability of machinery and equipment for use near power lines will be risk assessed.
- All staff will be trained on operating voltages of overhead electricity lines running through the Site. All staff will be trained to be aware of the risks associated with underground cables. All contractors that may visit the Site are made aware of the location of lines before they come on to Site.
- When activities must be carried out beneath overhead lines, e.g., component delivery or substation construction, a site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used prior to any works.
- Information on safe clearances will be provided to all staff and visitors.
- Signage indicating locations and health and safety measures regarding electrical cables will be erected in canteens and on Site.
- The construction of the Proposed Grid Connection underground cabling will be in phases along the proposed route. Prior to commencing grid connection works in the local road network, goal posts will be established under the 110kV and 38kV overhead lines and remain in place for the duration of the works in this area. The goal posts will not exceed a height of 4.2 metres, unless specifically agreed with ESB Networks
- All staff will be made aware of and adhere to the Health & Safety Authority's '*Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021'*. This will encompass the use of all necessary Personal Protective Equipment and adherence to the Site Health and Safety Plan.
- The suitability of machinery and equipment for use near power lines will be risk assessed.
- All staff will be trained on operating voltages of electricity cables running the Site. All staff will be trained to be aware of the risks associated with overhead lines. All contractors that may visit the Site are made aware of the location of lines before they come on to Site.
- When activities must be carried out beneath overhead lines, e.g., component delivery, a site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used prior to any works.
- Overhead line proximity detection equipment will be fitted to machinery when such works are required.

The scale and scope of the project requires that a Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) are required to be appointed in accordance with the provisions of the Health & Safety Authority's '*Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013'*. The PSDP appointed for the construction stage shall be required to perform his/her duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to):

- Identify hazards arising from the design or from the technical, organisational, planning or time related aspects of the project;
- Where possible, eliminate the hazards or reduce the risks;
- Communicate necessary control measures, design assumptions or remaining risks to the PSCS so they can be dealt with in the Safety and Health Plan;
- Ensure that the work of designers is coordinated to ensure safety;
- Organise co-operation between designers;
- Prepare a written Safety and Health Plan;
- Prepare a safety file for the completed structure and give it to the client; and
- Notify the Authority and the client of non-compliance with any written directions issued.

The PSCS appointed for the construction stage shall be required to perform his/her duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to):

- Development of the Safety and Health Plan for the construction stage with updating where required as work progresses;
- Compile and develop safety file information.
- Reporting of accidents / incidents;
- Weekly Site meeting with PSCS;
- Coordinate arrangements for checking the implementation of safe working procedures.
- Ensure that the following are being carried out:
    - Induction of all site staff including any new staff enlisted for the project from time to time;
    - Toolbox talks as necessary;
    - Maintenance of a file which lists personnel on Site, their name, nationality, current Safe Pass number, current Construction Skills Certification Scheme (CSCS) card (where relevant) and induction date;
    - Report on site activities to include but not limited to information on accidents and incidents, disciplinary action taken and PPE compliance;
    - Monitor the compliance of contractors and others and take corrective action where necessary; and
    - Notify the Authority and the client of non-compliance with any written directions issued.

Residual Effects

With consideration of the implementation of the detailed mitigation measures there will be a short-term potential, slight negative residual effect on health and safety during the construction phase of the Proposed Project.

Significance of Effects

Based on the assessment above the effects on health and safety during the construction phase of the Proposed Project are considered to be Not Significant.

5.4.2.2.2 *Air Quality: Dust, NO_2, PM_{10} and PM_{25} and CO_2 Emissions*

Pre-Mitigation Impacts

Proposed Wind Farm

Potential dust and exhaust emission sources during the construction phase of the Proposed Wind Farm include upgrading of existing access tracks and construction of new access roads, turbine and meteorological mast foundations, construction of a proposed 110kV onsite substation, temporary construction compound, peat and spoil management areas, tree felling areas, and habitat enhancement areas.

An increase in dust and exhaust emissions has the potential to cause a nuisance to sensitive receptors in the immediate vicinity of the Proposed Wind Farm site. The entry and exit of construction vehicles from the Proposed Wind Farm site may result in the transfer of mud to the public road, particularly if the weather is wet. This may cause nuisance to residents and other road users. the transport of volumes of stone to be transported into the Proposed Wind Farm site also has the potential to create dust, which could affect nearby sensitive receptors. These effects will have a short-term, slight, negative impact on air quality, which is not significant. The potential dust impacts that may occur during the construction phase of the Proposed Wind Farm are further described in Ch. 10: Air Quality.

Proposed Grid Connection

Potential dust and exhaust emission sources during the construction phase of the Proposed Grid Connection include the laying of approximately 20.5km of underground cabling and the road upgrade works which are associated with this process.

The entry and exit of construction vehicles from the Proposed Grid Connection has the potential to result in the transfer of mud to the public road, particularly if the weather is wet. This may cause nuisance to road users and local residents. These impacts will have a short-term slight, negative impact on air quality which is not significant. The potential dust impacts may occur at construction phase of the Proposed Wind Farm are further described in Ch. 10: Air Quality.

Mitigation and Monitoring Measures

The following mitigation measures will be implemented during the construction phase of the Proposed Project. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.

- Sporadic wetting of loose stone surface will be carried out during the construction phase to minimise movement of dust particles to the air. In periods of extended dry weather, dust suppression may be necessary along haul roads to ensure dust does not cause a nuisance. Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff.
- All plant and materials vehicles shall be stored in dedicated areas within the Site.
- Turbines and construction vehicles will be transported to the Site on specified haul routes only.
- Construction materials for the Proposed Wind Farm and Proposed Grid Connection will be sourced locally from licenced quarries and transported on specified haul routes only.
- The agreed haul route roads adjacent to the Site will be regularly inspected for cleanliness and cleaned as necessary.
- The roads adjacent to the Site entrances will be checked weekly or damage/potholes and repaired as necessary.
- Waste material will be transferred to a licensed /permitted Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal. The MRF facility will be local to the Site to reduce the level of emissions associated with vehicle movements
- A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Appendix 4-3).

Residual Effects

With the implementation of the above measures for this construction phase, residual effects on air quality from exhaust emissions associated with construction activities and machinery are considered to be in short-term slight negative effect.

Significance of Effects

The effects on air quality from exhaust emissions during the construction phase of the Proposed Project are considered to be Not Significant.

5.4.2.2.3 *Water Quality*

Pre-Mitigation Impacts

Proposed Wind Farm

The construction phase ground works and use of plant onsite may give rise to the potential release of suspended solids and hydrocarbons into groundwaters. There are several surface watercourses within the Proposed Wind Farm. There are no underground water or sewerage networks at the Proposed Wind Farm infrastructure locations. There are no source protection zones located within the Proposed Wind Farm; however, the Site sits within an Article 7 SW River Waterbody Area. Ch. 9: Hydrology and Hydrogeology assesses the potential for impact on group water schemes and other public water supplies during the construction phase. The pre-mitigation impact on water quality is assessed as indirect, negative, moderate, Short-Term, likely effect.

Proposed Grid Connection

There are no Group Water Schemes located within and in close proximity to the Proposed Grid Connection infrastructure. The Proposed Grid Connection underground cabling trench depth will only be approximately 1.2m in depth, the excavation will be temporary and transient, and the cable trench will be backfilled with hardcore material. There are 11 no. watercourse crossings located along the Proposed Grid Connection underground cabling route.. The pre-mitigation effect on water quality is assessed as indirect, negative, moderate, temporary, likely effect.

Mitigation and Monitoring Measures

It is proposed that all rock needed to construct the Proposed Project will come from the Proposed Onsite Borrow Pits. This rock will be used to construct the sub-base layer of proposed upgraded and new access roads, hardstand areas and turbine base areas. Once installed the subbase layer will be overlain by a clean capping layer of high-grade stone material which will be sourced from local quarries. Further information relating to the mitigation measures for control of hydrocarbons during maintenance works as described in Ch. 9: Hydrology and Hydrogeology: Section 9.6.2.5

A bespoke drainage design which includes but is not limited to interceptor drains, check dams, swales and ponds will be implemented on the Site. Ch. 9: Hydrology and Hydrogeology of this EIAR details all best practice and mitigation measures to minimise the potential for entrainment of suspended sediment or potential hydrocarbon leak. Please see Ch. 9: Hydrology and Hydrogeology for details and Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of mitigation and monitoring measures for the Proposed Project.

