# 5. POPULATION AND HUMAN HEALTH

## 5.1 INTRODUCTION

This chapter examines the existing environment and addresses the potential impacts on Population and Human Health arising from the proposed project. Population and Human Health are addressed under separate headings throughout this chapter.

Full details of the proposed project are outlined in Chapter 2 (Description of the Proposed Project).

The assessment on population and human health primarily considers the proposed wind farm site and the surrounding area. The assessment considered property receptors and residential amenity, as well as current land use and activities, occurring within and in the vicinity of the proposed wind farm site, as this is where any likely effects on population and human health receptors will mainly to occur. The range of turbine parameters, as presented in Table 2-2 of Chapter 2, is accounted for in this assessment as the worse-case in terms of distance to receptors (i.e., the shortest distance). Each supporting assessment which feeds into the human health aspect of this chapter, namely Chapter 8 (Land, Soils and Geology), Chapter 9 (Hydrology and Hydrogeology), Chapter 10 (Shadow Flicker), Chapter 11 (Material Assets), Chapter 12 (Noise and Vibration), Chapter 13 (Landscape and Visual Impact Assessment), Chapter 14 (Air Quality and Climate), Chapter 16 (Traffic and Transport), and Chapter 17 (Major Accidents and Natural Disasters), already accounts for the range of turbine parameters. The works required along the GCO One (this GCO is partly external to the proposed wind farm and utilises the local road network, GCO Two lies within the proposed wind farm site) and the proposed turbine delivery route (TDR) works areas during the construction phase are also considered where any effects are likely to occur. The assessment also considers local population trends, employment and economic data, tourism data, and visitor attractions surrounding the proposed project (i.e., relevant local, county, regional and national level statistics/data where available).

In terms of human health, the assessment also considers available Irish health statistics and surveys, as well as a literature review of research carried out on the potential effects of wind farm developments on human health.

In order to establish a baseline and understanding of population and human health status of the local area of the proposed project, where available, data has been gathered at a local, county, regional and national level where available, and local property receptors have been identified within a 2 kilometer (km) radius of the proposed wind farm site; this distance is typical best practice when undertaking population and human health environmental impact assessment (EIA). In terms of census data, a period of 11 years has been reviewed, i.e., 2011 to 2022, to review local, regional and national change.

The potential effects of the proposed project on other environmental factors which may also have an impact on human beings, as set out in Chapter 8 (Land, Soils and Geology), Chapter 9 (Hydrology and Hydrogeology), Chapter 10 (Shadow Flicker), Chapter 11 (Material Assets), Chapter 12 (Noise and Vibration), Chapter 13 (Landscape and Visual Impact Assessment), Chapter 14 (Air Quality and Climate), Chapter 16 (Traffic and Transport), and Chapter 17 (Major Accidents and Natural Disasters) are addressed in this chapter and discussed in more detail in their respective chapters of this EIAR.

A separate section setting out the likely interactions between this assessment and other technical assessments is presented in Chapter 18 (Interaction of the Foregoing) of this EIAR.

This assessment has been carried out in accordance with the following guidelines:

- Department of Housing, Planning and Local Government (DoHPLG), *Guidelines for Planning Authorities and An Bord Pleanála* [now An Coimisiún Pleanala] *on carrying out Environmental Impact Assessment* (2018);
- Environmental Protection Agency (EPA), *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* (2022) (hereafter referred to as the 'EPA EIAR Guidelines (2022)');
- European Commission (EC), *Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report* (2017);
- Department of the Environment, Heritage and Local Government (DoHPLG) *Wind Energy Development Guidelines* (WEDGs) (2006) (hereafter referred to as the 2006 WEDGs); and
- DoHPLG, *Draft Revised Wind Energy Development Guidelines* (WEDGs) (2019) (hereafter referred to as the 'Draft Revised 2019 WEDGs').

### 5.1.1 Statement of Authority

This chapter was prepared by Serena Byrne of TOBIN. Serena Byrne is a Project Manager at TOBIN, with over 12 years' multidisciplinary experience in engineering and environmental consulting. She has recently completed a MSc in Environmental Sustainability in University College Dublin, including EIA modules. She has a number of years' experience preparing EIAR chapters, including for population and human health, on renewable energy projects.

This chapter has been reviewed by Orla Fitzpatrick, Technical Director in TOBIN. Orla has over 20 years' experience working in the delivery of EIA projects in environmental consultancy. She holds a BSc in Geophysics and MSc in Environmental Consultancy, and is a Chartered Environmentalist. She has considerable experience as technical approver of environmental deliverables for major infrastructure projects.

### 5.1.2 Legislation, Policy and Guidance

The following key information sources and guidance have been used in the completion of this chapter:

- Central Statistics Office (CSO) –2011-2022 Census and associated data;
- CSO Health Survey Data;
- HSE Health Surveys;
- Department of Health (Government of Ireland), Health in Ireland: Key Trends 2023 Surveys (February 2024);
- Discover Ireland Website;
- Discover Ireland Irelands Ancient East material;
- Southern Regional Assembly, *Regional Spatial and Economic Strategy (RSES)*;
- EPA Geoportal Site Data and Maps;
- Fáilte Ireland website;
- Fáilte Ireland, *EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects* (as provided by Fáilte Ireland);
- Fáilte Ireland website information regarding the Ireland's Ancient East;

- Health Ireland (Government of Ireland) Surveys;
- Health Service Executive (HSE) Website;
- Institute of Public Health Ireland, *Health Impact Assessment* (2009);
- Institute of Environmental Management and Assessment (IEMA), *Health in Environmental Impact Assessment - A Primer for a Proportionate Approach* (2017);
- IEMA Guide - Effective Scoping of Human Health in Environmental Impact Assessment (2022);
- IEMA Guide - Determining Significance for Human Health in Environmental Impact Assessment (2022);
- Kilkenny County Council, Kilkenny City and County Development Plan (KCCDP) 2021-2027;
- Ordnance Survey Ireland (OSI) – Mapping and aerial photography;
- US Environmental Protection Agency, *Health Impact Assessment Resource and Tool Compilation* (September 2016);
- Sports Ireland Walking trails information;
- World Health Organisation (WHO), *Environmental Noise Guidelines for the European Region* (2018);
- WHO, *Night-time Noise Guidelines for Europe* (2009); and
- WHO, *Global Air Quality Guidelines* (2021).

The effects of the proposed project on the population and human health are assessed in accordance with the EIA Directive (2014/52/EU) and the EPA EIAR Guidelines (2022) as outlined in Chapter 1 (Introduction) of this EIAR, and described in the following sections. The EPA EIAR Guidelines (2022) are primarily intended to be an authoritative reference to those preparing EIARs for projects covered under the EIA Directive (2014/52/EU). The Guidelines are a statutory document that should be regarded by those preparing EIARs and the decision makers considering the EIARs (EPA, 2022). Regard has been given to other guidance and key information sources in relation to the assessment, however, as a statutory document, the EPA EIAR Guidelines (2022) are considered the most relevant and suitable for EIA in the Irish context.

#### *5.1.2.1 EIA Directive (2014/52/EU)*

The EIA Directive (2014/52/EU) directs that population and human health factors be assessed in an EIAR. The EIA Directive does not define the term 'human health', however the 2017 EC Guidance on the preparation of the EIAR states that -

*"human health is a very broad factor that would be highly project dependent. 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".*

#### *5.1.2.2 EPA EIAR Guidelines (2022)*

The EPA EIAR Guidelines (2022) set out the following headings and/or topics, generally identified during the scoping process, relevant to population and human health:

- *Employment;*
- *Settlement patterns;*
- *Land use patterns;*
- *Baseline population;*
- *Demographic trends;*
- *Human health (considered with reference to other headings, such as water and air); and*
- *Amenity (e.g. effects on amenity uses of a site or of other areas in the vicinity may be addressed under the factor of Landscape).*

In relation to human health, the EPA EIAR Guidelines (2022) state 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 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)'".* Paragraph (f) of Annex I of the SEA Directive lists the environmental factors including soils, water, landscape, air etc. The EPA EIAR Guidelines (2022) also state that the above health assessment approach is - *"consistent with the approach set out in the 2002 EPA EIS Guidelines where health was considered through assessment of the environmental pathways through which it could be affected, such as air, water or soil".*

The EPA EIAR Guidelines (2022) note that the EPA EIS Guidelines (2002) state the following in relation to environmental pathways through which human health could be affected – *"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".*

The EPA EIAR Guidelines (2022) also note that in an EIAR *"the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil, etc."* and that *"assessment of other health & safety issues are carried out under other EU Directives, as relevant. These may include reports prepared under the Integrated Pollution Prevention and Control, Industrial Emissions, Waste Framework, Landfill, Strategic Environmental Assessment, Seveso III, Floods or Nuclear Safety Directives. In keeping with the requirement of the amended Directive, an EIAR should take account of the results of such assessments without duplicating them".*

The classification and description of effects in this EIAR chapter follows the terms provided in Table 3-4 of the EPA EIAR Guidelines (2022) and are set out in Table 5.1 for reference.

#### *5.1.2.3 IEMA Discussion Document (2017)*

IEMA issued a discussion document in 2017 titled *"Health in Environmental Impact Assessment"*, which it describes as a primer for discussion on the proportionate assessment of the impacts on health within the EIA process and suggests what should be assessed in this context. The IEMA Primer notes with reference to 'proportionate' that *"the scoping of population and human health issues into EIA should focus on whether the potential impacts are likely to be significant. Where they are found likely to be significant, effort should focus on identifying and gaining commitment to avoiding or reducing any adverse effects and to enhancing beneficial effects".*

The discussion document notes that Health Impact Assessment (HIA) and EIA are separate processes and that while a HIA can inform EIA practice in relation to human health, a HIA alone will not necessarily meet the EIA human health requirement. The discussion document also notes that the WHO provides an overview of health in different types of impact assessment and presents the WHO perspective on the relationship of HIA to other types of impact assessment as follows:

*"The health sector, by crafting and promoting HIA, can be regarded as contributing to fragmentation among impact assessments. Given the value of impact assessments from a societal perspective, this is a risk not to be taken lightly...The need…and justification for separate HIA cannot automatically be derived from the universally accepted significance of health; rather, it should be demonstrated whether and how HIA offers a comparative advantage in terms of societal benefits…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."* (IEMA, 2007).

This indicates that the WHO does not support a stand-alone HIA unless it could be demonstrated to be of advantage over an EIAR. Furthermore, HIA is not routinely carried out for major infrastructure schemes in Ireland. It is for these reasons that this health assessment is part of the EIAR and there is no stand-alone HIA.

One of the messages in the IEMA document in terms of assessing health in EIA, is that there should be a greater emphasis on health outcomes (i.e., the potential effects on human health), rather than simply the health determinants (i.e., the agents or emissions which could have the potential to have health effects). The IEMA document noted that in EIA, there has previously been a strong focus on just the agents or emission levels (e.g., dust) rather than focusing on the effects of these agents/emission levels on human health. This change in emphasis does not mean a complete change in practice.

The IEMA document notes that *"public health is defined as the science and art of promoting and protecting health and well-being, preventing ill-health and prolonging life through the organised efforts of society and has three domains of practice: health protection, health improvement and improving services"*. The IEMA document suggests that these three domains should be considered in the assessment of health in EIA. Examples of health protection issues to be considered could include issues such as chemicals, radiation, health hazards, emergency response and infectious diseases whilst health improvement issues could include lifestyles, inequalities, housing, community, and employment. Examples of improving service issues could include service planning, equity, and efficiencies.

The WHO defined health, in its broader sense, in its 1948 constitution as *"a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity"*. Therefore, whilst the EPA EIAR Guidance (2022) is useful in terms of health protection, for a more holistic assessment, as per the IEMA document, it is also worthwhile to look at broader health effects in terms of opportunities for improvement of health and for improvement of access to services. While it is important to do this, it is also important not to attribute every conceivable event as being a health effect. To further rely on the WHO definition, a health effect would be something

that would have a material impact on somebody's physical, mental and social well-being, be that positive or negative.

The IEMA 2017 discussion document is a useful document when considering what can and should be assessed in the context of EIA. Regard has been given to the general approach put forward in this discussion document when preparing this chapter.

#### *5.1.2.4 IEMA Guidance 2022*

*IEMA Guide on Effective Scoping of Human Health in Environmental Impact Assessment (2022)*

In November 2022, IEMA published a guide to the 'Effective Scoping of Human Health in Environmental Impact Assessment' for use by EIA practitioners. The guide covers the consideration of health as a topic in EIA. The guide states *'"legislation for EIA has left the definition of "human health" to competent experts. This guidance updates and provides further detail on the position from the 2017 IEMA Primer on health in EIA".*

The guide is focused on the scoping phase of the EIA process – including input to Scoping Reports and responses within Scoping Opinions. Its aim is to enable those responsible for commissioning, conducting or reviewing an EIA to determine the scope of the human health chapter in EIA. The relationship with standalone HIA is clarified. Where an EIA is undertaken and there is also a requirement for HIA, projects should normally meet the HIA requirement through the EIAR health chapter. Regard has been given to the general approach put forward in this IEMA guidance when preparing this chapter.

*IEMA Guide on Determining Significance for Human Health in Environmental Impact Assessment (2022)*

In November 2022, IEMA published a guide to the 'Determining Significance for Human Health in Environmental Impact Assessment'. The aim of the guide is to enable those responsible for commissioning, conducting or reviewing an EIA to determine significance in terms of human health in EIA. The guide focuses on and discusses what 'significance' means for 'human health' in terms of EIA. The guide was produced in order to inform current practice and in anticipation of potential changes to the way that EIA is undertaken. Regard has been given to the general approach put forward in this IEMA guidance when preparing this chapter.