Residual Effects

With the implementation of the drainage design and all mitigation measures listed in Ch. 9: Hydrology and Hydrogeology (separation distances, prevailing geology, topography and groundwater flow directions), it is considered that the residual effects are to be short-term, imperceptible, negative effect on water quality.

Significance of Effects

The effects on water quality during the construction phase of the Proposed Project are considered to be Not Significant.

5.4.2.2.4 Noise and Vibration

Pre-Mitigation Impacts

Proposed Wind Farm

There will be an increase in noise levels in the vicinity of the Site during the construction phase, as a result of heavy machinery and construction work which has the potential to cause a nuisance to sensitive receptors as located closest the Site. This will be a short-term, very low sensitivity and low magnitude of change human health. The noisiest construction activities associated with wind farm development are excavation and concrete pouring of the turbine bases. Excavation of a turbine base can typically be completed in five days however, and the main concrete pours are usually conducted in one continuous pour, which is done within a matter of hours.

Construction noise at any given noise sensitive location will be variable throughout the construction project, depending on the activities underway and the distance from the main construction activities to the receiving properties. The potential noise impacts that will occur during the construction phase of the Proposed Wind Farm are further described in Ch. 12: Noise and Vibration.

Proposed Grid Connection

There will be an increase in noise levels in the vicinity of the Site during the construction phase, as a result of heavy machinery and construction work which has the potential to cause a nuisance to Sensitive Receptors located closest the Proposed Grid Connection works. This will be a short-term, very low sensitivity and low magnitude of change on human health due to increased noise levels from construction. The noisiest construction activities associated with the construction activities are excavation and concrete pouring of the substation and end mast foundations.

The predicted pre-mitigation noise impacts during the construction of the Proposed Project are assessed as negative, not significant and short-term, which is Not Significant

Mitigation and Monitoring Measures

Best practice measures for noise control will be adhered to on Site during the construction phase of the Proposed Project to impacts associated with this phase of the development. Please refer to Ch. 12: Noise and Vibration and Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.

- No plant used on Site will be permitted to cause an on-going public nuisance due to noise.
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on Site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- Any plant, such as generators or pumps, which is required to operate outside of general construction hours will be surrounded by an acoustic enclosure or portable screen.
- During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Ch.12: Noise and Vibration using methods outlined in British Standard BS 5228-1:2014+A1:2019 Code of practice for noise and vibration control on construction and open Sites – Noise.

- The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 7:00hrs and 19:00hrs Monday to Saturday. However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (i.e., concrete pours, large turbine component delivery, rotor/blade lifting) it could occasionally be necessary to work out of these hours.

Residual Effects

With the implementation of the above mitigation measures, there will be a short-term, slight impact on health due to an increase in noise levels during the construction phase of the Proposed Project.

Significance of Effects

For the reasons outlined above, the effects on human health due to due to noise emissions from the Proposed Project during construction will be slight.

5.4.2.2.5 *Traffic and Transport*

Pre-Mitigation Effects

Proposed Wind Farm

It is proposed that the wind turbine components be delivered to the Proposed Wind Farm site from

Port of Cork. For the purposes of assessment, the turbine components and other abnormal loads will be transported from Ringaskiddy Port. The proposed Turbine Delivery Route (TDR) leaves Ringaskiddy on Ringaskiddy Rd (N28), following the N28 right onto Carr's Hill, merging onto the Cork south Ring Rd (N40), continuing on the N22 until turning southwest onto the R585 Regional Road. The TDR continues on the R585 before reaching the Site in the townland of Maughanaclea where it will turn left up the existing Coillte forestry track to reach the southern turbine cluster, or turn right up the new proposed site entrance to reach the northern turbine cluster.

The proposed route is described in further detail in Ch. 4: Description of the Proposed Project of this EIAR and Ch. 15: Material Assets. Non-turbine construction traffic e.g., Heavy Goods Vehicles (HGVs) and Light Goods Vehicles (LGVs) movements involved in the delivery of construction related materials to the Proposed Wind Farm site will also enter the Proposed Wind Farm via site entrances along the R585.

This will have a temporary slight negative effect on traffic users on the delivery routes.

Proposed Grid Connection

Materials to be used to construct the proposed 110kV onsite substation will be delivered to the Site via the R585. This may have a negative temporary effect on existing road users, which will be minimised by the implementation of the mitigation measures included in the traffic management plan.

The Proposed Grid Connection works will last approximately 18 months, completed with a traffic management plan in place and will follow the TII and EirGrid requirements. The grid route trenches will be excavated in a rolling manner, approx. 100m per day and backfilled each evening.

By its nature the effects of these additional trips and diversions on the network will be transient, will be temporary and will be slight.

Mitigation and Monitoring Measures

A complete Traffic and Transport Assessment (TTA) of the Proposed Project has been carried out by Alan Lipscombe Traffic and Transport Consultants. The full results of the TTA are presented in Section 15.1 of Ch. 15: Material Assets. A Traffic Management Plan has also been developed in order to minimise any potential effect on the local population during the construction phase of the Proposed Project due to traffic. The plan will be developed and implemented to ensure any effect is short term in duration and slight in significance during the construction of the Proposed Project. Prior to commencement of any works, the occupants of dwellings in the vicinity of the proposed works will be contacted and the scheduling of works will be made known. Local access to properties will also be maintained throughout any construction works and local residents will be supplied with the number of the works supervisor in order to ensure that disruption will be kept to a minimum. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

Once the Traffic Management Plan is implemented for the construction phase of the Proposed Project, there will be a short-term slight negative effect on local road users.

Significance of Effects

Based on the assessment above, the effects on traffic from the Proposed Project during construction will be Not Significant.

5.4.2.2.6 *Major Accidents and Natural Disasters*

Pre-Mitigation Impacts

Proposed Wind Farm

A risk register has been developed which contains all potentially relevant risks identified during the construction phase of the Proposed Wind Farm. Seven risks (Critical Infrastructure Emergencies, Severe Weather, Flooding, Utility Emergencies, Traffic Incident, Contamination, and Fire/Gas Explosion) specific to the construction phase have been identified and are presented in Ch. 16: Major Accidents and Natural Disasters. As outlined in 16.4.1 of this EIAR, the scenario with the highest risk score in terms of the occurrence of major accident and/or disaster during the construction is identified as 'Contamination' of the Site and risk of 'Fire/Explosion' and 'Peat Stability' during construction.

Proposed Grid Connection

A risk register has been developed which contains all potentially relevant risks identified during the construction phase of the Proposed Grid Connection. Seven risks (Critical Infrastructure Emergencies, Severe Weather, Flooding, Utility Emergencies, Traffic Incident, Contamination, and Fire/Gas Explosion) specific to the construction phase have been identified and are presented in Ch. 16: Major Accidents and Natural Disasters. The risk register concludes that there is low potential for natural disaster and/or major accident to occur at the Proposed Grid Connection. As outlined in Section 16.4.1 of this EIAR, the scenario with the highest risk score in terms of the occurrence of a major accident and/or disaster during construction is identified as 'Contamination' of the Site and risk of 'Fire/Explosion' during construction.

Therefore, in the absence of mitigation, the impact of contamination, peat stability and major fires unlikely, temporary, moderate, negative effects, which are Not Significant

Residual Effects

- The impact assessment concludes that the risk of a major accident and/or disaster during the construction phase of the Proposed Project is considered 'low' in accordance with the Department of Housing, Local Government and Heritage (2024*). A Framework for Major Emergency Management – A Guide to Regional Risk Assessment*[31]

Significance of Effects

Based on the above risk assessment in Ch.16: Major Accidents and Natural Disasters, the effects to/from Major Accidents and Natural Disasters during the construction phase of the Proposed Project is Not Significant.

5.4.2.2.7 *Shadow Flicker*

Proposed Project

Shadow flicker, which occurs during certain weather conditions due to the movement of wind turbine rotor blades, as described in Section 5.2.3 of this chapter, can only occur during the operational phase of a wind energy development. There are therefore no shadow flicker impacts associated with the construction phase of the Proposed Project. Any shadow flicker effects that occur in the commissioning phase of the proposed turbines will be short in duration and is dealt with under Section 5.4.3.2.7 below.

5.4.3 Operational Phase

5.4.3.1 Population

The effects set out below relate to the operational phase of the Proposed Project.

5.4.3.1.1 *Population Levels*

Pre-Mitigation Impacts

Proposed Wind Farm

The operational phase of the Proposed Project will have no impact on the population of the area with regard to changes to trends, population density, household size or age structure.

Proposed Grid Connection

The operational phase of the Proposed Grid Connection will have no impact on the population of the area with regard to changes to trends, population density, household size or age structure.

Mitigation and Monitoring Measures

No mitigation required.

Residual Effects

No residual effects.

[31] *DoHLGH (2024) A Framework for Major Emergency Management – A Guide to Regional Risk Assessment. Available at: https://assets.gov.ie/static/documents/Guide_to_Regional_Risk_Assessment_September_2024.pdf*

Significance of Effects

No significance of effects.

5.4.3.1.2 *Employment and Investment*

The operational phase will present an opportunity for mechanical-electrical contractors and craftspeople to become involved with the maintenance and operation of the Proposed Project. On a long-term scale, the Proposed Project will create approximately 3-4 jobs during the operational phase relating to the maintenance and control of the Proposed Project, having a long-term slight positive effect.

The injection of money in the form of Community Gain income and landowner payments to the landowners who are participating in the Proposed Project, where a rental agreement has the potential to result in an increase in household spending and demand for goods and services in the local area. This would result in local retailers and businesses experiencing a long-term positive impact on their cash flow. This will have a long-term slight positive indirect effect.

Rates payments for the Proposed Project will contribute significant funds to Cork County Council, which will be redirected to the provision of public services within the county. These services include provisions such as road upkeep fire services, environmental protection, street lighting, footpath maintenance etc. along with other community and cultural support initiatives.

Proposed Community Benefit Scheme

Should the Proposed Project receive planning permission, there are substantial opportunities available for the local area in the form of Community Benefit Funds. The value of this fund will be directly proportional to the installed capacity and/or energy produced at the Site and will support and facilitate projects and initiatives including youth, sport and community facilities, schools, educational and training initiatives, and wider amenity heritage and environmental projects. Should the Proposed Project qualify under the Renewable Energy Support Scheme (RESS), a Community Benefit Fund of €2 per megawatt hour will be available to local residents under the Community Benefit Fund. Based on this value, the Proposed Project could generate up to €430k for the Community Benefit Fund for the first 15 years of operation of the Proposed Wind Farm. If the Proposed Project does not qualify under RESS, a guaranteed fee of €1 per megawatt hour will be available to locals through the Community Benefit Fund. Based on this, the Proposed Project has the potential to generate up to €205k per annum for the Community Benefit Fund for the lifespan of the Proposed Project.

Further details on the proposed Community Gain proposals are presented in Appendix 2-1 and Section 4.10 of Ch. 4: Description of the Proposed Project of this EIAR.

Mitigation Measures

No mitigation required.

Residual Effects

During the operational phase of the Proposed Project there will be positive, slight, long-term residual effect on employment and investment.

Significance of Effects

The effect on employment and investment due to the operation of the Proposed Project is Not Significant.

5.4.3.1.3 *Land Use Patterns and Activities*

Pre-Mitigation Impacts

Proposed Wind Farm

The footprint of the Proposed Wind Farm will occupy only a small percentage of the Site; 14.67 hectares (1.25%) of the overall 1,175 hectare site. Farming practices will not be impacted during the operational phase. The addition of new roads throughout the Proposed Wind Farm site will enable access for landowners throughout their lands. This will have a Permanent imperceptible positive impact on land use. During the operational phase, farming practices will resume around the proposed 110kV onsite substation and underground electrical cabling route from the proposed 110kV onsite substation to the existing Dunmanway 110kV substation.

As detailed in the Biodiversity Management and Enhancement Plan (BMEP) (Appendix 6-4) native woodland will be replanted within the identified biodiversity enhancement areas (Table 3-1 in Appendix 6-4). This will have a Permanent slight positive impact on land use.

As such, its small-scale relative to the Site and Population Study Area combined with its ability to coexist with ongoing site activities and activities within the landscape indicate that the Proposed Wind Farm will not impact significantly on other land uses within the Site and the wider area.

Proposed Grid Connection

The Proposed Grid Connection's footprint is limited to a small portion of the Site and overall Population Study Area, and traffic movements on the R585,L4909, L-4609, L-4615, R587, R586 will continue as normal.

Mitigation and Monitoring Measures

No mitigation required.

Residual Effects

Due to the small footprint of the Proposed Project infrastructure on a Site scale and even more so on a local scale, the residual effect is considered Negative, direct, not significant, permanent effect on land use and activities during the operational phase.

Significance of Effects

The effect on land use/activities due to the operational phase of the Proposed Project will be Not Significant.

5.4.3.1.4 *Property Values*

Pre-Mitigation Impacts

Proposed Wind Farm

As noted in Section 5.3.5 above, the available scientific literature demonstrates that there is insufficient evidence from the scientific literature and studies conducted to determine that there is the potential for a significant effect on property values as a result of the Proposed Wind Farm. The impact assessment

on property values outlined below takes a precautionary approach and assumes that based on the inconclusive evidence summarised above in Section 5.3.5, there is the potential for long-term slight impacts on property values located within 1km of the proposed turbines during the early operational phase of the Proposed Wind Farm.

Proposed Grid Connection

As noted in Section 5.3.5 above, the conclusions from available EirGrid studies indicate that property values (residential and agricultural) show no correlation with the presence of grid infrastructure in the area, with opinions on nearby grid infrastructure diminishing over time. In some cases, property values were demonstrated to increase however, causation with grid infrastructure cannot be determined. There is no potential for the Proposed Grid Connection to impact on property values in the area.

Mitigation and Monitoring Measures

- All mitigation relevant to property values, outlined above and the corresponding chapters: Ch. 10: Air Quality, Ch. 12: Noise and Vibration, Ch. 13: Landscape and Visual, and Ch. 15: Material Assets, will be implemented in order to reduce insofar as possible, impacts on property values at properties located in the vicinity of Proposed Wind Farm construction works. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.
- The Proposed Wind Farm has been designed in accordance with the parameters set out in the Guidelines (DoEHLG, 2006) and with cognisance of the Draft Guidelines (DoHPLG, 2019), adhering to the required setback distances from sensitive receptors set out in those documents.

Residual Effects

It can be concluded that there is the potential for a long-term, negative, not significant, residual effect on property values from the operational phase of the Proposed Project.

Significance of Effects

The effect on property values due to the Proposed Project is Not Significant.

5.4.3.1.5 *Tourism*

Pre-Mitigation Effect

Proposed Wind Farm

There are no tourism attractions within or adjacent to the Site that could be affected by the operation of the Proposed Wind Farm. The nearest notable tourist attraction, Kealkill Stone Circle, is 2.1km west of the nearest turbine (t14). As outlined in Section 5.4 above, Kealkill Stone Circle is recognised as a locally important archaeological feature. There will be a change to the landscape setting as described in Ch.14: Cultural Heritage of this EIAR.

Based on the literature review in Section 5.3.2, the majority of studies indicate that wind farm developments do not deter visitors to tourist attractions or scenic landscapes where turbines are visually evident. This will have a long-term, imperceptible, negative effect on tourism.

Proposed Grid Connection

The Proposed Grid Connection underground cabling route will travel through the public road network and will be located underground. There are no tourism attractions along the underground cabling route The nearest tourist attraction to the Proposed Grid Connection underground cabling route is the Sam Maguire birthplace located in the townland of Mallabracka just off the TDR route For all potential tourist attractions located along the Proposed Grid Connection, there will be no visibility of the Proposed Grid Connection during the operational phase and therefore no effects are deemed to arise.

Mitigation and Monitoring Measures

No mitigation required.

Residual Effects

It is considered that the Proposed Project will have a long-term, imperceptible, negative effect on tourism. on visitor experiences to attractions in the wider landscape.

Significance of Effects

The effect on tourism in the wider landscape due to the operational phase of the Proposed Project will be Not Significant.

5.4.3.1.6 *Residential Amenity*

Pre-Mitigation Effects

Proposed Wind Farm

Potential impacts on residential amenity during the operational phase of the Proposed Wind Farm could arise primarily due to noise, shadow flicker or changes to visual amenity. This will have a long-term significant negative direct effect on residential amenity. Detailed noise and shadow flicker modelling have been carried out as part of this EIAR, which shows that the Proposed Wind Farm will be capable of meeting all required guideline limits in relation to noise and the shadow flicker set out in the Guidelines (DoEHLG, 2006), or the Draft Guidelines (DoHPLG, 2019) if adopted. The noise and vibration assessment is detailed in Ch.12: Noise and Vibration of this EIAR. It should be noted that the Proposed Wind Farm will be brought in line with the noise thresholds imposed on the development by the consenting authority should permission be granted for the Proposed Project. The visual impact of the Proposed Wind Farm is addressed in Ch.13: Landscape and Visual. The turbine locations have been designed to maximise turbine separation distances to dwellings in the area, with no turbines located within 676 metres of non-involved sensitive receptors, achieving the recommended four times turbine setback, set out in the Draft Guidelines (DoHPLG, 2019) specifically for protecting visual amenity.