#### *5.1.2.5 HSE Position Paper on Wind Turbines and Public Health (2017)*

The Public Health Medicine, Environment and Health Group of the HSE were tasked with investigating the potential public health issues involved with wind farm development, given the increase in wind farm development in Ireland in recent years. The issues often cited in terms of health impacts are considered, including noise, shadow flicker and electromagnetic frequency.

The paper has reviewed the scientific basis for reports on negative heath impact resulting from wind farms. Its findings conclude that the evidence is weak, where present, and in many cases, is lacking. The paper states that *"Published scientific evidence is inconsistent and does not support adverse effects of wind turbines on health" and that "adequate setback distances and meaningful engagement with local communities are recommended in order to address public concern".*

In respect of the proposed wind farm site, there is a minimum setback distance of 720 m (i.e., four times the tip height) from the proposed turbine locations to sensitive receptors which is in excess of the minimum setback requirements in the 2006 WEDGs and in compliance with the Draft Revised WEDGs (2019).

The position paper states that *"Further research is required to investigate the effects of wind farms on public health. Large-scale prospective cohort studies would be most informative for identifying potential health effects of exposure to wind turbine noise; further cross-sectional studies are unlikely to contribute meaningfully to the current limited evidence base"*.

The paper recommends the use of relevant national planning guidelines (which would include the 2006 WEDGs) in order to determine applicable limits for noise, shadow flicker and setback distances from sensitive properties.

Therefore, health protection and health improvement are considered in this chapter. The methodology for assessing health protection is considered further herein.

### 5.1.3 Health Protection

The assessment of human health for the proposed project, in terms of health protection, follows the approach set out in the EPA EIAR Guidelines (2022) and in the EC's (2017) Guidance on the preparation of the EIAR. Human health protection is considered through the assessment of the environmental factors (pathways) through which health could be affected such as air, noise, water and soils. Potential noise, air, soils and water impacts which could affect human health are identified, the scale of these potential impacts and their duration are assessed, and the significance of the potential impact on human health is determined.

It should be noted that the identification of individual environmental impacts and the associated potential effects and duration are undertaken in other chapters of this EIAR namely, Chapter 8 (Land, Soils and Geology), Chapter 9 (Hydrology and Hydrogeology), Chapter 10 (Shadow Flicker), Chapter 11 (Material Assets), Chapter 12 (Noise and Vibration), Chapter 13 (Landscape and Visual Impact Assessment (LVIA)), Chapter 14 (Air Quality and Climate), Chapter 16 (Traffic and Transport), and Chapter 17 (Major Accidents and Natural Disasters).

The associated significance in terms of the potential impact on human health is then considered in this chapter. In the assessment of cumulative effects, any other existing, permitted or proposed projects in the surrounding area (see Chapter 1 Introduction) have been considered where they have the potential to generate in-combination or cumulative effects with the proposed project. The potential for cumulative effects on the local population and human health is considered herein (see Section 5.7), while elements such as noise, shadow flicker, traffic and visual impacts are discussed in their respective chapters.

## 5.2 METHODS

A desktop study was carried out in order to examine relevant information relating to this population and human health impact assessment, including a review of published information, and site visit reports, to assemble information on the local receiving environment.

Population and human health, in this chapter of the EIAR, is therefore considered in relation to the potential effects arising from the activities primarily associated with the proposed wind farm site and environmental factors impacting the population and human health receptors (hereafter referred to as 'sensitive receptors') within the study area (see Sections 5.2.2 and 5.3.1 for more information on the scope of the assessment and study area). Likely potential effects related to the works required along the GCO One (this GCO is partly external to the proposed wind farm site and utilises the local road network and third party lands, GCO Two lies within the proposed wind farm site) and the proposed TDR works areas during the construction phase are also considered.

### 5.2.1 Consultation

As part of the EIA scoping process, an Environmental Scoping Report was prepared and submitted to relevant statutory and non-statutory bodies in September 2023 for review and comment. The Scoping Report was updated with the latest project details and resubmitted to relevant statutory and non-statutory bodies in October 2024 for review and comment. The Environmental Scoping Report was accompanied by a cover email introducing the proposed project and inviting comments or observations within a period of six weeks from the date of the email. Chapter 1 (Introduction) of this EIAR provides a summary of the consultees and responses received (or not received). A copy of the latest 2024 Scoping Report is provided in Appendix 1-6 of this EIAR.

Responses primarily relevant to the Population and Human Health were received from the HSE and Fáilte Ireland. Both responses can be found in Appendix 1-6 of this EIAR, which compiles the responses received from consultees, which have been considered in the preparation of this chapter and elsewhere in the EIAR.

A summary of Failte Ireland's response is provided in Appendix 1-6. The response included a copy of Fáilte Ireland's *EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects* and these guidelines have been consulted in the completion of this assessment. The Fáilte Ireland Guidelines state that *"the character of an area from a tourism perspective should be described and the principal types of tourism in the area. Where relevant, the specific environmental resources or attributes in the existing environment which each group uses or values should be stated and where relevant, indicate the time, duration or seasonality of any of those activities"*. The Guidelines also note that *"Where possible the value of the contribution of such tourism assets and activities to the local economy should be provided"*. These aspects are described in Sections 5.3 and 5.4 of this chapter.

The HSE provided a HSE National Environmental Health Service (NEHS) Consultation report (see Appendix 1-6), which recommends that the following matters are considered in the EIAR: Public consultation; decommissioning phase of the proposed wind farm; siting and location of turbines; noise and vibration; shadow flicker; air quality; surface and groundwater quality; geological impacts (inc. geotechnical and peat stability assessment); ancillary facilities; and cumulative impacts. The response also noted the EIAR should identify the nearest sensitive receptors and consider the impact of the proposed project on them. Sensitive receptors include

but are not limited to; occupied houses; farms; schools; childcare facilities; medical facilities and nursing homes; sports and community facilities and food premises. The HSE / NEHS welcomes the Applicant's "Community Engagement Strategy" and the appointment of a Community Liaison Officer, and states *"Early and meaningful public consultation with the local community and all stakeholders is of utmost importance to ensure all potentially significant impacts have been adequately addressed. Members of the public should be given sufficient opportunities to express their views on the proposed project"*.

Public engagement was also carried out in the local area as described in Chapter 1 (Introduction) and Appendix 1-7 of this EIAR, and the feedback obtained during this exercise has been reviewed in the preparation of this chapter, and embedded into the iterative design and assessment of the project.

### 5.2.2 Scope of the Assessment

Aspects which the EPA EIAR Guidelines (2022) state should be examined as part of the environmental assessment of population and human health include; *"employment, settlement patterns, land-use patterns, baseline population, human health (considered with reference to other headings, such as water and air), and amenity (e.g. effects on amenity uses of a site or of other areas in the vicinity may be addressed under the factor of landscape)"* .

The primary potential sources of effects of the proposed project on sensitive receptors have been identified as follows:

- Dust emissions from construction activities (construction and decommissioning phase);
- Noise and vibration emissions (construction, operational and decommissioning phases);
- Traffic emissions and disruption (construction and decommissioning phase); and
- Installed infrastructure (operational phase).

Potential effects on sensitive receptors in relation to the above sources are assessed in this EIAR in terms of land use, population trends, property receptors, property value, employment/economy, tourism and amenity, and human health.

#### *Population*

For the population assessment, a desktop study was carried out in order to examine relevant information relating to this population and human health impact assessment. A local population and socio-economic profile has been established and described in terms of available relevant census data obtained primarily from the Central Statistics Office (CSO). Information on population statistics, land use, employment and socio-economic data for the areas surrounding the proposed wind farm site have been obtained predominantly from the 2011 to 2022 Census of Ireland and 2020 Census of Agriculture records.

In terms of a 'study area', for the purposes of the population and human health assessment, this primarily focuses on the local receiving human environment surrounding (i.e., the EDs as per Figure 5.1) the proposed wind farm site, as this is where any likely potential effects on population and human health receptors will mainly occur. Where available, CSO data has been reviewed at the smallest available level for the local area, including at Electoral Division (ED) level, which are the smallest legally defined administrative areas within which Small Area Population Statistics (SAPS) are gathered by the CSO. This is considered the most appropriate scale for collated census data and is commonly used for defining the existing population profile. Therefore, in order to discuss the receiving human environment and other statistics for the

proposed project, the study area for this assessment includes the EDs within or immediately surrounding to the proposed wind farm site area (Farnoge, Ballincrea, Kilbride, Jerpoint West, Kilmakevoge, and Kilbeacon) (see Figure 5-1).

In summary, the desk study with respect to population included the following activities:

- A review of GeoDirectory and ground-truthing data in order to identify property receptors within and surrounding the proposed wind farm site;
- A review of Ordnance Survey Ireland (OSI) Mapping, EPA Maps (including CORINE 2018 and aerial photography to establish current land use and settlement patterns, as well as relevant amenity facilities, surrounding the proposed wind farm site;
- A review of the most recent information available regarding population statistics, employment and social data for the areas surrounding the proposed wind farm site have been obtained primarily from the CSO. Information to establish a population profile, settlement demographics and the economic context of the study area on population statistics, land use, employment, and socio-economic data for the areas surrounding the proposed wind farm site have been obtained predominantly from the 2011 to 2022 Census record period. The 2020 Census of Agriculture records were also reviewed;
- A review of tourism data including Fáilte Ireland, Tourism Ireland, Discover Ireland, and available local websites to identify visitor attractions within the study area and tourism data and performance in the local and wider county. Fáilte Ireland tourist literature for County Kilkenny was examined in relation to tourism amenity in conjunction with the websites of relevant tourism assets, locations and amenities in the area. County Kilkenny is located in Ireland's Ancient East, a branding initiative developed by Fáilte Ireland to make the area *"the most personally engaging cultural destination in Europe by harnessing the authentic character of the real Ireland, its living culture, lush landscapes and hidden history, opening it up for everyone"*. Information on other tourist attractions and initiatives in the area have been sourced from relevant websites, such as Discover Ireland, Visit Kilkenny, Tourism Ireland, those hosted by the Kilkenny Tourist Information Centre (visitkilkenny.ie) Information and published literature;
- A planning application search has been undertaken as part of the EIAR to identify proposed and consented, but as yet not built, developments, and is discussed in Chapter 1 (Introduction) and Appendix 1-4; and
- A review of information sources identifying walking and cycling routes and other Rights of Ways in the vicinity of the proposed project (e.g., Trails.ie and Sports Ireland).

## *Human Health*

To establish a baseline in terms of human health, available census data and surveys from the CSO and Government were reviewed; information has been presented on a county, regional or national scale depending on the availability.

In summary, the desk study with respect to human health included the following activities:

- A review of published literature on the effects of wind energy developments on human health has been undertaken. Aspects examined under human health primarily relate to impacts from the proposed wind farm on socio-economic activities and on local community health. These two themes are discussed in this chapter but may be further addressed in other technical chapters, where relevant;

- A review of published surveys on public perception of wind energy developments on has been undertaken;
- A review of recent available health surveys published by the Government and CSO; and
- A review of other relevant chapter assessments within this EIAR.

Aspects examined in this assessment primarily relate to potential impacts from the proposed wind farm on local population, properties, socio-economic activities and local community health. These themes are discussed primarily in this chapter but may be further addressed in other technical chapters, where relevant.

### 5.2.3 Assessment criteria

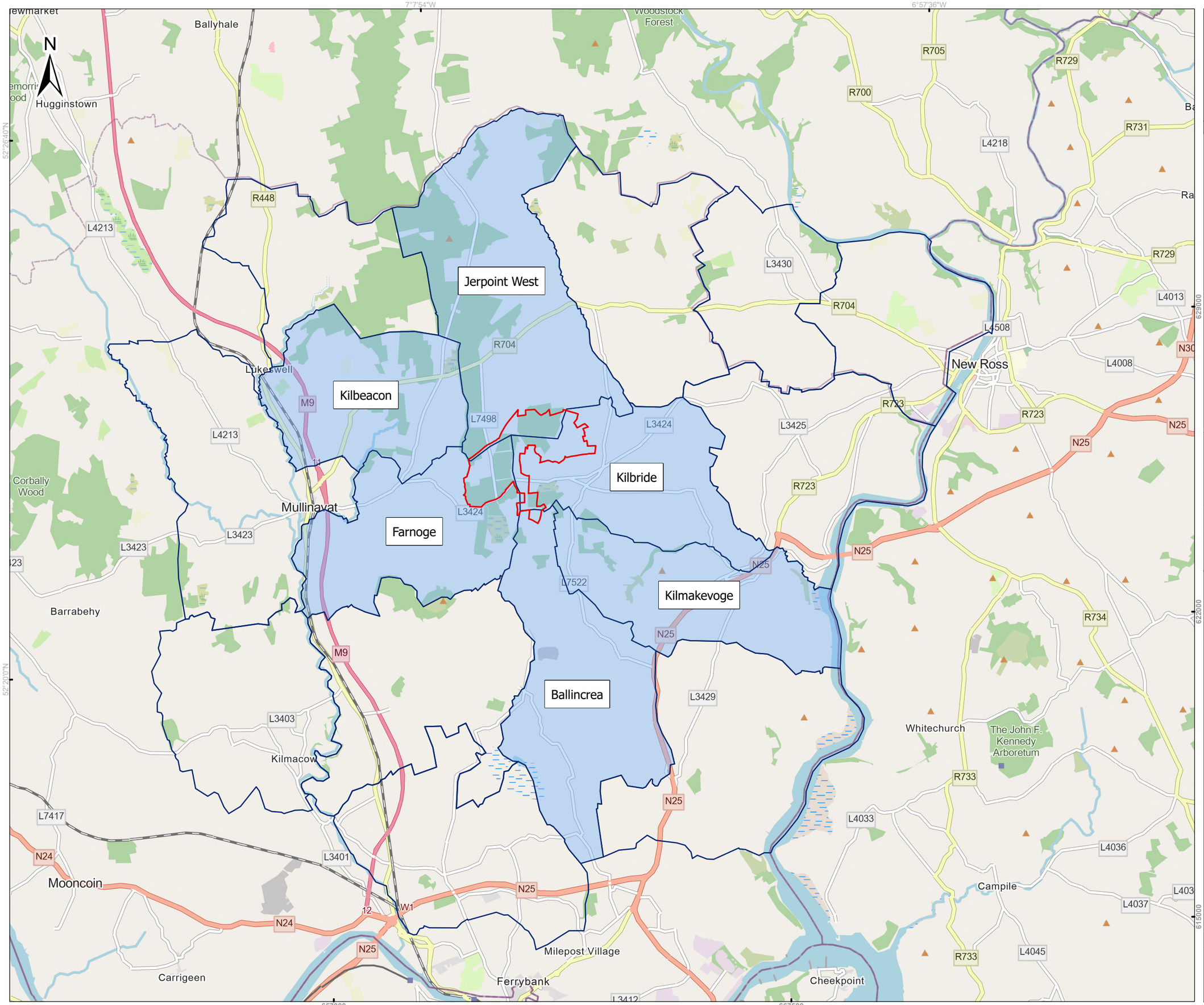
The effects of the proposed wind farm on the human environment are assessed in accordance with the EPA EIAR Guidelines (2022).