Potential impacts on residential amenity during the operational phase of the proposed 110kV onsite substation could arise primarily due to noise and changes to visual amenity. Detailed noise modelling has been carried for the proposed 110kV onsite substation, please see below and Ch. 12: Noise and Vibration for details. The visual effects of the proposed 110kV onsite substation and the associated temporary construction compound have been assessed in Ch.13: Landscape and Visual of this EIAR. The nearest sensitive receptor is located approximately 325m northeast of the proposed 110kV onsite substation location, and will be largely screened by existing commercial forestry and proposed native woodland tree planting.

Proposed Grid Connection

The Proposed Grid Connection electrical cabling route is located underground; therefore, no visual effects are deemed to arise from this element.

Overall, without the implementation of mitigation measures there would be a Long-Term Moderate, Negative effect on Residential Amenity as a result of the Proposed Project.

Mitigation and Monitoring Measures

- There are no turbines proposed within 676m (4 x tip height) of any sensitive receptors.
- All mitigation measures outlined in Ch.12: Noise and Vibration, shadow flicker (Section 5.4.2.2.7 of this EIAR) and Ch.13: Landscape and Visual in this EIAR will be implemented in order to reduce insofar as possible, impacts on residential amenity at properties located within the in the vicinity of the Proposed Project, including along the proposed turbine and construction materials haul route and the Proposed Grid Connection.
- A 2.6m high palisade fence will be erected around the substation which will be painted RAL 6005 (green) to help blend the substation infrastructure in with the surrounding rural landscape. Please see Ch.13: Landscape and Visual for residential amenity pertaining to visual effects.

Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

The residual effect is considered to be a long-term, slight, negative, residual effect on residential amenity.

Significance of Effects

Based on the assessment above the effects on residential amenity during the operational life of the Proposed Project will be Not Significant.

5.4.3.2 Health

5.4.3.2.1 *Health and Safety*

Pre-Mitigation Effect

Proposed Wind Farm

Rigorous safety checks and continued maintenance are conducted on the turbines and ancillary infrastructure, including the proposed 110kV onsite substation during the operational phase to ensure there are no health and safety risks posed by the Proposed Wind Farm. This will have a potential long-term, slight impact on health and safety during the operation phase.

Proposed Grid Connection

Rigorous safety checks and continued maintenance are conducted along the 110kV underground cabling connection and all ancillary works during the operational phase to ensure the risks posed to staff and landowners are negligible. This will have a potential long-term, slight impact on health and safety during the operational phase.

Mitigation and Monitoring Measures

The following mitigation measures will be implemented during the operation of the Proposed Project to ensure that the risks posed to staff and landowners remain imperceptible throughout the operational life of the Proposed Project. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of mitigation and monitoring measures for the Proposed Project.

- Access to the turbines is through a door at the base of the structure, which will be locked at all times outside maintenance visits. The doors will only be unlocked as required for entry by authorised personnel and will be locked again following their exit.
- Staff associated with the project will conduct frequent visits, which will include inspections to establish whether any signs have been defaced, removed, faded, or are becoming hidden by vegetation or foliage, with prompt action taken as necessary.
- Signs will also be erected at suitable locations across the Site as required for the ease and safety of operation of the wind farm. These signs include:
    - Buried cable route markers at 50m (maximum) intervals and change of cable route direction;
    - Directions to relevant turbines at junctions;
    - "No access to Unauthorised Personnel" at appropriate locations;
    - Speed limits signs at Site entrance and junctions;
    - "Warning these Premises are alarmed" at appropriate locations;
    - "Danger HV" at appropriate locations;
    - "Warning – Keep clear of structures during electrical storms, high winds or ice conditions" at Site entrance;
    - "No unauthorised vehicles beyond this point" at specific Site entrances; and
    - Other operational signage required as per Site-specific hazards.
- The proposed 110kV onsite substation, which will be operated by EirGrid, will be locked and fenced off from public access. The substation will be operational remotely and manually 24 hours per day, 7 days a week. Supervisory operational and monitoring activities will be carried out remotely using a SCADA system, with the aid of computers connected via a telephone modem link.
- Periodic service and maintenance work which include some vehicle movement.
- For operational and inspection purposes, substation access is required.
- Servicing of the substation equipment will be carried out in accordance with the manufacturer's specifications, which would be expected to entail the following:
    - Six-month service – three-week visit
    - Annual service – six-week visit
    - Weekly visits as required.
- An operational phase Health and Safety Plan will be developed to fully address identified Health and Safety issues associated with the operation of the Site. Access for emergency services will be available at all times.

The components of a wind turbine are designed to last up to 35 years and are equipped with a number of safety devices to ensure safe operation during their lifetime. During the operation of the wind farm regular maintenance of the turbines will be carried out by the turbine manufacturer or appointed service company. A project or task specific Health and Safety Plan will be developed for these works in accordance with the Site's health and safety requirements.

Residual Effects

With the implementation of the above mitigation measures, there will be a long-term, negative, imperceptible residual effect on health and safety during the operational life of the Proposed Project.

Significance of Effects

Based on the assessment above the effects on health and safety during the operational life of the Proposed Project will be Not Significant.

5.4.3.2.2 *Noise and Vibration*

Pre-Mitigation Effect

Proposed Wind Farm

An assessment of the operational wind turbine noise levels has been undertaken in accordance with best practice guidelines and procedures as outlined in Ch. 12: Noise and Vibration. The predicted noise levels associated with the Proposed Wind Farm will be within best practice noise criteria curves recommended in the Guidelines (DoEHLG 2006) therefore, it is not considered that a significant effect is associated with the Proposed Wind Farm.

The predicted noise level from the operation of the 110kV onsite substation at the nearest NSL (H11) at approximately 325 m from the noise source at the 110kV onsite substation (transformer of substation layout) is 24 dB LAeq,T. This level of noise is considered low, and it is concluded that there will be no significant noise emissions from the operation of the 110kV onsite substation at any NSL.

Proposed Grid Connection

The level of noise from the Proposed Grid Connection will be negligible.

Mitigation and Monitoring Measures

Please see Ch.12: Noise and Vibration Section 12.7 for noise and vibration mitigation and monitoring proposals for the Proposed Project. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of mitigation and monitoring measures for the Proposed Project.

Residual Effects

The predicted residual operational turbine noise effects at the closest noise sensitive locations is long-term, negative, not significant. Please see Ch. 12: Noise and Vibration for details.

Significance of Effects

As stated in the noise assessment in Ch.12: Noise and Vibration, it has been demonstrated that the relevant national guidance in relation to noise associated with proposed wind turbines can be satisfied. The effects are considered Not Significant.

5.4.3.2.3 *Air Quality: Dust, NO2, PM10 and PM25 and CO2 Emissions*

Pre-Mitigation Effect

Proposed Wind Farm

The Proposed Wind Farm will require daily visits of maintenance staff in LGVs and the infrequent generation of small volumes of hydrocarbon waste. The Proposed Wind Farm will generate electricity from a renewable source, contributing to a positive impact on air quality. Over the envisaged 35-year lifespan of the Proposed Wind Farm it is expected to effectively reduce carbon dioxide emissions that

would have occurred if the same energy were generated by traditional fossil fuel plants. This is a long-term moderate positive effect on Air Quality.

In terms of the proposed 110kV onsite substation, the sources of dust and other emissions generated during the operational phase will be from infrequent visits by EirGrid staff in light good vehicles (LGVs), approximately one or two visits per day, using private LGVs. Maintenance of the substation infrastructure may, on occasion, generate of small volumes of hydrocarbon waste. Any waste generated at the Site will be managed in accordance the Waste Management Act 1996 and under the relevant EU legislation. This will have a potential long-term, imperceptible impact on health during the operation phase.

Proposed Grid Connection

The sources of dust and other emissions generated during the operational phase will be from infrequent visits by maintenance staff to the Proposed Grid Connection in LGVs. This will result in a temporary, imperceptible, negative effect on air quality.

Mitigation Measures

All mitigation as outlined in Section 10.3.3 of Ch. 10: Air Quality will be implemented in order to reduce insofar as possible, impacts on air quality in the vicinity of Proposed Project construction works. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

Impacts from dust and other emissions to air from the maintenance of the Proposed Project on sensitive receptors during the operational phase of the Proposed Project is considered to be a brief and imperceptible effect. Overall, considering offsetting of dust and greenhouse gas emissions from fossil fuels as a result of the Proposed Project, there will be a long-term overall moderate positive effect on air quality.

Significance of Effects

Through the offsetting of dust and greenhouse gas emissions from fossil fuels, the Proposed Project is considered have be Not Significant.

5.4.3.2.4 *Water Quality*

Pre-Mitigation Effect

Proposed Wind Farm

During the operational phase, all permanent drainage controls will be in place and the disturbance of ground and excavation works will be complete. Some minor maintenance works may be completed, such as maintenance of the site entrance, internal roads and hardstand areas. These works would be of a very minor scale and would be very infrequent. During such maintenance works there is a small risk associated with the release of hydrocarbons from site vehicles, although it is not envisaged that any significant refuelling works will be undertaken on site during the operational phase. There will be a temporary imperceptible impact on human health due to water quality.

Proposed Grid Connection

During the operational phase, all permanent drainage controls will be in place and the disturbance of ground and excavation works will be complete. Some minor maintenance works may be completed,

such as maintenance of roads. These works would be of a very minor scale and would be very infrequent. During such maintenance works there is a small risk associated with the release of hydrocarbons from site vehicles, although it is not envisaged that any significant refuelling works will be undertaken on site during the operational phase. There will be a temporary imperceptible impact on human health due to water quality.

Mitigation and Monitoring Measures

The mitigation measures detailed in Ch. 9: Hydrology and Hydrogeology will ensure all surface water runoff will be captured and treated prior to discharge/release. Settlement ponds, checks dams and buffered outfalls will prevent roads acting as preferential flowpaths by providing attenuation and water quality treatment. Please see Ch. 9: Hydrology and Hydrogeology for details. The full list of mitigation and monitoring measures for the Proposed Project are detailed in Ch. 18: Schedule of Mitigation and Monitoring Measures.

Residual Effects

With the implementation of the Proposed Wind Farm drainage design and mitigation measures the residual effects are considered to be negative, imperceptible, indirect, temporary, and unlikely.

Significance of Effects

Based on the assessment above, the effects on Human Health due to water quality will be imperceptible and Not Significant.

5.4.3.2.5 *Traffic and Transport*

Pre-Mitigation Effect

Proposed Wind Farm

Major component failures are considered unlikely and therefore the presence of abnormal load vehicles and HGVs at the Proposed Wind Farm site is considered extremely rare. Should a turbine component need replacing, the measures detailed in Section 5.4.2.2.5 and Ch. 15: Material Assets will be implemented.

All site visits for maintenance and inspection purposes for the Proposed Wind Farm will be done so via LGVs with just one or two LGVs with day.

The proposed 110kV onsite substation will not require ongoing maintenance during the operation phase. Visits to the Site by EirGrid for maintenance and inspection purposes will be done so via LGVs with just one or two visits per day.

Proposed Grid Connection

The Proposed Grid Connection, underground cabling route will not require ongoing maintenance during the operation phase. Visits to the Site by EirGrid for maintenance and inspection purposes will be done so via LGVs with just one or two visits per day.

Residual Effects

Effects on local road users during the operational phase are considered to be a long term negative imperceptible impact.

Significance of Effects

Based on the assessment above, the effects on Human Health due to traffic will be imperceptible and Not Significant.

5.4.3.2.6 *Major Accidents and Natural Disasters*

Pre-Mitigation Effects

Proposed Wind Farm

A risk register has been developed which contains all potentially relevant risks identified during the operational phase of the Proposed Wind Farm. Five risks (, Severe Weather, Collapse/Damage to Structures, Peat Stability, Traffic Incident, Contamination, and Fire/Gas Explosion) specific to the operational phase have been identified and are presented in Ch. 16: Major Accidents and Natural Disasters. As outlined in Section 16.4.1, the scenario with the highest risk score in terms of the occurrence of major accident and/or disaster during operation is identified as "Fire/Explosion' during operation.

Proposed Grid Connection

A risk register has been developed which contains all potentially relevant risks identified during the operational phase of the Proposed Grid Connection. Five risks (, Severe Weather, Collapse/Damage to Structures, Peat Stability, Traffic Incident, Contamination, and Fire/Gas Explosion) specific to the operational phase have been identified and are presented in Ch. 16: Major Accidents and Natural Disasters. The risk register concludes that there is low potential for significant natural disasters to occur at the Proposed Grid Connection. As outlined in Section 16.4.1, the scenario with the highest risk score in terms of the occurrence of major accident and/or disaster during operation is identified as 'Fire/Explosion' during operation.

Therefore, in the absence of mitigation, the impact of both contamination and major fires with regards to the Proposed Project is unlikely, temporary, moderate, negative effects, which are Not Significant

Mitigation and Monitoring Measures

- The Proposed Project will be designed and built in line with current best practice and, as such, mitigation against the risk of major accidents and/or disasters will be embedded through the design. In accordance with the provision of the European Commission '*Guidance on the preparation of Environmental Impact Assessment Reports'* 2017, a Risk Management Plan will be prepared and implemented onsite to ensure an effective response to disasters or the risk of accidents. The plan will include sufficient preparedness and emergency planning measures.
- The Proposed Project will also be subject to a fire safety risk assessment in accordance with Chapter 19 of the Safety, Health and Welfare at Work Acts 2005 to 2014, which will assist in the identification of any major risks of fire onsite, and mitigation of the same during operation.

Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures which details all proposed mitigation and monitoring measures for the operation of the Proposed Project.

Residual Effect

The impact assessment concludes that the risk of a major accident and/or disaster during the operational phase of the Proposed Project is considered 'low' in accordance with the '*Guide to Risk*

Assessment in Major Emergency Management' (DoEHLG, 2010). "[32]. It is considered that when the mitigation and monitoring measures outlined in the CEMP (Appendix 4-4) are implemented and adhered to there the residual effects associated with the operation of Proposed Project will be unlikely, temporary, slight, negative effects, which are Not Significant.

Significance of Effects

Based on the above and the risk assessment in Ch.16: Major Accidents and Natural Disasters, the effects to/from Major Accidents and Natural Disasters during the operational phase of the Proposed Project are Not Significant.

5.4.3.2.7 *Shadow Flicker*

Pre-Mitigation Effects

Proposed Wind Farm

Assuming worst-case conditions, a total of 41 properties as a result of the Proposed Maughanaclea Renewable Energy Development may experience daily shadow flicker in excess of the current DoEHLG guideline threshold of 30 minutes per day. The DoEHLG total annual guideline limit of 30 hours is predicted to be exceeded at 30 no. properties when the regional sunshine average of 33.40% is taken into account. As stated in Section 5.3.6 there are 79 no. properties located within 1,330m (of the proposed turbines, (of the 41 no sensitive receptors that may require daily and/or annual mitigation measures It should be noted that 9 no. of these 30 no. sensitive receptors are involved landowners and 1 no. is in a derelict condition. As a result, no mitigation measures are required for these 10 no. properties. Relying on the prediction modelling alone, shadow flicker could potentially have a long-term, slight, negative impact on each sensitive receptor, which is not significant. **Proposed Grid Connection**

There is no potential for the Proposed Grid Connection infrastructure to cause shadow flicker, and so no effect is predicted.

Mitigation and Monitoring Measures

Where daily or annual shadow flicker exceedances are predicted at any inhabitable or third-party dwelling of the identified 31 no. sensitive receptors, a site visit will be undertaken firstly to determine the presence of existing screening and window orientation at each potentially affected property. This will determine if the receptor has an actual line of sight to any turbine and actual potential for shadow flicker to occur. Once this exercise is completed and all of the potentially affected properties, the following measures will be employed.

Screening Measures

In the event of an occurrence of shadow flicker exceeding guideline threshold values of 30 minutes per day at residential receptor locations, mitigation options will be discussed with the affected homeowner, including:

- Installation of appropriate window blinds in the affected rooms of the residence;
- Planting of screening vegetation;
- Other site-specific measures which might be agreeable to the affected party and may lead to the desired mitigation.

[32] *Department of Environment, Heritage and Local Government, 2010. A Guide to Risk Assessment in Major Emergency Management. Available at: https://assets.gov.ie/117528/e06a7ca8-a634-4f70-a9a7-b405ee08429a.pdf*

If agreement can be reached with the homeowner, then it would be arranged for the required mitigation to be implemented in cooperation with the affected party as soon as practically possible and for the full costs to be borne by the wind farm operator.