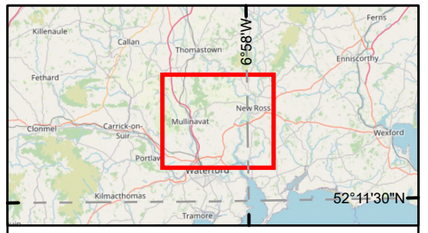
Determination and description of the significance of effects is assessed in accordance with the terminology provided in Table 3-4 of the EPA EIAR Guidelines (2022), and are set out in Table 5-1.

**Table 5-1: EIAR Assessment Criteria from the EPA EIAR Guidelines (2022)**

| Description of Effects | | |
|---|---|---|
| Quality of Effects | Positive | A change which improves the quality of the environment (for example, by increasing species diversity, or improving the reproductive capacity of an ecosystem, or by removing nuisances or improving amenities). |
| | Neutral | No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error. |
| | Negative / Adverse | A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem, or damaging health or property or by causing nuisance). |
| Significance of Effects | Imperceptible | An effect capable of measurement but without significant consequences. |
| | Not significant | An effect which causes noticeable changes in the character of the environment but without significant consequences. |
| | Slight | An effect which causes noticeable changes in the character of the environment without affecting its sensitivities. |
| | Moderate | An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends. |
| | Significant | An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment. |
| | Very significant | An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment. |
| | Profound | An effect which obliterates sensitive characteristics. |
| Extent and Context of Effects | Extent | Describe the size of the area, the number of sites and the proportion of a population affected by an effect. |
| | Context | Describe whether the extent, duration or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?) |
| Probability of Effects | Likely | The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented. |
| | Unlikely | The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented. |

| Description of Effects | | |
|---|---|---|
| Duration and Frequency of Effects | Momentary | Effects lasting from seconds to minutes. |
| | Brief | Effects lasting less than a day. |
| | Temporary | Effects lasting less than a year. |
| | Short-term | Effects lasting one to seven years. |
| | Medium-term | Effects lasting seven to fifteen years. |
| | Long-term | Effects lasting fifteen to sixty years. |
| | Permanent | Effects lasting over sixty years. |
| | Reversible | Effects that can be undone, for example through remediation or restoration. |
| | Frequency | Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually). |
| Types of Effects | Indirect (a.k.a. Secondary or Off-site Effects) | Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway. |
| | Cumulative | The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects. |
| | 'Do-nothing' | The environment as it would be in the future should the subject project not be carried out. |
| | 'Worst-case' | The effects arising from a project in the case where mitigation measures substantially fail. |
| | Indeterminable | When the full consequences of a change in the environment cannot be described. |
| | Irreversible | When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost. |
| | Residual | The degree of environmental change that will occur after the proposed mitigation measures have taken effect. |
| | Synergistic | Where the resultant effect is of greater significance than the sum of its constituents (e.g. combination of SOx and NOx to produce smog). |




**Legend**

- Wind Farm Study Area
- Electoral Divisions (EDs)
- Local EDs

0 1.5 3
Kilometers

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

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| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| A | 09/10/2025 | First issue | S.P | A.M |

Client: Manogate Ltd.

Project: Ballyfasy Wind Farm

Title: Figure 5-1: Proposed Wind Farm Site and Electoral Divisions (EDs)

Scale @ A3: 1:80,000

| Prepared by: | Checked by: | Date: |
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Map Ref: 11474-006-E.Div-P.App.BO-TOB-A

Draft: A

## 5.3 EXISTING ENVIRONMENT

### 5.3.1 Study Area

The proposed wind farm site is located in the southern portion of County Kilkenny, between the villages of Listerlin (approximately 4 km northeast), Mullinavat (approximately 3.5 km west), Glenmore (approximately 5 km southeast), and Slieverue (approximately 9 km south).

The landscape is largely agricultural with areas of coniferous forestry occurring. In general terms, the area surrounding the site can be described as rural with a dispersed settlement type.

The main urban centres in the region are Waterford City, located approximately 11 km to the south of the proposed wind farm site and Kilkenny City, located approximately 30 km to the north. New Ross is situated approximately 10 km east.

As mentioned, for the purposes of gathering data and establishing a baseline in terms of the local population and human health statistics, the EDs surrounding and within which the proposed wind farm site is located comprise the study area for the population and human health assessment. EDs are the smallest legally defined administrative areas within which Small Area Population Statistics (SAPS) are gathered by the CSO. This is considered the most appropriate scale for collated census data and is commonly used for defining the existing population profile. Based on a review of EDs (CSO, 2023), the EDs identified within the study area are Farnoge, Ballincrea, Kilbride, Jerpoint West, Kilmakevoge, and Kilbeacon (shown in Figure 5-1).

Those most likely to experience effects are typically those residing in proximity to the proposed wind farm. To identify a baseline in terms of local sensitive receptors, a distance of up to 1 to 2 km from the wind farm site boundary is best practice and typically considered for identifying sensitive receptors (i.e. through identifying properties where sensitive receptors may reside) for the population and human health assessment. This distance may be amended during the assessment on account of the location of population centres, density of receptors or specific local considerations. For this assessment, properties within a 2 km distance have been identified and reviewed through available aerial mapping, GeoDirectory and ground-truthing.

It should be noted, there are no statutory guidelines in respect of how far from the site boundary or proposed turbines this assessment should extend for the purpose of population and human health impacts and assessment, however the distances identified as part of the assessment of other environmental factors (e.g., air quality, noise, landscape and visual and shadow flicker) are useful references.

### 5.3.2 Population

#### *5.3.2.1 Land use*

The current land uses of the proposed wind farm site are primarily commercial forestry and agriculture. The landscape surrounding the proposed wind farm site is a mixture of agricultural land and forestry, with existing wind farms. The Ballymartin Wind Farm and Smithstown Wind Farm are adjacent to the north of the proposed wind farm site with the nearest turbine being at Ballymartin Wind Farm approximately 587 m from proposed turbine T3. The Rahora Wind Farm is located to the north east with the nearest turbine being approximately 2.25 km from proposed turbine T5. The consented Castlebanny Wind Farm boundary is located approximately 1.5 km to the northwest of the proposed wind farm site boundary.

The current land use for both proposed GCOs is predominantly pastoral agriculture with some areas of forestry cover. GCO One, will install a 110 kV underground cable from the proposed onsite substation to the consented Castlebanny Wind Farm 110 kV substation approximately 12 km to the north. This cable will be within approximately 8.45 km of public road and 3.55 km of third party lands. GCO Two will connect into the existing 110 kV Great Island-Kilkenny overhead line which crosses over the east of the proposed wind farm site. This cable will be within 2.3 km of third party lands.

Temporary works at the proposed TDR works areas on lands required to facilitate turbine component deliveries currently comprise boundary walls, hedgerows, forestry, as well as transport (road corridors).

**Agricultural Land Use**

There are 3,573 farms with crops within County Kilkenny, covering an area of approximately 163,343 ha, with an average area of 45.7 ha farmed (CSO, 2020).

The total area of farmland (agricultural holdings) within study area (i.e., the six EDs) surrounding the proposed wind farm site measures approximately 277 ha, comprising approximately 3% of the combined area for these EDs (approximately 9,310 ha), according to the CSO Census of Agriculture 2020. The main crop type farmed is grassland (CSO, 2020).

There are approximately 151 farms (agricultural holdings) located within the study area, with an average holding size of approximately 46.2 ha, marginally higher than the 45.7 ha average farm size for Co. Kilkenny (CSO, 2020).

**Table 5-2: Agricultural Land Use in the Study Area (EDs)**

| Area (EDs) | Agricultural Holdings | Average Size of Holdings (ha) | Average Area Farmed (ha) | Main Crop Type |
|---|---|---|---|---|
| Farnoge | 22 | 42 | 923.7 | Grassland |
| Ballincrea | 35 | 36.6 | 1,283 | Grassland |
| Kilbride | 25 | 41.2 | 1,031 | Grassland |
| Jerpoint West | 27 | 51.6 | 1,394 | Grassland |
| Kilmakevoge | 22 | 60.3 | 1,326 | Grassland |
| Kilbeacon | 20 | 45.3 | 905 | Grassland |
| **Total** | **151** | **277** | **6,863** | Grassland |

### *5.3.2.2 Population trends / statistics*

In contrast to recent demographic trends towards urbanisation experienced by other counties, the Census 2022 indicates that Kilkenny remains, in population terms, a predominantly rural county, with approximately 60% of the County's population identified as living in a rural setting (Kilkenny CCDP, 2021).

An examination of the existing population in the study area has been carried out to identify population trends, density and to define the properties/receptors surrounding the proposed wind farm site. Census data from the period 2011-2022 available from the CSO[1] has been summarised in Table 5-3.

[1] https://www.cso.ie/en/census/ (Accessed March 2025).

Works associated with the proposed wind farm site are located within the local authority area of Kilkenny County Council, and fall within the study area EDs of Farnoge, Ballincrea, Kilbride, Jerpoint West, Kilmakevoge, and Kilbeacon. See Figure 5-1 (Proposed Wind Farm Site and Electoral Divisions (EDs)). These EDs have been used in defining the existing population in the study area and vicinity of the proposed wind farm site.

Census results for the 10-year period between 2011 and 2022 show a rise in population nationally of 11%. Between 2011 to 2022, the population of County Kilkenny increased along with the national trend by approximately 8%, while the population of the ED's within which the proposed wind farm site is located has fluctuated, with population decreasing in two ED's by up to (-6% in Kilbride and -1% in Kilmakevoge) and increasing between +10-13% in the four remaining EDs.

**Table 5-3: Population Trends over the 10-year period 2011 – 2022 (CSO, 2022)**

| Area | Population 2011 | Population 2016 | Population 2022[2] | % Change from 2011 - 2022 |
|---|---|---|---|---|
| State | 4,588,252 | 4,761,865 | 5,084,879 | +11% |
| Kilkenny County | 95,419 | 99,232 | 103,036 | +8% |
| **Electoral Divisions (EDs)** | | | | |
| Farnoge | 297 | 304 | 336 | +13% |
| Ballincrea | 310 | 313 | 348 | +12% |
| Kilbride | 427 | 400 | 401 | -6% |
| Jerpoint West | 259 | 269 | 286 | +10% |
| Kilmakevoge | 430 | 433 | 427 | -1% |
| Kilbeacon | 194 | 200 | 214 | +10% |
| **EDs (total)** | **1,917** | **1,919** | **2,012** | **+5%** |

The location of the proposed wind farm site in the context of the above ED's is shown in Figure 5-2.

Population density is a useful indicator of the settlement patterns in the area surrounding the proposed wind farm site. Table 5-4 shows population density for the EDs study area, as well as the State. The 2022 census identified that the average population density in Ireland was 73.3 persons/km$^2$, the population density of the electoral divisions within the study area ranges from 12.9 to 31.9 persons/km$^2$, demonstrating that the population density in the area surrounding the proposed wind farm site is lower than the national average, indicating a generally sparser population in the area.

[2] Population Usually Resident and Present in the State (CSO, 2023) (Accessed March 2025).

Table 5-4: Population density of Electoral Divisions within the study area (CSO Census 2022)

| Area | Population density (persons per sq km) |
|---|---|
| State | 73.3 |
| Farnoge | 24.1 |
| Ballincrea | 20.5 |
| Kilbride | 30.2 |
| Jerpoint West | 12.9 |
| Kilmakevoge | 31.9 |
| Kilbeacon | 16.2 |

**Census 2022**

The Census 2022 results indicate that the number of persons present in the country on Census Night 2022 (Sunday 3rd of April 2022) was 5,149,139; this population result is the first time in over 170 years (since 1841) that a census has recorded a population in Ireland of over 5 million people. The population increased by 361,671 persons (8%) since the previous census (2016), with an average annual population increase of 1.2% a year since 2016.