Wind Turbine Control Measures

If it is not possible to mitigate any identified shadow flicker limit exceedance locally using the measures detailed above, wind turbine control measures will be implemented.

Wind turbines can be fitted with shadow flicker control units to allow the turbines to be controlled to prevent the occurrence of shadow flicker at properties surrounding the wind farm. The shadow flicker control units will be added to any required turbines.

A shadow flicker control unit allows a wind turbine to be programmed and controlled using the wind farm's Supervisory Control and Data Acquisition (SCADA) system to change a particular turbine's operating mode during certain conditions or times, or even turn the turbine off if necessary.

All predicted incidents of shadow flicker can be pre-programmed into the wind farm's control software. The wind farm's SCADA control system can be programmed to shut down any particular turbine at any particular time on any given day to avoid excessive shadow flicker occurrences at properties which are not naturally screened or cannot be screened with measures outlined above. Where such wind turbine control measures are to be utilised, they need only be implemented when the specific combined circumstances occur that are necessary to give rise to the shadow flicker effect in the first instance. Therefore, if the sun is not shining on a particular day that shadow flicker was predicted to occur at a nearby property, there would be no need to shut down the relevant turbines that would have given rise to the shadow flicker at the property. Similarly, if the wind speed was below the cut-in speed that caused the turbine rotor to rotate and give rise to a shadow flicker effect at a nearby property, there would be no need to shut down the relevant turbines that otherwise would have caused shadow flicker.

The atmospheric variables that determine whether shadow flicker will occur or not, are continuously monitored at the Proposed Wind Farm and the data fed into the wind farm's SCADA control system. The strength of direct sunlight is measured by way of photocells, and if the sunlight is of sufficient strength to cast a shadow, the shadow flicker control mechanisms come into effect. Wind speed and direction are measured by anemometers and wind vanes on each turbine and on the wind farm's met mast, and similarly, and if wind speed and direction is such that a shadow will be cast, the shadow flicker control mechanisms come into effect. The moving blades of the turbine will require a short period of time to cease rotating and as such there may be a very short period (less than 3 to 5 minutes) during which the blades are slowed to a complete halt. The turbines giving rise to shadow flicker may be turned off on different days to prevent excessive wear and tear on any single turbine.

In order to ensure that the model and SCADA system is accurate and working well a site visit will be carried out to verify the system. The shadow flicker prediction data will be used to select dates on which a shadow flicker event could be observed at one or multiple affected properties and the following process will be adhered to.

1. *Recording the weather conditions at the time of the site visit, including wind speeds and direction (i.e. blue sky, intermittent clouds, overcast, moderate breeze, light breeze, still etc.).*
2. *Recording the house number, time and duration of site visit and the observation point GPS coordinates.*
3. *Recording the nature of the sensitive receptor, its orientation, windows, landscaping in the vicinity, any elements of the built environment in the vicinity, vegetation.*
4. *In the event of shadow flicker being noted as occurring the details of the duration (times) of the occurrence will be recorded.*
5. *The data will then be sent to the wind farm operational team to confirm that the model and SCADA system are working.*

6. *Following 12 months of full operation of the Proposed Project a report can be prepared for the Local Authority describing the shadow flicker mitigation measures used at the wind farm and confirming the implementation and successful operation of the system.*

This method of shadow flicker mitigation has been technically well-proven at wind farms in Ireland and also in areas outside Ireland that experience significantly longer periods of direct sunlight.

In order to demonstrate how the SCADA control system can be applied to switch off particular turbines at the relevant times and dates, Table 5-11 below lists the 31 properties at which a shadow flicker mitigation strategy may be necessary to ensure the Guidelines (DoEHLG 2006) 30-minute per day shadow flicker threshold is not exceeded. In this case, the relevant turbine(s) would be programmed to switch off for the time required to reduce daily shadow flicker to below the guideline limit of 30 minutes. The SCADA control system would be utilised to control shadow flicker in the absence of being able to agree alternative mitigation measures with the relevant property owner. The mitigation strategy outlined in Table 5-11 below is based on the theoretical precautionary scenario. The details presented in Table 5-11 list the days per year and the turbines that could be programmed to switch off at specific times, in order to reduce daily shadow flicker to a maximum of 28 minutes, which is below the guideline limit of 30 minutes.

Table 5-111 Shadow Flicker Mitigation Strategy for Daily Shadow Flicker Exceedance - Turbine Numbers and Dates

Property No.	No. of Days 30min/day Threshold is Exceeded	Turbine(s) Producing Shadow Flicker Exceedance	Days of Year When Mitigation May be Required (Day No's)*	Days of Year When Mitigation May be Required (Dates)*	Post-mitigation Maximum Daily Shadow Flicker (hrs:mins:sec)
H001	92	T12, T13	1-39,308-353, 359-365	1st of January- 8th of February, 04th of November-19th of December, 25th of December-31st of December	00:28:00
H002	62	T03	74,143-203	15th of March 23rd 0f May -22nd of July	00:28:00
H003	51	T03, T02	80-97, 118-123,223-230, 248-266	21st of March-7th of April, 28th of April-3rd of May, 8th of August - 18th of August, 5th of September -23rd of September	00:28:00
H004	69	T04, T05	1-24, 322-365	1st of January -24th of January, 18th of November - 31st of December	00:28:00
H005	82	T11, T12, T13	1-31,315-365	1st of January -31st of January, 11th of November -31st of December	00:28:00
H006	31	T05	2-4,9-10,340-365	2nd of January-4th of January, 9th of January - 10th of January, 6th of December - 31st of December	00:28:00
H007	90	T04, T05	1-35, 311-365	1st of January -4th of February, 7th of November - 31st of December	00:28:00
H008	18	T06	164-181	13th of June -30th of June	00:28:00
H009	87	T11, T12, T13	1-33, 313- 365	1st of January - 2nd of February, 9th of November - 31st of December	00:28:00
H010	81	T11, T12, T13	1-31, 316-365	1st of January -31st of January, 12th of November -31st of December	00:28:00
H011	77	T07	1-28,318-365	1st of January -28th of January, 14th of November -31st of December	00:28:00
H012	111	T08, T09, T10, T11, T12,	1-35, 53-59,287-299,311-365	1st of January -4th of February, 22nd of February- 28th of February, 15th of October- 21st of October, 07th of November -31st of December	00:28:00

Property No.	No. of Days 30min/day Threshold is Exceeded	Turbine(s) Producing Shadow Flicker Exceedance	Days of Year When Mitigation May be Required (Day No's)*	Days of Year When Mitigation May be Required (Dates)*	Post-mitigation Maximum Daily Shadow Flicker (hrs:mins:sec)
H013	101	T08, T09, T10	1-41, 306-365	1st of January - 10th of February, 2nd of November - 31st of December	00:28:00
H015	91	T11, T12, T13	1-36, 311-365	1st of January - 5th of February, 7th of November - 31st of December	00:28:00
H016	16	T07	37-51,295-310	6th of February - 20th of February, 22nd of October -6th of November	00:28:00
H017	50	T12, T13	12-36, 310-334	12 of January -5th of February, 6th of November - 30th of November	00:28:00
H018	44	T01, T02	1-12, 334-365	1st of January -12th of January, 30th of November -31st of December	00:28:00
H019	87	T08, T09, T10, T11	1-34, 313-365	1st of January - 3rd of February, 9th of November - 31st of December	00:28:00
H020	70	T11, T12, T13	1-25, 321-365	1st of January -25th of January, 17th of November -31st of December	00:28:00
H022	30	T01	23-36, 311-323	23rd of January -5th of February, 7th of November -19th of November	00:28:00
H023	68	T12, T13	1-24, 322-365	1st of January -24th of January, 18th of November - 31st of December	00:28:00
H027	8	T02	43-45,300-304	12th of February -14th of February, 27th of October -31st of October	00:28:00
H030	6	T02	33-35, 311-313	2nd of February -5th of February, 7th of November, 9th of November	00:28:00
H031	74	T08, T09, T10, T11	1-27, 319-365	1st of January -27th of January, 15th of November - 31st of December	00:28:00
H033	62	T12, T13	1-8,13-26,321-335,341-365	1st of January -8th of January, 13th of January -26th of January, 17th of November -1st of December, 07th of December -31st of December	00:28:00

Property No.	No. of Days 30min/day Threshold is Exceeded	Turbine(s) Producing Shadow Flicker Exceedance	Days of Year When Mitigation May be Required (Day No's)*	Days of Year When Mitigation May be Required (Dates)*	Post-mitigation Maximum Daily Shadow Flicker (hrs:mins:sec)
H034	47	T01	1-14, 333-365	1st of January -14th of January, 29th of November - 31st of December	00:28:00
H035	37	T01	154-191	3rd of June - 10th of July	00:28:00
H036	20	T07	30-39,307-316	30th of January -8th of February, 3rd of November -12th of November	00:28:00
H045	4	T07	56, 290-292	25th of February, 17th of October- 19th of October	00:28:00
H048	35	T07	1-9,340-365	1st of January -9th of January, 6th of December - 31st of December	00:28:00
H049	20	T07	8-17, 329,331-339	8th of January -17th of January,25th of November, 27th of November - 31st of December	00:28:00
H050	32	T07	1-6,340-365	1st of January -6th of January, 6th of December - 31st of December	00:28:00
H055	3	T12, T13	3-4, 344	3rd of January -4th of January, 10th of December	00:28:00

Where a shadow flicker mitigation strategy is to be implemented, it is likely that the control mechanisms would only have to be applied to a turbine to bring the duration of shadow flicker down to the 28-minute post-mitigation shadow flicker target.