The key findings of the Census 2022 results, in terms of population growth are:

- It is the first time in 171 years that Ireland's population exceeded the five million threshold. There were 5,149,139 people in the State on Sunday, 03 April 2022, an 8% increase since April 2016;
- The average age of the population increased from 37.4 in 2016 to 38.8 in 2022;
- The number of people with dual Irish citizenship was 170,597 which represents a 63% increase from 2016;
- There was a drop from 87% to 83% in the proportion of people who reported their health was good or very good since 2016;
- Approximately a third of all workers (747,961 people) worked from home for at least some part of their week;
- The proportion of the population who identified Roman Catholic as their religion fell from 79% in 2016 to 69% in 2022;
- More than 700,000 people indicated that they undertook voluntary work, and of those, nearly 300,000 people volunteered in a sporting organisation; and
- Almost 80% of households had a broadband internet connection in 2022, up from 71% in 2016 (CSO, 2023)[3].

### *5.3.2.3 Property and Buildings*

The locations of properties and buildings in the vicinity of the proposed wind farm site have been identified using address data from the GeoDirectory database which is used to populate Eircodes.

[3]https://www.cso.ie/en/releasesandpublications/ep/p-cpsr/censusofpopulation2022-summaryresults/keyfindings/ (Accessed March 2025).

The validity of the GeoDirectory data within 2 km of the site boundary has been confirmed by way of desk top review, including publicly available mapping, aerial imagery, street-level imagery, and a ground-truthing exercise. Ground-truthing allows for verification of the location and type of properties identified from the desk study and to include additional properties where arising. The ground-truthing exercise also notes sites where planning application notices may be currently present (i.e., potential future property receptor).

168 properties have been identified within a 2 km buffer of the proposed wind farm site. A breakdown of the properties identified, along with their property type, is outlined in Table 5-5 below.

**Table 5-5: Receptors Identified within the 2 km of the proposed Wind Farm Site**

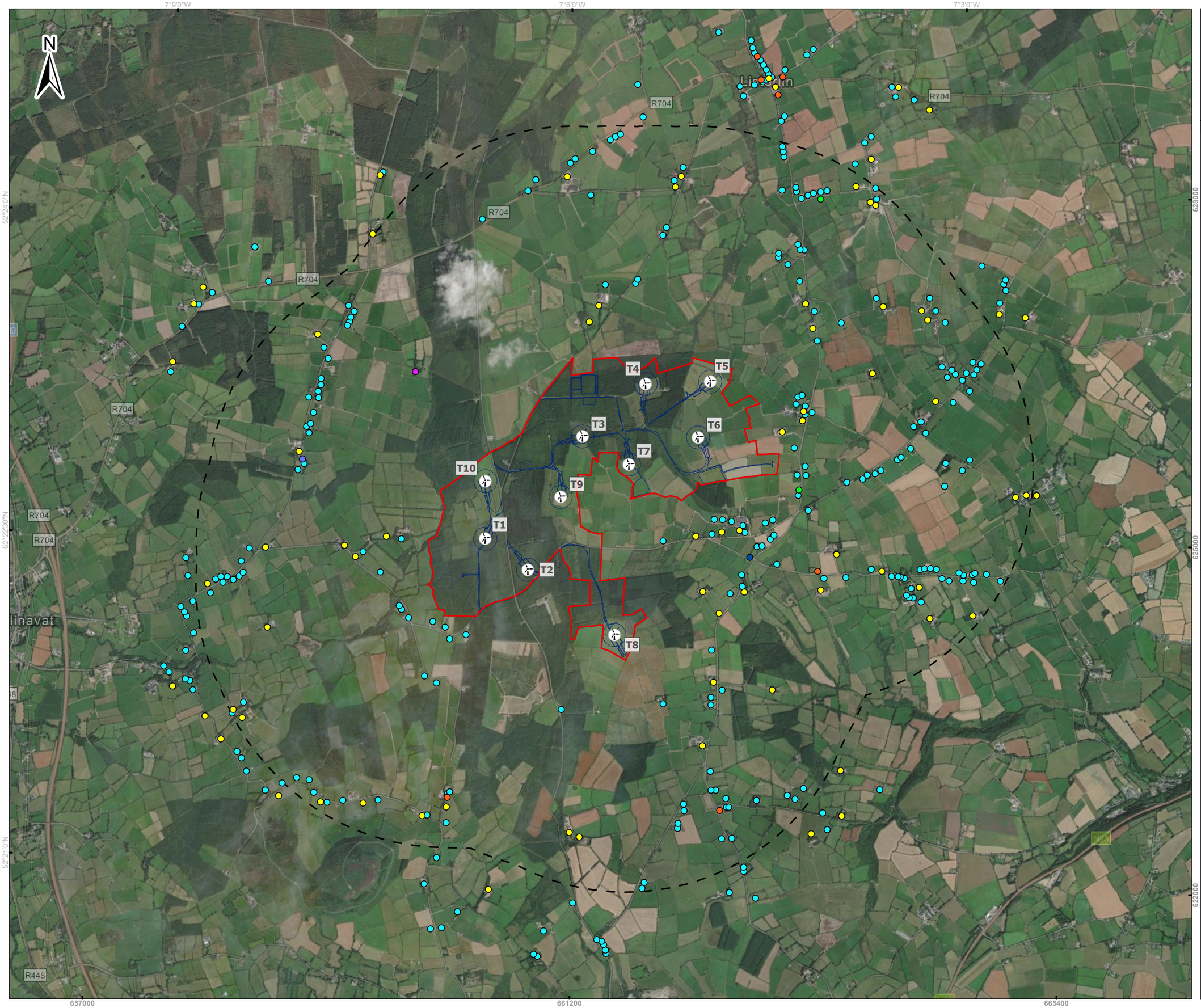
| Property Type | No. |
|---|---|
| Residential | 127 |
| Residential with Commercial | 37 |
| Commercial | 2 |
| Derelict | 1 |
| Other (e.g. sheds) | 1 |
| **Total property receptors identified within 2 km** | 168 |

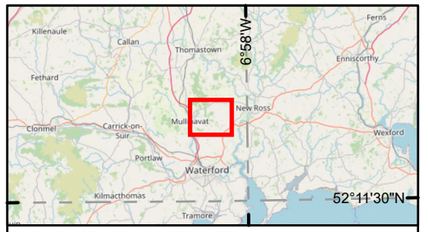
Of the 168 properties identified, 50 are within 1 km of the proposed wind farm site. Table 5-6 outlines the properties identified as closest to a turbine; 13 properties were identified within 800 m of a turbine.

Figure 5-2 below shows the distribution of properties in relation to the turbine layout.

**Table 5-6: Property Receptors Identified as being closest to a Turbine**

| Building ID | Property Type | Closest Turbine No. | Approximate Distance (m) |
|---|---|---|---|
| 554 | Residential | T6 | 720 |
| 557 | Residential | T7 | 721 |
| 172 | Residential | T1 | 723 |
| 270 | Residential & Commercial | T4 | 724 |
| 359 | Residential & Commercial | T6 | 726 |
| 643 | Residential | T8 | 726 |
| 553 | Residential | T6 | 738 |
| 352 | Residential | T5 | 766 |
| 351 | Residential | T5 | 768 |
| 180 | Residential | T2 | 773 |
| 551 | Residential | T6 | 776 |
| 271 | Residential & Commercial | T4 | 788 |
| 183 | Residential | T8 | 789 |




**Legend**

- Wind Farm Study Area
- 2km buffer
- Site layout
- Turbine locations

Property Types

- Residential
- Residential - Mobile home
- Both Residential and Commercial
- Commercial
- Derelict
- Planning Application
- Shed

0 500 1,000
Meters

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

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| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| A | 14/10/2025 | First issue | S.P | A.M |

Client:
Manogate Ltd.

Project:
Ballyfasy Wind Farm

Title:
Figure 5-2:
Properties identified in proximity to the Wind Farm Site

Scale @ A3: 1:30,000

| Prepared by: | Checked by: | Date: |
|---|---|---|
| S.Pezzetta | A.Murphy | October 2025 |

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Map Ref: 11474-052-Sens.R-P.App.BO-TOB-A

Draft: A

**Amenity, Services and Education**

The nearest identified primary school to the proposed wind farm site study area is Ballyfacey National School in Ballyfasy Lower, Ballyfacey, Co. Kilkenny (approximately 800 m south east from the proposed wind farm study area site boundary), while the nearest identified post-primary school is Scoil Aireagail (approximately 12 km north west), in Ballyhale. The nearest identified large third level campus is Waterford Institute of Technology located in Waterford City, while Ormonde College of Further Education is the nearest identified third level college located in Kilkenny City.

A number of community facilities and amenities, including shops, health centre, community halls and churches are available in the wider area, including in the towns of Mullinavat and Ballyhale.

Sports clubs and other sports facilities are located in the area, including Gaelic Athletic Association (GAA) clubs in Mullinavat (approximately 3.5 km west), Ballyhale (approximately 10 km north west), Glenmore (approximately 3 km south east), and Tullogher (approximately 5 km north east). The Mountain View Golf Course, located near Ballyhale, is approximately 8.8 km north west of the proposed wind farm site, while Mount Juliet Estate, located Thomastown, is approximately 14.4 km north west of the proposed wind farm site. The Bishops Mountain Shooting Centre is 0.3 km to the west of the proposed wind farm site. Further amenities and services are available in New Ross, Kilkenny City and Waterford City.

#### *5.3.2.4 Property value*

Data available from the CSO on property values is presented in terms of Eircode Routing Key areas. The proposed wind farm site is located within two Eircode Routing Key boundaries, namely R95: Kilkenny (covering the northern part of the proposed wind farm site and including Kilkenny City) and X91: Waterford (covering the central and southern part of the proposed wind farm site and including Waterford City).

In March 2025, the CSO published the Residential Property Price Index (RPPI) data for the 12-months to January 2025[4]. The CSO property data for properties sold show that the average price of residential properties sold across the two areas (R95 and X91) is approximately €312,000 (based on R95 median price of €325,000 and X91 median price of €299,000 as per the RPPI (published January 2025)). The national median residential property price for residential dwellings purchased in the 12-months to January 2025 was €359,999[5].

The latest RPPI data release shows that overall residential property prices rose by 8.1% in the 12-months to January 2025, a marginal decrease from 8.7% in the year to December 2024 (the previous CSO RPPI release). Property prices in Dublin increased by 7.5%, and property prices outside Dublin rose by 8.6% when compared to the same period a year earlier (January 2024) (CSO, 2025).

In terms of houses, in Dublin prices rose by 7.9%. The highest house price growth in the Dublin region was in Fingal, at 9.5%, while Dún Laoghaire-Rathdown saw a rise of 6.4% (CSO, 2025).

Outside of Dublin, house prices increased by 8.9% and apartment prices grew by 5.0%. The greatest increase in house prices outside of Dublin was in the Border Region (Cavan, Donegal,

[4] https://www.cso.ie/en/interactivezone/visualisationtools/housepricesbyeircode/ (accessed March 2025).
[5]https://www.cso.ie/en/releasesandpublications/ep/p-rppi/residentialpropertypriceindexjanuary2025/ (Accessed March 2025).

Leitrim, Monaghan, and Sligo) at 12.7% compared to the Mid-East region (Kildare, Louth, Meath, and Wicklow) which experienced a 5.8% increase.

In January 2025, 3,801 dwelling purchases by households at market prices were filed with the Revenue Commissioners, an increase of 5.0% when compared with the 3,621 purchases in January 2024 (CSO, 2025).

Nationally, the lowest median price paid for a dwelling was €180,000 in County Leitrim, and the highest was Dún Laoghaire-Rathdown, County Dublin at €662,349. The CSO states the most expensive Eircode area over the 12-months to January 2025 according to the RPPI was A94 'Blackrock' (median price of €743,500) in County Dublin. Outside of Dublin the most expensive Eircode area over the last 12 months was A98 'Bray' (median price of €546,150), while H23 'Clones' was the least expensive (median price of €133,000) (CSO, 2025).

#### 5.3.2.4.1 Wind Farms and Property Values

A UK study, entitled *The effect of wind farms on house prices*, was carried out by the Centre of Economics and Business Research (CEBR) in March 2014. The key findings of the study were:

- Overall, the analysis found that country-wide property market drives local house prices, not the presence or absence of wind farms; and
- The econometric analysis established that construction of wind farms at the sites examined across England and Wales has not had a detectable negative impact on house price growth within a 5 km radius of the sites.

However, a similar study published in April 2014 by the London School of Economics (LSE) Spatial Economic Research Centre found an average reduction in the value of houses (based on 125,000 house sales between 2000 and 2012) of between 5% and 6% within 2 km of wind farms (Gibbons, 2014). These contradicting studies led to further research in Scotland in 2016 (ClimateXChange, 2016) which was based on analysis of over 500,000 property sales in Scotland between 1990 and 2014. This study, again, found no evidence of a negative impact from wind turbines on house prices and suggests that *"generally speaking the effect is either positive…or not distinguishable from zero"*.

The authors of the report tried to explain why the research carried out in Scotland found a very different result to that carried out in England even though the approach was very similar to that used in the LSE study. They suggested a number of possibilities including:

- Attitudes towards wind farms may be different in Scotland than in other parts of the UK;
- In Scotland, a much higher proportion of turbines are likely to be located on moors and mountains and in more remote areas than in England and Wales; and
- Some wind farms, especially in Scotland, enhance the local area by providing tracks for walkers, cyclists, horse riders and other members of the community, as well as community benefit funds.

Large scale studies in United States have indicated that there is no conclusive evidence of any effect on property values located in close proximity to wind farms. A study entitled *A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States* by Lawrence Berkley National Laboratory in 2013, carried out sampling in over 51,000 homes across nine US states. The range of distances examined accounted for as far as 10 miles away (approximately 16 km), but also took into account 1,198 homes within 1 mile (approximately 1.6 km) of turbines.

Presently, there is one Irish based study that has looked at the effect of wind farms on property values within the Irish context. This working paper entitled '*Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach*' (Gillespie & McHale, 2023) was published by the Centre for Economic Research on Inclusivity and Sustainable (CERIS) in 2023. This paper reviewed wind turbine developments in the west of Ireland covering counties Cork, Donegal, Galway, Kerry, Leitrim, Mayo, and Sligo and associated property values. The study used satellite imagery to identify individual turbines and sourced local housing data from Irish property website 'daft.ie'. Although prices published on daft.ie are not necessarily equivalent to the price agreed on final sale of a property, the assumption was made that property listing and sale agreed prices correspond. The findings of the study indicated a potential decrease in property values of approximately -14.7% within a radius of 0-1 km of a wind turbine. It should be noted that the sample size considered within this range was small, approximately 225 houses, which does not fully represent the distribution of wind turbines and broader landscape of Irish rural residential properties. Furthermore, the paper states that there are "*no significant reduction in house prices beyond 1 km*" and that the effects seen within the 0-1 km radius were not persistent, and were seen to diminish over the operational lifetime of the wind turbines (Gillespie & McHale, 2023).

#### 5.3.2.4.2 Public perception of wind farms

**Scotland and Ireland Survey 2005**

In 2005, researchers from the University of St. Andrews, Fife and The Macaulay Institute, Aberdeen published the results of a survey conducted on the perception of wind power in Scotland and Ireland, undertaken between 2003 and 2004 (Warren *et al*., 2005). The study aimed to find the degree to which people support or oppose wind power, to understand reasons for such attitudes and establish how these attitudes relate to certain reasons such as personal experience and proximity. The surveys were conducted around the localities of existing and planned wind farms in Ireland, in Counties Cork and Kerry, and in Scotland, within the Scottish Borders region. Key findings included:

- The large majority of those surveyed indicated that they are greatly in favour of their local wind farm, with their personal experience having prompted their positive attitude;
- In Scotland, attitudes towards the concept of wind energy were found to be "overwhelmingly positive" (Warren *et al*., 2005);
- In Ireland, survey results indicated 92% support for the development of wind energy in the country, with results showing a high level of support for renewable energy;
- The study indicates its findings are in line with previous similar research, which indicate that positive attitudes grow over time and with proximity to wind farms;
- The study found that that in terms of the 'not in my back yard' (NIMBY) effect appears, it is much more pronounced in relation to proposed wind farm developments than with existing wind farms;
- Reasons provided by respondents for their positive view of local wind farms were primarily related to positive aspects including, promotion of renewable energy, moving away from fossil fuels, and environmental protection;
- In terms of wind farm size, the study noted that similar to previous research, the surveys found that wind farm developments with small numbers of large turbines are usually preferred over developments with large numbers of smaller turbines;
- In Scotland, problems often cited as negative impacts of wind farms, such as shadow flicker and telecommunications interference, were not cited by respondents;

- Scottish respondents reasons for a positive change in attitude post construction phase included that they thought wind farms were "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%)" (Warren *et al*., 2005);
- In Scotland, the surveys found that although those living in proximity to proposed and existing wind farm sites had indicated positive attitudes towards wind power, those around a proposed wind farm site were less convinced than those living in proximity to the existing wind farm site;
- In Ireland, survey results support the Scottish results, showing an increase in positive attitudes to wind power through time and proximity to wind farms;
- Data recorded from Irish respondents indicate that those who regularly see the wind farms are generally most accepting of the visual impact;
- The study further states that the majority of those with direct experience of wind farms do not think that they have had any adverse impact on wildlife, tourism, scenic beauty or property values; and
- Overall, the study results indicate "a clear pattern of public attitudes becoming significantly more positive following personal experience of operational wind farms" (Warren *et al*., 2005).

**Sustainable Energy Authority of Ireland (SEAI) National Survey 2023**

In May 2023, the SEAI published their latest survey findings regarding attitudes towards wind and solar energy farms, which builds upon SEAI surveys undertaken in 2003 and 2017. The objective of the survey was to provide insight on public attitudes to commercial wind and solar energy farms in Ireland, and to understand the impacts of these projects on those who live in surrounding areas, to help inform an "*equitable and socially sustainable energy transition*" (SEAI, 2023).

The SEAI's survey is an initial step to track the impact of projects developed under the government's Renewable Electricity Support Scheme (RESS). Key findings from the research are:

- *"Most households close to new wind or solar power projects have positive attitudes to the project close to them;*
- *Across rural Ireland, general levels of support for wind and solar energy projects remain very high, regardless of whether people live close to new projects or far away;*
- *A large majority of the public living in rural areas supports government policies that secure financial benefits for households and communities close to new renewable energy infrastructure projects through 'Community Benefit Funds';*
- *Most people feel like they and their communities can have a say in the planning process. However, many still feel that the planning process is unfair, and that more effort should be made with community engagement and careful siting of projects;*
- *Currently, 5 GW of renewable electricity capacity is connected to the national grid with 2022 being a record year for new wind and solar energy connections. At peak time, Ireland requires about 5.5GW of energy and renewables and a significant proportion of that is provided by renewable power. In the first quarter of 2023, for example, 34% of Ireland's electricity came from wind, and while solar continues to increase, on a sunny day earlier in May, 10% of the country's energy was produced by solar power;*

- *The national survey of attitudes is an early step in a long-term research programme to understand the socio-economic impacts of the RESS policy. To date, SEAI has commissioned studies to understand the ways in which community engagement in wind energy can be improved through public participation in decision-making, direct investment, co-ownership in projects and by enhancing developers' practices in establishing community benefits schemes; and*
- *SEAI are planning further studies on the socio-economic impacts of the government's RESS policy" (SEAI, 2023).*

#### *5.3.2.5 Employment / economy*

Employment is an important indicator of the economic standing of an area. This section examines employment status and unemployment levels in the region of the proposed project. The Labour Force Survey[6]undertaken by the CSO, in accordance with standard International Labour Organisation (ILO) criteria, and provides details of unemployment on a regional level. County Kilkenny is located in the South East Region (NUTS 3 IE052)[7].

The key findings from the Q4 2024 Labour Force Survey (latest available data at the time of writing) published by the CSO[8] are outlined in the following sections.

- *The estimated number of people in employment in Q4 2024 stood at just under 2.8 million, up 2.6% compared with Q4 2023;*
- *The employment rate for people aged 15-64 years was 74.3% in Quarter 4 2024, up 0.3 percentage points from 74.0% a year earlier;*
- *The number of people aged 15-89 years in employment rose by 70,000 or 2.6% to 2,776,400 people in the 12 months to Q4 2024;*
- *There were 116,100 unemployed people aged 15-74 years in Q4 2024 using International Labour Organisation (ILO) criteria, with an associated unemployment rate for those aged 15-74 years of 4.0%, down from 4.2% in Q4 2023;*
- *The estimated Labour Force (i.e. the sum of all people aged 15-89 years who were either employed or unemployed) stood at 2,892,500 in Q4 2024, up 2.4% (68,400) from Q4 2023;*
- *The estimated labour market participation rate in Q4 2024 was 65.5%, up from 65.4% in Q4 2023; and*
- *The estimated total number of hours worked per week in Q4 2024 increased by 3.1 million hours or 3.8% on Q4 2023 figures to 85.6 million hours* (CSO, 2025).

In the South East Region, there were 238,400 persons in employment in Q4 2024, an increase of 6,000 persons or +2.5% over the year from Q4 2023 (232,400 persons); this indicates employment in the South East Region has increased over the 2023-2024 period.

The unemployment rates outlined in Table 5-7 is the number of unemployed persons expressed as a percentage of the total labour force (aged 15-74). The unemployment rate for the State in Q4 2024 was 4.0%, while the unemployment rate for the South East Region was 3.7%, indicating

[6] https://www.cso.ie/en/methods/labourmarket/labourforcesurvey/ and https://www.cso.ie/en/statistics/labourmarket/labourforcesurveylfs/ (Accessed March 2025).
[7] https://ec.europa.eu/eurostat/web/nuts/maps#expand-ie-17764716 - NUTS 3 – Nomenclature of Territorial Units for Statistics (NUTS) created by Eurostat /. https://www.cso.ie/en/methods/informationnotefordatausersrevisiontotheirishnuts2andnuts3regions/ (Accessed March 2025).
[8] https://www.cso.ie/en/releasesandpublications/ep/p-lfs/labourforcesurveyquarter42024/ (Accessed March 2025).

that unemployment in the region for the period Q4 2024 is similar, though slightly lower (-0.3%) than the State.

The participation rate is the number of persons available to the labour force (i.e. persons 15 years or older either working or looking for work) expressed as a percentage of the total population. In Q4 2024, the participation rate in the State was 65.5% compared with 66.6% in Q4 2023. In the South East Region the participation rate was 62.9% in Q4 2024; this demonstrates that the participation rate in the South East Region is marginally lower than the current trend nationally.

**Table 5-7: Labour Force Survey (Q4 2024)**

| Location | Unemployment Rate | Participation Rate |
|---|---|---|
| State | 4.0% | 65.5% |
| South East Region | 3.7% | 62.9% |

The CSO also publishes figures relating to the Live Register. These figures are not strictly a measure of unemployment as they include persons who are legitimately working part-time and signing on part-time. However, the Register can be used to provide an overall trend within an area.

Table 5-8 shows that for the State, there was 165,307 persons on the Live Register[9] in February 2025, a -5% decrease on the number of persons on the Live Register for the same period the previous year (February 2024). In the South East Region, the number of persons on the Live Register for February 2025 was 17,035 persons, a -6% decrease compared to the same period in the number of persons on the Live Register in February 2024.

In February 2025, the number of persons on the Live Register in County Kilkenny was 2,193, also showing a decrease (-6%) compared to the same period in the number of persons on the Live Register in February 2024.

Overall, there is a decreasing trend in Live Register figures, with the latest figures indicating a lowering trend of those signing on to the Live Register in the South East Region, including County Kilkenny, for the period discussed.

**Table 5-8: Live Register Total Figures (Feb 2024 – Feb 2025)**

| Location | Feb 2024 | Feb 2025 | % Change |
|---|---|---|---|
| State | 173,982 | 165,307 | -5% |
| South East Region | 18,157 | 17,035 | -6% |
| County Kilkenny | 2,330 | 2,193 | -6% |

Table 5-9 provides a breakdown of the labour force by industry occupation in County Kilkenny between Census 2016 and Census 2022. The industry areas with the highest proportion of the labour force include health and social areas, wholesale and retail sectors, manufacturing activity, educational roles, agriculture forestry and fishing activities, construction, professional roles including science and technical activities, and accommodation and service industry.

According to the latest Census (2022), in 2022, nationally there were approximately 2,531,099 people were in the labour force, a 13% increase on the number recorded (2,232,203 persons)

[9] https://www.cso.ie/en/releasesandpublications/ep/p-lr/liveregisterfebruary2025/ (Accessed March 2025).

11-years prior (Census 2011), and a 10% increase on the number recorded in the 2016 Census (2,304,037 persons).

**Table 5-9: Labour Force Figures (Census 2011 to Census 2022)**

| Location | 2011 | 2016 | 2022 | % Change (11-22) |
|---|---|---|---|---|
| State | 2,232,203 | 2,304,037 | 2,531,099 | +13% |
| South East Region | 192,666 | 197,042 | 217,780 | +13% |
| County Kilkenny | 46,265 | 47,407 | 50,203 | +9% |

More locally, in 2022, approximately 50,203 people were in the labour force for County Kilkenny, a 13% increase on the number recorded 11-years prior (Census 2011), and a 6% increase on the number recorded in the 2016 Census.

Table 5-10 below give an indication of the numbers of persons occupation by industry in County Kilkenny between 2010 and 2022. Industries with a high proportion of the labour force in County Kilkenny include wholesale and retail trade, manufacturing, human health and social work, education, construction and public administration.

The agriculture, forestry and fishing industry employed approximately 3,334 persons in County Kilkenny in 2022. As mentioned above under Section 3.2.1 Land Use, agricultural activity accounts for a moderate proportion of land use within the study area.

Nationally, according to the Census of Agriculture 2020, there were 278,600 persons in the Agriculture Labour Force, with 73% being male, and 30% female. There are approximately 130,200 farm holders in the State, of these, approximately 113,316 holders were male. There were only 9,197 farm holders under the age of 35-years, with 121,019 farm holders being over the age of 35-years. The age categories with the highest level of farm holders were 45-54 years (28,488), 55-64 years (32,026) and 65+ years (42,391).

There are approximately 11,600 farm holdings in the South-East region (CSO, Census of Agriculture 2020).

The average age of farm holders in the State in 2020 was 57.2 years old, and in Co. Kilkenny is 56-years old. Over 57% of farm holders in Ireland are above the age of 55 years (CSO, 2020).

Table 5-10: Labour Force by Industry County Kilkenny (Census 2016 & 2022)

| Labour Force by Industry - County Kilkenny | 2016 | 2022 |
|---|---|---|
| Human health and social work activities | 5,533 | 6,332 |
| Wholesale and retail trade (including motor repair businesses) | 5,423 | 5,776 |
| Manufacturing | 4,348 | 4,722 |
| Education | 3,767 | 4,519 |
| Agriculture, forestry and fishing | 3,488 | 3,334 |
| Construction | 2,496 | 3,182 |
| Professional, scientific and technical activities | 1,877 | 2,832 |
| Public administration and defence (inc. compulsory social security) | 2,144 | 2,602 |
| Accommodation and food service activities | 2,575 | 2,571 |
| Financial and insurance activities | 1,901 | 1,940 |
| Transportation and storage | 1,252 | 1,379 |
| Administrative and support service activities | 1,146 | 1,267 |
| Information and communication | 739 | 1,144 |
| Other industries | 4,674 | 4,596 |
| Unemployed | 6,044 | 4,007 |
| **Total in Labour Force in County Kilkenny** | **47,407** | **50,203** |

#### *5.3.2.6 Tourism / recreation*

The National Tourism Development Authority (Fáilte Ireland) periodically collates statistics on overseas visitors to Ireland and regions within the country. Table 5-11 shows the most recent domestic tourism (tourism involving residents of one country traveling only within that country) statistics from Failte Irelands 'Key Tourism Facts 2022 (published October 2023), for the country and the South East region, which includes County Kilkenny.