Table 5-12 below displays the 8 no. third-party sensitive receptors which are predicted to receive in excess of the Annual Shadow Flicker Limit of 30 hours per year.

Table 5-122 Shadow Flicker Mitigation Strategy for Annual Shadow Flicker Exceedance

Property No.	Max. Annual Shadow Flicker Adjusted for Regional Sunshine (hrs:min:sec)	Turbine(s) Producing Shadow Flicker Exceedance	Post-mitigation Maximum Daily Shadow Flicker (hrs:mins:sec)
H001	30:44:50	T12, T13	≤30:00:00
H005	37:13:39	T11, T12, T13	≤30:00:00
H009	34:38:39	T11, T12, T13	≤30:00:00
H010	34:00:35	T11, T12, T13	≤30:00:00
H012	59:01:42	T07, T08, T09, T10, T11, T12, T13	≤30:00:00
H013	47:41:37	T08, T09, T10, T11	≤30:00:00
H019	38:38:29	T08, T09, T10, T11	≤30:00:00
H031	32:58:47	T08, T09, T10, T11	≤30:00:00

Overall, the details presented in Table 5-12 demonstrate that using the turbine control system, it will be possible to reduce the level of shadow flicker at any affected property to below the daily guideline limit of 30 minutes, by programming the relevant turbines to switch off at the required dates and times.

Notwithstanding this, the approach set out above should shadow flicker associated with the Proposed Wind Farm be perceived to cause nuisance at any home, the affected homeowner is invited to engage with the Wind Farm operator. Should a complaint or query in relation to shadow flicker be received within 12 months of commissioning of the Proposed Wind Farm, field investigation/monitoring will be carried out by the wind farm operator at the affected property. The homeowner will be asked to log the date, time and duration of shadow flicker events occurring on at least five different days. The provided log will be compared with the predicted occurrence of shadow flicker at the residence, and if necessary, a field investigation will be carried out. Likewise, the Proposed Project can be brought in line with the requirements of the Draft Guidelines (DoHPLG, 2019) should they be adopted during the planning application process for this development.

Residual Effect

Following the implementation of the above suite of mitigation measures, the Guidelines' (DoEHLG 2006) limit of 30 mins per day or 30 hours per year will not be exceeded and this will result in a long-term, imperceptible negative residual effect from shadow flicker on human health.

Significance of Effects

Based on the assessment above and the mitigation measures proposed the effects related to shadow flicker will be Not Significant.

5.4.3.3 Interference with Communications Systems and EMF

Wind turbines, like all large structures, have the potential to interfere with broadcast signals, by acting as a physical barrier or causing a degree of scattering to microwave links. The alternating current, electrical generating and transformer equipment associated with wind turbines, like all electrical equipment, also generates its own electromagnetic fields, and this can interfere with broadcast communications.

EMF is often colloquially considered to have a negative effect on human health. However, as stated in Section 5.3.4 above, the EMF and ELF of electricity cables are in compliance with EU guidelines for the exposure of EMF to humans. As such, there is no potential for negative health effects on the local population due to EMF or ELF produced by any of the proposed infrastructure.

The most significant effect at a domestic level relates to a possible flicker effect caused by the moving rotor, affecting, for example, radio signals. The most significant potential effect occurs where the wind farm is directly in line with the transmitter radio path. This interference can be overcome by the installation of deflectors or repeaters.

Potential impacts on broadcast signals are discussed in detail in Ch. 15: Material Assets. The Proposed Project will have no residual effect on the telecommunications signals of any operator, due to distance from or absence of any links in the area.

5.4.4 Decommissioning Phase

The wind turbines proposed as part of the Proposed Project are expected to have a lifespan of 35 years. Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to planning permission being obtained, or the site of the Proposed Wind Farm may be decommissioned fully. The proposed 110kV onsite substation and the Proposed Grid Connection will remain in place as it will form part of the national electricity grid under the control of ESB / EirGrid.

The works required during the decommissioning phase are described in Section 4.12 in Ch. 4: Description of the Proposed Project. Any effect and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent, and the mitigation measures outlined above will be implemented during the decommissioning phase also. A Decommissioning Plan has been prepared as part of this EIAR and is included as Appendix 4-6. This Decommissioning Plan follows the most up to date Scottish Natural Heritage (SNH) guidance. An updated decommissioning plan will be agreed with the local authorities three months prior to decommissioning the Proposed Project. The principles that will inform the final decommissioning plan are contained in the Construction and Environmental Management Plan (CEMP) in Appendix 4-3.

5.4.5 Cumulative and In-Combination Effects

For the assessment of cumulative effects, any other existing, permitted or Proposed Projects (wind energy or otherwise) have been considered. The potential cumulative effects of the Proposed Wind Farm and the Proposed Grid Connection (together forming the Proposed Project) and other relevant developments has been carried out with the purpose of identifying what influence the Proposed Project will have on the surrounding environment when considered cumulatively. Further information on projects considered as part of the cumulative assessment are given in Ch. 2: Background to the Proposed Project. The impacts with the potential to have cumulative impacts on population and human

health, in particular noise, air quality, climate, shadow flicker, traffic, telecommunications, and visual impacts are addressed in their relevant chapters of this EIAR.

5.4.5.1 Employment and Economic Activity

Cumulative projects within 25km of the Proposed Project that may be proposed, permitted or operational/existing contribute to short term employment during the construction stages and provide the potential for long-term employment resulting from maintenance operations. This results in a long-term slight positive effect.

5.4.5.2 Tourism and Amenity

Following EIAR assessments, it is not considered that the Proposed Project, together with other projects in the area, will cumulatively affect any tourism infrastructure in the wider area. Wind farms are an existing feature in the surrounding landscape, which will assist in the assimilation of the Proposed Project into this environment.

It is on this basis that it can be concluded that there would be a long-term slight cumulative effect from the Proposed Project and other wind farm developments in the area and is not significant.

5.4.5.3 Traffic

Construction of the Proposed Project at the same time as cumulative projects located in the surrounding area has the potential to give rise to cumulative impacts on traffic. In particular, the proposed Gortloughra Wind Farm, located approx. 2km from the Site. If construction occurs at the same time as the construction of the Proposed Project, there is potential for cumulative effects on traffic. There is the potential for short-term slight effects to arise as a result of the combination of the construction of the Proposed Project along with nearby cumulative permitted and proposed developments. However, the mitigation measures in relation to traffic set out in Section 5.4.2.2.5 above will ensure that any cumulative effects that arise will be short term in duration and imperceptible in significance and not significant.

5.4.5.4 Air (Dust)

The nature of the Proposed Project is such that, once operational, it will have a long-term, moderate, positive effect on the air quality.

During the construction phase of the Proposed Project and the construction phase of other developments within 25km of the wind farm site that are yet to be constructed, there will be minor emissions from construction plant and machinery and potential dust emissions associated with the construction activities. However, once the mitigation proposals, as outlined in Section 10.3.2.1 to Section 10.3.2.4 of Ch.10: Air Quality are implemented during the construction phase of the Proposed Project, there will be no significant cumulative negative effect on air quality.

The nature of the Proposed Project and other wind energy developments within 25 kms are such that, once operational, they will have a cumulative long-term, moderate, positive effect on the air quality and climate.