Table 5-11: Domestic Tourism Statistics 2022

| Location Travelled To | Domestic Trip's | Revenue Generated |
|---|---|---|
| Ireland (2022) | 13.3 million | €2,930 million |
| South East Region (2022) | 1,899,000 | €381 million |

In relation to domestic tourism, the Fáilte Ireland 2022 data reports 13.3 million domestic trips in 2022. The majority (39%) of these domestic trips were recorded as short (1-3 days) holiday trips, with trips to visit friends/relatives reported at 34% of all domestic trips. Most of these trips (40%) occur in the late summer period (July – September), with the majority of domestic holidaymakers engaging in hiking/walking (54%) and swimming (37%).

In 2018, Fáilte Ireland released[10] a report regarding the topline performance by county related to visits and revenue generated by tourists. This report showed that overseas and domestic trips

[10]http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/2_Regional_SurveysReports/2017-topline-regional-performance-(003).pdf?ext=.pdf (Accessed March 2025)

to the county made it the 8th most popular county for visitors. The county supported 315,000 overseas and 298,000[11] domestic trips in that year.

Based on the Failte Ireland Annual Visitor Attractions survey[12], Kilkenny Castle Parklands currently sits at number two by visitor numbers (1,418,171 total visitors) in a list of visitor attractions in Ireland in 2022. Kilkenny Castle itself sits in 12th position on the list, with 486,073 visitors in 2022. These tourist attractions are situated in Kilkenny City, c. 20 km north of the proposed wind farm site. The visitor attraction (within County Kilkenny) closest to the proposed project is Jerpoint Abbey, a medieval Cistercian Abbey (20,938 visitors in 2022), and Jerpoint Park (5,500 visitors in 2022), situated approximately 14 km north west of the proposed wind farm site.

**Ireland's Ancient East**

Fáilte Ireland launched a tourism initiative called Ireland's Ancient East, which incorporates County Kilkenny, with a goal to make the region *"the most personally engaging cultural destination in Europe by harnessing the authentic character of the real Ireland, its living culture, lush landscapes and hidden history, opening it up for everyone"*.

The nearest attractions to the proposed project as indicated on the Ireland's Ancient East 'Cultural County Kilkenny' website[13] are in Thomastown in County Kilkenny which is approximately 7 km north of the proposed wind farm site. Attractions here include the previously mentioned Jerpoint Abbey and Jerpoint Park. Jerpoint Park has guided heritage tours of a deserted 12th Century medieval town (the Lost Town of Newtown Jerpoint) and a 14th century medieval tomb. Another attraction, Goatsbridge Trout Farm, is located next to Jerpoint Park and organises tours where visitors can learn about traditional trout farming system, the art of smoking and processing, as well as the family history and the heritage behind the park. Knocktopher Abbey is located approximately 4 km north-west of the proposed wind farm site and was home to the first Carmelite order in Ireland.

Mount Juliet Estate is located just north of Jerpoint Park and approximately 6 km north the proposed wind farm site. Mount Juliet offers a range of activities including golf, equestrian, falconry, fishing and archery. Dunbrody Famine Ship in New Ross in County Wexford is approximately 10 km to the east of the proposed wind farm site and provides tour guides on the Irish emigrant experience including an authentic reproduction of an 1840's emigrant vessel, a visitor centre and the Irish America Hall of Fame.

**Walking / cycling routes and trails, equestrian / studs and other activities**

The South Leinster Way walking/hiking trail, running from Kildavin in County Carlow to Carrick-on-Suir in County Tipperary, which is approximately 105 km in length. This is designated as a National Waymarked Trail by the National Trails Office of the Irish Sports Council and is jointly managed by Carlow County Council, Kilkenny County Council, Tipperary County Council, Carlow Local Sports Partnership, Kilkenny Trails and Coillte. The route passes approximately 2.8 km north of the proposed wind farm site.

There are several other nearby trails/walks which are in the general vicinity of the proposed wind farm site. The Tory Hill Loops and Holy Day Memorial are located at Farnoge

[11] https://statbank.cso.ie/px/pxeirestat/Statire/SelectVarVal/saveselections.asp (Accessed March 2025).
[12]https://www.failteireland.ie/Research-Insights/Activities/visitor-numbers-to-attractions-dashboard.aspx (Accessed March 2025).
[13] Discover Ireland – Cultural County Kilkenny. www.discoverireland.ie/kilkenny (Accessed March 2025).

approximately 3 km south west of the proposed wind farm site. These Loops lead walkers to the top of Tory Hill to the memorial cross. From here walkers can experience 360 degree views of the surrounding countryside all the way to the sea.

Other walks noted include the Nore Valley Walk (Thomastown to Inistioge), the Castlemorris – Fern Loop, the Castlemorris Wood - Holly Loop and the Castlemorris – Pheasant loop. These trails/walks are approximately 10 km or further from the proposed wind farm site.

The East Kilkenny Cycle Route is a scenic cycling route linking the most historic and culturally significant towns in east Kilkenny. The route uses quiet roads and laneways and provides views of Brandon Hill, the River Barrow and the River Nore. The Cycle Route, where it passes through the village of Inistioge, approximately 10 km (north) from the proposed wind farm site.

Some equestrian activity is noted in the surrounding area. Annshoon Stud is located approximately 1.5 km north east of the proposed wind farm site.

In terms of other recreation/activity facilities, the Bishops Mountain Shooting Club is situated within approximately 100 m of the proposed wind farm site boundary. This site offers clay pigeon shooting activities.

#### *5.3.2.7 Tourism and Wind Farms*

Since onshore wind farms first began to appear in the landscape, there have been concerns about their potential impact on tourism, and whether tourists may be discouraged from visiting areas in general, or, in particular, areas where wind farms can be seen. The following research has been conducted in Ireland and Scotland relating to the attitudes towards wind farms by tourists.

**Fáilte Ireland - attitudes to wind farms surveys 2007 and 2012**

In 2007, Fáilte Ireland put out a survey to domestic and overseas tourists to Ireland in order to determine their attitudes to wind farms. The survey's purpose was to investigate if the development of wind farms impacts on the enjoyment of the Irish scenery by tourists. The survey involved face-to-face interviews with 1,300 tourists, 25% domestic and 75% overseas, (1,000 in the Republic, 300 in Northern Ireland) (Fáilte Ireland, 2007)[14].

The survey looked at the following; visitor awareness of wind farms, perceived impact on sightseeing, perceived impact on beauty of the landscape, and perceived impact on future visits to the area. The results of the survey indicate that most visitors are broadly positive towards the development of more wind farms in Ireland, although there is a minority (1 in 7 surveyed) that indicated a negative response towards wind farms in any context (Fáilte Ireland, 2007). Regarding the awareness of wind farms, findings of the survey include:

- *Almost half of tourists surveyed claimed to have seen at least one wind farm on their holiday, and of those who had seen a wind farm, two thirds claimed to have seen up to two during the holiday;*
- *Typically, wind farms are encountered in the landscape while driving or being driven (74%), while few experienced a wind farm up close;*

[14] The results of the survey are presented in the Fáilte Ireland Newsletter 2008/No.3 entitled 'Visitor Attitudes on the Environment: Wind Farms'.

- *For more than three in ten, the wind farm observed was seen on the horizon and for a further one in four it was viewed from a distance of 1-2 km;*
- *Around half of the wind farms observed were located in mountain moorland, and a further 37% viewed were in a coastal landscape; and*
- *Of the wind farms seen most were made up of less than ten turbines, and 15% had fewer than five turbines* (Fáilte Ireland, 2007).

In terms of the perceived impact of wind farms on sightseeing, the Fáilte Ireland survey found that although almost half of tourists surveyed had seen at least one wind farm on their trip, the majority felt that their presence did not detract from the quality of their sightseeing, with the highest proportion of those surveyed (45%) saying that the presence of the wind farm seen had a positive impact on their enjoyment of sightseeing, with a lower proportion (15%) claiming they had a negative impact on sightseeing in general (Fáilte Ireland, 2007). Fáilte Ireland *(2007)* noted that *"Compared with other types of development in the Irish landscape, wind farms elicited a positive response when compared to telecommunication masts and steel electricity pylons"*.

In terms of the perceived impact of wind farms on beauty of the landscape, the Fáilte Ireland survey report states that visitors were asked to rate the beauty of five different landscape types[15], and then rate the potential impact of a wind farm being sited in each landscape. The results indicate that each potential wind farm site must be assessed on its own merits, as rating proportions varied depending on the perceived beauty of the location. However, it was noted when looking across all sites, the numbers claiming a positive impact on the landscape are greater than those claiming a negative impact, in all cases (Fáilte Ireland, 2007).

With regard to the perceived impact of wind farms on future visits, the survey states that "*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"*. Furthermore, the results indicate that "*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"* (Fáilte Ireland, 2007). Following the outcomes of the survey, Fáilte Ireland (2007) 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"*.

In 2012, Fáilte Ireland undertook an update on their 2007 survey; this updated research was published in the '*Fáilte Ireland Newsletter 2012/No.1 entitled 'Visitor Attitudes on the Environment: Wind Farms – Update on 2007 Research'*. The updated research found that over half of tourists (56%) surveyed (1,000 domestic and foreign tourists) who visited Ireland during 2012, said that they had seen a wind turbine while travelling in Ireland. Of these tourists, 48% said that wind turbines had no impact on their sightseeing experience, 32% said that they have a positive impact, and 21% claimed they have a negative impact. In terms of future visits to Ireland, 71% of tourists claimed that potentially greater numbers of wind farms in Ireland over the coming years would have either no impact or a positive impact on their likelihood to visit the country. Of those who feel that the potentially greater number of wind farms would impact positively on future

[15] Coastal, Mountain, Farmland, Bogland and Urban Industrial.

visits, this was predominately associated with support for renewable energy, and potential decreased carbon emissions (Fáilte Ireland, 2012).

**Scotland – Wind farms and tourism trends survey 2017 and 2021**

In 2017, BiGGAR Economics published an independent research study on *'Wind Farms and Tourism Trends in Scotland'*[16]. The aim of the research was to understand the relationship, if any exists, between wind farm developments and the tourism industry in Scotland.

Since 2009, onshore wind development has expanded significantly in Scotland. Between 2009 and 2015 employment in the sustainable tourism sector in Scotland also grew, by 15%. Looking at the Scottish economy as a whole, this suggests that both the onshore wind sector and the sustainable tourism sector can coexist and grow (BiGGAR, 2017). However, the study noted – "*it could be argued that if there were any relationship between the growth of onshore wind energy and tourism, it would be at a more local level"* - therefore the study looked at 28 wind farms constructed between 2009 and 2015 and considered evidence at a local authority level and within the immediate vicinity of operational wind farms (i.e., analysis of local tourism trends within a 15 km radius from onshore wind energy sites) (BiGGAR, 2017). Results indicate that there was growth in employment in the sustainable tourism sector in the majority of local authority areas in Scotland during this period (2009-2015). It was noted that the growth in onshore wind energy capacity was greater in some areas of Scotland than in others. Nine of the local authorities considered had greater increase in wind energy deployment than the Scottish average. Of these, four saw a larger increase in sustainable tourism employment than the Scottish average, while five saw less growth than the Scottish average (BiGGAR, 2017). The analysis undertaken suggests that, at the local authority level, onshore wind development does not have a detrimental impact on tourism.

With regard to analysis of local tourism trends within the immediate vicinity of operational wind farms (radius -15 km), it was found that, in most cases, sustainable tourism employment performed better in the areas in the vicinity of wind farms compared to the wider local authority area. BiGGAR (2017) noted that – "*There was no pattern, which emerged that would suggest that onshore wind farm development has had a detrimental impact on the tourism sector, even at a very local level"*. Overall, the conclusion of the study was that "*published national statistics on employment in sustainable tourism demonstrates 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"* (BiGGAR, 2017).

<u>Updated survey and report (2021)</u>

In 2021, BiGGAR published an updated report[17] on wind farms and tourism trends in Scotland. The updated survey and research looked to further investigate if wind farms have discouraged tourism activity, and if there is evidence of such effects given the time that has passed since the first commercial scale wind farms were established in Scotland over 25 years ago. Since 2009, the number of onshore wind turbines in Scotland has grown from 1,082 to 3,772 in 2019.

[16]https://biggareconomics.co.uk/wp-content/uploads/2020/01/Wind-farms-and-tourism-trends-in-Scotland.pdf (Accessed March 2025).
[17]https://biggareconomics.co.uk/wp-content/uploads/2021/11/BiGGAR-Economics-Wind-Farms-and-Tourism-2021.pdf (Accessed March 2025).

Evidence shows that employment in tourism-related sectors also grew during the decade (increase of 20%) (BiGGAR, 2021).

Employment growth in tourism-related sectors has not been consistent across all areas of Scotland. The highest levels of growth in tourism employment have been seen primarily in rural local authority areas, while in some central belt local authorities there have been decreases in tourism-related employment. An analysis of the rates of change in tourism-related employment and the number of onshore wind turbines in local authority areas found that there is no correlation between the two factors (BiGGAR, 2021).