5.4.5.5 Health and Safety

The Proposed Project will have no effects in terms of health and safety. There is no credible scientific evidence to link wind turbines with adverse health effects. All other existing, permitted or Proposed Projects (wind energy or otherwise) would be expected to follow all relevant Health and Safety Legislation during the construction, operation and decommissioning phases of the development. It is

presumed also that all mitigation measures in relation to the other cumulative projects will also be implemented.

It is on this basis that it can be concluded that there would be a long-term imperceptible cumulative effect from the Proposed Project and other developments in the area.

5.4.5.6 Property Values

As noted in Section 5.4.2.1.4 above, it can be concluded that there is the potential for a short-term negative not significant effect on property values within 1km of the proposed turbines of the Proposed Wind Farm site. There are no other cumulative turbines located within 2km of the proposed turbines and so this area within 1km, where there is potential for impacts on property values, will not overlap with any other cumulative turbines. On that basis it is concluded that there is no potential for cumulative effects on property values to arise.

5.4.5.7 Services

The rate payments from the Proposed Project and other projects in the area will contribute significant funds to Cork County Council, which will be redirected to the provision of public services within the County.

In addition, the injection of money into local services though the establishment of community benefit funds is also expected to be a long-term positive cumulative effect.

5.4.5.8 Shadow Flicker

As outlined above, no dwellings may be impacted by shadow flicker from the Proposed Project in combination with other existing, permitted, or proposed wind farms.

5.4.5.9 Residential Amenity

Pre-Mitigation Effects

In the extremely unlikely event that all permitted and Proposed Projects as described in the cumulative assessment in Ch. 2: Background to the Proposed Project are constructed at the same time, there is the potential for a resulting short term, moderate, cumulative, negative effects to occur on residential amenity, in relation to noise and vibration, dust, traffic, telecommunications and visual amenity.

During the operational phase of the Proposed Project, all constructed developments as described in the cumulative assessment in Ch. 2: Background to the Proposed Project will have a cumulative long term, negative affect on residential amenity (noise, shadow flicker and visual amenity) and a moderate significance.

Proposed Mitigation Measures

There are no turbines proposed as part of the Proposed Project that will be located within 676 metres of any non-involved sensitive receptors (4 times tip height set back distance set out in the Draft Guidelines (DoHPLG, 2019)). All mitigation as outlined under noise and vibration, dust, traffic, visual amenity and telecommunications in this EIAR will be implemented in order to reduce insofar as possible effects on residential amenity at properties located in the vicinity of the Proposed Project, including along the proposed turbine and construction materials haul route.

During the operational phase, all mitigation as outlined under noise, traffic, shadow flicker and visual amenity in this EIAR will be implemented in order to reduce insofar as possible effects on residential amenity at properties located in the vicinity of the Proposed Project.

It is presumed also that all mitigation measures in relation to the other cumulative projects will also be implemented.

Residual Effects

The Proposed Project will have a short-term, slight negative residual effect on residential amenity during construction works. During the operational phase, noise and shadow flicker from the proposed and permitted projects will be limited to below Guideline (DoEHLG, 2006) levels, resulting in a long-term, slight, negative residual impact on residential amenity.

Significance of Effects

Based on the assessment above and the mitigation measures proposed, the cumulative effects will be Not Significant during the construction and operational phases of the Proposed Project.

5.5 Summary

Following consideration of the residual effects (post-mitigation) it is noted that the Proposed Project will not result in any significant effects on human beings in the area surrounding the Proposed Project. Following appropriate mitigation, the Guidelines' (DoEHLG 2006) shadow flicker limits will not be exceeded at any property. It is noted that the Proposed Project can be brought in line with the requirements of the Draft Guidelines (DoHPLG, 2019), should they be adopted while this application is in the planning system, through the implementation alteration of the mitigation measures outlined.

Provided that the Proposed Project is constructed, operated and decommissioned in accordance with the design, best practice and mitigation that is described within this EIAR, significant effects on population and human health employment and economic activity, land-use, residential amenity, community facilities and services, tourism, property values and health and safety are not anticipated at international, national or county scale.

5.1 EIA Classification Summary

Please see the below table for a summary of all identified impacts for the Proposed Project relating to population and human health. Where the effect differs between the Proposed Grid Connection and the Proposed Wind Farm the greater effect is noted below

Table 5-13 Impact Assessment Classification Summary

Topic	Pre-Mitigation Effect	Mitigation Section Reference	Residual Effect	Significance
Construction Phase				
Population Levels	No identified impacts	Section 5.4.2.1.1 – No mitigation required	No identified impacts	Not Significant
Employment and Investment	Short-term, Moderate, Positive	Section 5.4.2.1.2- No mitigation required	Short-term, Moderate, Positive	Not Significant

Land Use Patterns & Activities	Short-Term, Slight, Negative	Section 5.4.2.1.3 – No mitigation required	Short-Term, Slight, Negative	Not Significant
Property Values	Short-Term, Slight, Negative	Section 5.4.2.1.4	Short-Term, Imperceptible, Negative	Not Significant
Tourism	Short-Term, Imperceptible, Negative	Section 5.4.2.1.5- No Mitigation required-	Short-Term, Imperceptible, Negative	Not Significant
Residential Amenity	Short-Term, Moderate, Negative	Section 5.4.2.1.6	Short-Term, Slight, Negative	Not Significant
Health & Safety	Short-term, Significant, Negative	Section 5.4.2.2.1	Short-Term, Slight, Negative	Not Significant
Air Quality: Dust and Exhaust Emissions	Short-Term, Slight, Negative	Section 5.4.2.2.2	Short-Term, Slight, Negative	Not Significant
Water Quality	Short-Term, Moderate, Negative	Section 5.4.2.2.4	Short-Term, Imperceptible, Negative	Not Significant
Noise and Vibration	Short-Term, Not Significant, Negative	Section 5.4.2.2.5	Short-Term, Not Significant, Negative	Not Significant
Traffic and Transport	Short-Term, Slight - Moderate, Negative	Section 5.4.2.2.6	Short-Term, Slight-Moderate, Negative	Not Significant
Major Accidents and Natural Disasters	Temporary, Moderate, Negative	Section 5.4.2.2.7	Temporary, Slight, Negative	Not Significant
Shadow Flicker	N/A	N/A	N/A	N/A
Interference with Telecommunication Systems and EMF	N/A	N/A	N/A	N/A
Operational Phase				
Population Levels	No identified impacts	Section 5.4.3.1.1 – No mitigation required	No identified impacts	Not Significant
Employment and Investment	Long-Term, Slight, Positive	Section 5.4.3.1.2 – No mitigation required	Long-Term, Slight, Positive	Not Significant

Land Use Patterns and Activities	Permanent, Slight, Negative	Section 5.4.3.1.3 – No mitigation required	Permanent, Not Significant, Negative	Not Significant
Property Values	Long-Term, Slight, Negative	Section 5.4.3.1.4	Long-Term, Not Significant Negative	Not Significant
Tourism	Long-Term, Imperceptible, Negative	Section 5.4.3.1.5	Long-Term, Imperceptible, Negative	Not Significant
Residential Amenity	Long- Term, Moderate, Negative	Section 5.4.3.1.6	Long-Term, Slight, Negative	Not Significant
Health and Safety	Long-term, Slight, Negative	Section 5.4.3.2.1	Long-Term, Imperceptible, Negative	Not Significant
Noise and Vibration	Long-Term, Not Significant, Negative	Section 5.4.3.2.5	Long-Term, Not Significant, Negative	Not Significant
Air Quality; Dust and Exhaust Emissions	Long-Term, Moderate, Positive	Section 5.4.3.2.2-	Long-Term, Moderate, Positive	Not Significant
Water Quality	Temporary, Slight, Negative	Section 5.4.3.2.4	Temporary, Imperceptible, Negative	Not Significant
Traffic and Transport	Long-Term, Imperceptible, Negative	Section 5.4.3.2.5 – No mitigation required	Long-Term, Imperceptible, Negative	Not Significant
Major Accidents and Natural Disasters	Temporary, Moderate, Negative	Section 5.4.3.2.6	Temporary, Slight, Negative	Not Significant
Shadow Flicker	Long-Term, Slight, Negative	Section 5.4.3.2.7	Long-Term, Imperceptible, Negative	Not Significant
Interference with Communication Systems and EMF	No identified impacts	Section 5.4.3.3	No identified impacts	Not Significant
Decommissioning Phase				
Population and Human Health	Any impact and consequential effect that occurs during the	Section 5.4.4	N/A	N/A

	decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration, and the mitigation measures outlined in Section 5.8.2 will be implemented during the decommissioning phase also			