Like the 2017 research, this update also considered trends in tourism employment in the immediate vicinity of wind farm developments. This included an additional 16 wind farms that became operational since the previous study (2015-2019). Analysis of trends in tourism employment in the locality of these windfarms (based on a 15 km radius) found that 11 of the 16 areas experienced more growth in tourism employment compared to Scotland as a whole. Furthermore, tourism employment trends in the locality of 12 out of the 16 wind farms outperformed the local authority area in which they were based (BiGGAR, 2021). The updated study also re-examined the 28 wind farms analysed in the 2017 report and found that the localities in which they were based had outperformed Scotland and their local authority areas in most cases. Additionally, the analysis found that where seven areas that had underperformed in the 2017 study, four had done better than their local authorities in the period since. In total, the study analysed trends in the localities of 44 wind farms developed in recent years, providing a large evidence base. Overall, the latest study found no relationship between tourism employment and wind farm development, be it at the level of the national economy, local authority areas or in the locality of wind farm sites (BiGGAR, 2021).

### 5.3.3 Human Health

While the specific health data/status of individuals living in the vicinity of the proposed project is confidential and cannot be established, a community profile has been identified to establish the baseline health profile of the area and compare this profile to the rest of the country.

A review of latest deprivation indices (2022) available from Pobal[18]which ranges from 'very affluent' to 'extremely disadvantaged'[19], shows that County Kilkenny is currently considered 'marginally below average'. A review of the deprivation indices for the EDs shows that the EDs surrounding the proposed wind farm are primarily considered 'marginally above average', with the exception of Ballincrea which is noted as 'marginally below average' on the deprivation indices. It can be inferred that the area is neither particularly affluent nor particularly deprived. There are likely to be localised areas of deprivation where the county-level statistics simply do not apply.

It is not possible or necessary to identify every vulnerable individual. However, every human community contains vulnerable individuals; be those the old, the very young or because they have conditions which may make them more susceptible. Examples are as diverse as humans themselves but can include asthma, autism, and those with psychological illness. It is important to note that Health Standards are set for the vulnerable and not for the robust.

[18] https://maps.pobal.ie/WebApps/DeprivationIndices/index.html - Pobal administers and manages Government and EU funding to address disadvantage and support social inclusion (Accessed March 2025).
[19] 'Very affluent', 'Affluent', 'Marginally above average', 'Marginally below average', 'Disadvantaged', 'Very disadvantaged', and 'Extremely disadvantaged'.

#### *5.3.3.1 CSO Health Statistics*

##### 5.3.3.1.1 CSO Census 2022

The Census 2022 responses regarding general health found that approximately 83% of the Ireland's population felt they had 'Very Good' or 'Good' health, down slightly from 2016 when it was 87%. Approximately 53.5% of men felt their health was 'Very Good', compared with 52.9% of women. The census results also clearly show the decline in general health with age, with 73.5% of 15-19 year olds in 'Very Good' health, compared with those aged 40-44 (49.8%) and 65 to 69 (30.1%).

Census 2022 responses for County Kilkenny indicated the percentage of persons with 'Very Good' and 'Good' health was 85.3% (88,897 (44,466 Males / 44,431 Females)), while 8.5% indicated they were in 'Fair' health (8,884 (4,228 Males / 4,656 Females)), and 1.6% (1,694 (820 Males / 874 Females)) indicated they were in 'Bad' to 'Very Bad' health; 4.5% of respondents (4,685) did not state the status of their general health.

The 2022 census also indicated that there are 22,402 (10,930 Males / 11,472 Females) with disabilities (any extent) living in Kilkenny, and that there are 6,501 (2,544 Males / 3,957 Females) carers in the County.

The Census 2022 responses regarding general health found that 83% of the Ireland's population felt they had 'very good' or 'good' health; the Census 2022 indicated the percentage of persons reporting themselves as having 'bad' or 'very bad' health in the state was 1.7%. Census 2022 also indicates the level of those living with disabilities. In Ireland, 1,109,557 persons reported having a disability in Census 2022. The 2022 census also indicated that 22,402 persons living in County Kilkenny reported disabilities.

Census 2022 responses for the local EDs reviewed indicated that the majority of persons in the EDs reported themselves as having 'Very Good' to 'Good' health (see Table 5-12).

**Table 5-12: Reported health status census 2022 for EDs surrounding the proposed wind farm site**

| Area | Very good | Good | Fair | Bad | Very bad | Not stated | Total |
|---|---|---|---|---|---|---|---|
| County Kilkenny | 57,649 | 31,248 | 8,884 | 1,344 | 350 | 4,685 | 104,160 |
| Farnoge | 198 | 107 | 25 | 0 | 1 | 5 | 336 |
| Ballincrea | 212 | 93 | 21 | 7 | 3 | 12 | 348 |
| Kilbride | 272 | 90 | 28 | 1 | 0 | 10 | 401 |
| Jerpoint West | 179 | 84 | 13 | 1 | 0 | 9 | 286 |
| Kilmakevoge | 239 | 126 | 29 | 6 | 1 | 26 | 427 |
| Kilbeacon | 143 | 54 | 12 | 0 | 0 | 5 | 214 |

### *5.3.3.2 Irish Health surveys*

A number of sources were reviewed to understand the current baseline and context in terms of general health in Ireland. The following sections provide a summary of the most recent health surveys and census data gathered and published by the Government and the CSO.

**CSO Irish Health Survey 2019/20**

In 2020, the Central Statistics Office (CSO) published it's second "Irish Health Survey"[20], the data for which was collected in 2019 and early 2020. The first survey was collected for reference year 2015. This publication is part of an EU wide health survey and as other EU countries report on their data, it will be possible to compare how the Irish health experience compares to that of our EU neighbours. Some key findings of the survey included:

- *"Affluent people are more likely to feel their health status is Very good or good than people who are disadvantaged - 92% of Very affluent persons compared to 78% of persons who are Very disadvantaged;*
- *Over a quarter of persons aged 15 years and over report having a long lasting condition, with older persons reporting higher levels;*
- *Majority of persons (82%) report no limitations in everyday activities due to a health problem;*
- *Over a fifth (21%) of Unemployed persons report some form of mental ill-health compared to 9% of those In employment;*
- *Prevalence of hospital in-patient admissions rises with age and disadvantage level;*
- *In general, females and older people more likely to use a preventive health service;*
- *Physical activity declines with age and relative disadvantage level;*
- *Younger persons more likely to drink 6 or more units of alcohol in one sitting; and*
- *Over half of persons aged 15 years and over in the State are overweight or obese"* (CSO 2020).

**Healthy Ireland Survey 2023**

In November 2023, the Government released it's Healthy Ireland Survey Summary Report[21]. This is an interviewer-administered survey, commissioned by the Department of Health and carried out by Ipsos, of the health and health behaviours of people living in Ireland. This is the

[20]https://www.cso.ie/en/releasesandpublications/ep/p-ihsmr/irishhealthsurvey2019-mainresults/introductionandkeyfindings/ (Accessed March 2025).
[21] https://www.gov.ie/en/publication/73c9d-healthy-ireland-survey-2023/ (Accessed March 2025).

eighth set of findings and adds to the data collected in previous Healthy Ireland Surveys, published from 2015–2019 and 2021–2022; due to the COVID-19 pandemic it was not possible to complete the 2020 survey.

The Survey is a key component of the 'Healthy Ireland Framework' and informs the Healthy Ireland Strategic Action Plan, by contributing to the research, monitoring and evaluation required to assess the impact of policy implementation. Approximately 7,500 individuals representative of the population aged 15 and older are surveyed. The Survey covers a variety of health related topics, including; general health, alcohol, smoking, weight, dental, female health, skin protection, and mental health.

In terms of General Health, respondents were asked to rate their health on a 5-point scale ranging from 'very good' to 'very bad'. Overall, 80% of respondents perceived their health as 'good' or 'very good', which is a 2-point decline since 2022. 81% of men and 79% of women rated their health as 'good' or 'very good'. Overall, 4% of respondents perceived their health as 'bad' or 'very bad'. Results indicate that general 'good' health decreases with age, with 89% of 15–24-year-olds rating their health as 'good' or 'very good', in contrast to 69% of respondents aged 65 and older.

The Survey notes that those with Leaving Certificate education or higher are considerably more likely to report themselves as being in good health than those who did not attain a Leaving Certificate (85% and 66% respectively). Employment status is also stated as indicative of self-reported health, with those who are employed (88%) or students (91%) significantly more likely to report good health than those who are unemployed (71%).

With regard to the occurrence of health conditions, the Survey results indicated that 40% (2 in 5 people) have a long-standing illness or health problem confirmed by medical diagnosis. Survey results indicated that females are more likely than males to report that health conditions are limiting or severely limiting their day-to day activities (27% and 23% respectively); and respondents aged 65 and older are considerably more likely to report a long-standing illness or health problem than those aged under 45.

Overall, based on a list of 25 of the most common conditions, respondents were asked to report whether they had been medically diagnosed with a long-term illness. Of the responses, high blood pressure (9%), diabetes (5%), arthritis (6%), asthma (%), psychiatric diagnoses (such as anxiety or depression) (4%), and high cholesterol (5%) were the most common conditions reported by respondents.

#### *5.3.3.3 Environmental Factors*

##### 5.3.3.3.1 Air

The existing environment surrounding the proposed project currently has a high standard in relation to air quality and current levels of key pollutants are significantly lower than their respective limit values (as per latest EPA Air Quality Monitoring Network and annual air quality reporting data). Refer to Chapter 14 (Air Quality and Climate) for further details.

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones (A, B, C and D)[22] have been defined in Ireland for air quality management and assessment purposes (EPA, 2022).

In terms of air monitoring, the proposed project is located within Zone D (Rural Ireland). The most recent monitoring carried out by the EPA is summarised in their annual report "Air Quality Monitoring Report 2023" published in September 2024[23].

Overall, air quality in the area of the proposed project is generally good. Data reviewed and presented in Chapter 14 (Air Quality and Climate) were all well below the respective annual mean limit values for the protection of human health, in particular at the rural locations, the data from which is likely to be broadly representative of the typical background concentrations at the rural location of the proposed project.

Furthermore, the most recent live reporting by the EPA indicates that the current air quality in the vicinity of the proposed project is classified as "Good" (according to the EPA Air Quality Index for Health (AQIH) accessed March 2025)[24].

#### 5.3.3.3.2 Water

Chapter 9 (Hydrology and Hydrogeology) outlines the baseline environment in terms of the water environment. The proposed project is located across two main catchments: the River Suir and the River Nore.

There are several surface waterbodies which flow within or around the proposed wind farm site, a summary of which is provided in Chapter 9 (Hydrology and Hydrogeology). Two primary streams identified within the site are the Smithstown Stream (IE_SE_15A020100), which flows northward into the River Nore catchment, and the Smartscastle Stream (IE_SE_16S070500), which flows southward toward the River Suir catchment.

In terms of surface water quality, based on the data presented in Chapter 9 (Hydrology and Hydrogeology), the overall water quality within the study area, encompassing the proposed GCO, the Blackwater (Kilmacow) and Arrigle Rivers, and the proposed works areas along the TDR, has generally been classified as moderate to good over the past two decades, coinciding with the commencement of regular monitoring by the EPA. Data recorded in these watercourses have consistently been indicative of stable and relatively healthy ecological conditions. Chapter 9 (Hydrology and Hydrogeology) also outlines the results of surface water quality field surveys undertaken. Overall, the results indicate good water quality conditions.

In terms of groundwater quality, the WFD describes the groundwater quality status in the area of the proposed wind farm site (the Mullinavat and Inistioge groundwater bodies (GWB)) area as 'Good'. The Mullinavat and Inisitioge GWB are also classified as 'Not at risk'.

No surface water abstractions are located within the footprint of the proposed wind farm site or within a 2 km radius of its boundaries. Additionally, no elements of the proposed TDR are

[22] The main areas defined in each zone are: Zone A: Dublin; Zone B: Cork; Zone C: Other cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Naas, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise; and Zone D: Rural Ireland, i.e. the remainder of the State excluding Zones A, B and C.

[23] https://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2023.php (Accessed March 2025).

[24] https://airquality.ie/ (Accessed March 2025).

situated within a designated source protection zone or within 1 km of a public water supply (PWS).

Based on the Geological Survey of Ireland (GSI) data, a total of 13 groundwater sources, including 10 boreholes, one dug well, one spring, and one of unknown type, are located within 2 km of the proposed wind farm site. These sources are primarily used for agricultural and domestic purposes, with a few for domestic use only or unknown usage. There are no Group Water Schemes (GWS) or Public Water Supplies (PWS) located within the immediate vicinity of the proposed project.

#### 5.3.3.3.3 Noise

Chapter 12 (Noise and Vibration) outlines the baseline environment in terms of noise in the area of the proposed wind farm. The study area for the noise and vibration impact assessment is focused on the areas potentially to be affected by the construction, operational and decommissioning phases of the proposed project.

Background noise levels are measured in the vicinity of Noise Sensitive Locations (NSLs) identified in closest proximity to the proposed wind farm site, as presented in Chapter 10 (Noise and Vibration). Locations were selected to represent the noise environment at the nearest NSLs and to determine the baseline noise levels.

The existing noise sources and types identified during the baseline noise monitoring activity were typical of those heard in a rural area. Dependant on the location, in general, the main noise sources included a combination of the following:

- Local and distant traffic movements;
- Activity in and around the residences;
- Wind generated noise from local foliage; and
- Other typical anthropogenic sources typically found in such rural settings.

#### 5.3.3.3.4 Land and soils

An evaluation was carried out to assess the presence and extent of potentially contaminated land or sites within the study area, using data from the Environmental Protection Agency (EPA), including historical records and the Section 22 Register. This assessment was based on the identification of potential sources, pathways, and receptors, presented in Chapter 8 (Land, Soils and Geology). A review of the EPA's database of existing and historical licensed and unlicensed waste activities, mining operations, and industrial sites revealed no evidence of potential contamination sources or contaminating activities within the proposed wind farm site.

No contaminated soils were encountered during site investigations (SI) undertaken as part of studies for this EIAR at the proposed wind farm site. SI works and laboratory results associated with the proposed wind farm site are discussed within Chapter 8 (Land, Soils and Geology) and associated appendices.

#### 5.3.3.3.5 Traffic

Transport and access plays an important social role in urban and rural communities, linking rural areas with settlements and essential services, such as schools and healthcare facilities. Chapter 16 (Traffic and Transport) provides a detailed description in terms of local access, the wider road network, and the road network surrounding the proposed wind farm site. Local roads to be used to access the proposed wind farm site include the L3417, L7499 and L3424 local roads. GCO

One will partly use the L7499, L3417, R704 and L3418 roads. The TDR will follow the N29, N25, N9, M9, R704, L3417 roads before approaching the relevant site entrance for delivery.

Public transportation is available in the wider area around the proposed wind farm site but there are predominately limited to services provided by road. Train services are provided in the region by Irish Rail to County Kilkenny and County Waterford. Trains are available from Thomastown, located on the Dublin to Waterford line. A number of bus services operate in County Kilkenny and the local area operated by Bus Eireann, Transport for Ireland (TFI) and a number of private operators which provide a link to national routes through the county. TFI operate the 'TFI Local Link Bus Services'[25], which serves a number of stops in the county and vicinity of the proposed wind farm site including Ballyfasy, Mullinavat, Listerlin, Ballyhale, Glenmore and Kilmacow. Inter-city bus services connecting County Kilkenny to a number of destinations across Ireland are available.

Health impacts may be experienced by individual receptors using the local road network due to traffic impacts which may cause nuisance, delays and disruption to routes and access, leading to individual receptors experiencing feelings of anxiety, worry, frustration or irritation caused by such traffic disruption.

Chapter 16 (Traffic and Transport) provides a detailed description of the existing environment in relation to traffic and transport.

#### *5.3.3.4 Wind Turbine Health Effects*

The term *Wind Turbine Syndrome* first appeared in 2009, when a New York Paediatrician, Dr Nina Pierpont (Pierpont, 2009), published *"Wind Turbine Syndrome: A Report on a Natural Experiment"*. The experiment comprised speaking on the telephone with 23 people who answered her advertisement asking if they lived near a wind turbine and if they ever felt sick. Fifteen of them said they had family members who would probably answer the question posed in the affirmative. Based on these personal assessments, Dr Pierpont claimed science proved her belief that wind turbines cause a vast array of maladies. This pamphlet was not published in a peer-reviewed journal and would be considered to more closely resemble a relatively unscientific opinion poll.

In terms of research on the health effects of wind turbines generally, a review of the existing literature was performed in 2011 by Knopper and Ollson in *'Health effects and wind turbines: a review of the literature'*. The results of this study were stated as follows: *"Conclusions of the peer reviewed literature differ in some ways from those in the popular literature. In peer reviewed studies wind turbine annoyance has been statistically associated with noise but found to be more strongly related to visual impact, attitude to wind turbines and sensitivity to noise. To date, no peer reviewed articles demonstrate a direct causal link between people living in proximity to modern* wind *turbines, the noise they emit and resulting physiological health effects. If anything, reported health effects are likely attributed to a number of environmental stressors that result in an annoyed/stressed state in a segment of the population. In the popular literature, self-reported health outcomes are related to*

[25]https://www.transportforireland.ie/plan-a-journey/network-maps/kilkenny-tfi-local-link-bus-services/ (Accessed March 2025).

*distance from turbines and the claim is made that infrasound*[26] *is the causative factor for the reported effects, even though sound pressure levels are not measured."* (Knopper and Ollson, 2011).

A further study was carried out by Knopper *et al.* in 2014 which provides a *"bibliographic-like summary and analysis of the science around the issue* [of wind turbines and human health] *specifically in terms of noise (including audible, LFN* [low frequency noise] *and infrasound), EMF and shadow flicker"*. The study states that *"There is also a growing body of research that suggests that nocebo*[27] *effects may play a role in a number of self-reported health impacts related to the presence of wind turbines. Negative attitudes and worries of individuals about perceived environmental risks have been shown to be associated with adverse health-related symptoms such as headache, nausea, dizziness, agitation, and depression, even in the absence of an identifiable cause"* and *"Based on the findings and scientific merit of the available studies, the weight of evidence suggests that when sited properly, wind turbines are not related to adverse health."* (Knopper *et al.*, 2014).

In 2010, The National Health and Medical Research Council (NHMRC) of Australia published *'Wind Turbines and Health: A Rapid Review of the Evidence'* , which concluded that *"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."* (NHMRC, 2010). In 2015, the NHMRC in Australia published a systemic review of the health effects of wind farms (Merlin *et al.*, 2015). This was a thorough follow up to the 2010 '*Rapid Review*' and was independent research (i.e., no relationship to either wind farm developers, anti-wind groups or objectors). Which looked extensively at all the reported effects and systematically looked at all available evidence. The review concluded that *"The evidence considered does not support the conclusion that wind turbines have direct adverse effects on human health, as the criteria for causation have not been fulfilled"* (Merlin *et al.*, 2015).

Professor Simon Chapman of the School of Public Health and Sydney University Medical School, Australia writing in the New Scientist Magazine in October 2012 pointed out that if wind turbines did cause medical problems, we would expect to find a relationship between prevalence of the syndrome and populations living near wind farms, however this is not the case. He stated, in fact, that it is almost the case that the opposite is true. The people who should be most affected are those who live on the land where the wind turbines are actually located but this is not described in the literature. In September 2015, 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 by Professor Simon Chapman and Tersa Simonetti (of Sydney University Medical School). Another recent publication by Professor Chapman and Fiona Crichton, published in 2017 entitled 'Wind turbine syndrome: A communicated disease' provides a detailed examination of scientific evidence and critically discusses why certain health effects might often be incorrectly attributed to wind turbines.

A 2021 publication, *'Health Effects Related to Wind Turbine Sound: An Update'* (van Kamp and van den Berg, 2021), looked at literature published between 2017 and mid 2020 on the health

[26] Infrasound is sound below the audible human frequency which is normally taken as being 20 Hz or less. However, it can be associated with vibration and is sometimes an issue discussed with, for example, large tunnelling projects. Infrasound is also an everyday occurrence with everyday sources. Many of the people who cite human health problems with wind turbines relate these to infrasound and reported symptoms can include nausea, disturbance of sleep, and tinnitus (ringing in the ear).

[27] Nocebo is defined as "*A non-existent or inactive substance or factor that causes symptoms of disease in people who believe that they have been exposed to it*" (Source: Collins English Dictionary: Accessed October 2024).

impacts of wind turbine sound on local residents. This covered a range of topics such as annoyance, sleep disturbance, cardiovascular disease, and metabolic effects, as well as mental and cognitive impacts. The study indicated there may be a link between annoyance and the sound level of a wind turbine (though low frequency sound did not appear to affect this). There were no consistent results for the other topics (or data was not available). The study also showed evidence that annoyance is lower when people participate in the turbine siting process.

Another more recent UK study, *'Perceptions of Wind Turbine Noise and Self-Reported Health in Suburban Residential Areas'* (Qu and Tsuchiya, 2021) researching potential suburban health impacts associated with wind turbines found that questionnaire results were heavily influenced by whether the person knew the research aims or not. Those that were aware that the research aimed to assess wind farm impacts reported higher levels of health complaints than those that had the aim masked. This highlights the importance of considering good scientific data and studies.

**Wind Turbine Noise and Infrasound**

In 2009, a report was released by the American Wind Energy Association and Canadian Wind Energy Association – *'Wind Turbine Sound and Health Effects An Expert Panel Review'* (Colby *et al.* 2009). The report covered the extensive review, analysis and discussion undertaken by an expert panel into the large body of peer-reviewed literature on sound and health effects in general, and on sound produced by wind turbines in particular. Finding of the expert panel review included:

- That *"Wind Turbine Syndrome"* symptoms are not new, and are the same as those seen in common human stress responses. They include headaches, insomnia, anxiety, dizziness, etc.. The findings note *"Stress has multiple causes and is additive. Associated stress from annoyance, exacerbated by the rhetoric, fears, and negative publicity generated by the wind turbine controversy, may contribute to the reported symptoms described by some people living near rural wind turbines"* (Colby *et al.* 2009);
- That *"there is no evidence for direct physiological effects from either infrasound or low frequency sound at the levels generated from wind turbines, indoors or outside. Effects may result from the sounds being audible, but these are similar to the effects from other audible sounds"*. Low frequency and very low-frequency 'infrasound' produced by wind turbines are the same as other natural sources of low frequency sound including *"wind, rivers, and waterfalls in both audible and non-audible frequencies"* and other sources including *"road traffic, aircraft, and industrial machinery. The most common source of infrasound is vehicular"* (Colby *et al.* 2009);
- The review found that such 'infrasounds' or sound levels from wind turbines pose *"no risk of hearing loss or any other nonauditory effect"* and *"The levels of sound associated with wind turbine operations are considerably lower than industry levels associated with noise induced hearing loss"* (Colby *et al.* 2009);
- The review stated that media coverage of alleged adverse health effects of wind turbines creates an anticipatory fear in some that they will experience adverse effects from wind turbines and the resulting stress, fear, and hypervigilance may exacerbate or even create problems which would not otherwise exist (Colby *et al.* 2009).

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";*
- *"Ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans"; and*
- *"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."* (Colby *et al*. 2009).

In 2010, an independent review by an expert panel on behalf of Renewable UK was published, which consisted of three reviews undertaken by independent experts to provide an update and understanding of the existing scientific knowledge relating to infrasound and wind turbines. The 2010 report also discusses Dr Pierpont's 2009 publication. The independent review found the following in terms of Dr Pierpont's 2009 publication; noise from wind turbines cannot contribute to the symptoms reported by respondents by the mechanisms proposed, the scientific and audiological assumptions presented relating to infrasound are wrong, and the scientific and epidemiological methodology and conclusions drawn in the publication are fundamentally flawed (Renewable UK, 2010).

Commentary on *Wind Turbine Noise* published in the British Medical Journal (The BMJ) in March 2012 (Hanning and Evans, 2012) which was not an evidence-based study but merely an opinion piece. The piece identified that wind turbine noise seems to affect sleep and that an independent review of evidence is necessary. Professor Simon Chapman responded in a letter published in a subsequent issue of the BMJ stating *"Hanning and Evans, who declare histories of anti-wind farm activity, say that a large body of evidence now exists that wind turbines within permissible distances from housing disturb sleep and impair health. They are correct about a large body of evidence, but not in their interpretation of its conclusions. There are 17 reviews of the evidence, nearly all with an "independent" provenance. None are referenced in the editorial. These reviews strongly state that the evidence that wind turbines themselves cause problems is poor. They conclude that: Small minorities of exposed people claim to be adversely affected by turbines; …. Negative attitudes to turbines are more predictive of reported adverse health effects and annoyance than are objective measures of exposure"* (Chapman, 2012).

A 2013 study published by the South Australian Environment Protection Authority entitled *'Infrasound levels near wind farms and in other environments'* (Evans *et al*., 2013), the authors objectively measured infra-sound in a number of the different environments including urban and rural as well as in houses adjacent to windfarms and those further away. Among its conclusions were that *"Infrasound levels of between 60 and 70dB(G) commonly occur in the urban environment"* and that *"Noise generated by people and associated activities within a space was one of the most significant contributors to measured infrasound levels, with measured infrasound levels typically 10 to 15dB(G) higher when a space was occupied. Infrasound levels up to approximately 70dB(G) were measured in occupied spaces"*. When discussing the specific locations that were tested, the report stated *"At two locations, the EPA* [South Australian Environment Protection Authority] *offices and an office with a low frequency noise complaint, building air conditioning systems were identified as significant sources of infrasound. These locations exhibited some of the highest levels of infrasound measured during the study"*. For rural environments, the report concluded that while infra-sound levels were lower than urban areas, that *"Infrasound levels at houses adjacent to wind farms are no higher than those at houses located a considerable distance from wind farms"* (Evans *et al*., 2013).

A 2014 study by Health Canada on the effects of wind turbine noise on health and well-being (Health Canada, 2014) had the following key findings:

- No evidence found to support a link between exposure to wind turbine noise and any of the self-reported illnesses (such as dizziness, tinnitus, migraines) and chronic conditions (such as heart disease, high blood pressure, diabetes);
- No association was found between the multiple measures of stress (such as hair cortisol concentration (HCC), blood pressure, heart rate, self-reported stress) and exposure to wind turbine noise;
- No association was found between wind turbine noise and self-reported or measured sleep quality;
- An association was found between increasing levels of wind turbine noise and individuals reporting to be very or extremely annoyed. No association was found with any significant changes in reported quality of life, or with overall quality of life and satisfaction with health; and
- Calculated noise levels were found to be below levels that would be expected to directly affect health (WHO Community Noise Guidelines (1999)). This finding is consistent with self-reported and measured results of the study.

Furthermore, a critical review of the scientific literature published in the Journal of Occupational and Environmental Medicine (JOEM) in 2014 (McCunney, 2014) concluded that:

1. *"Infrasound sound near wind turbines does not exceed audibility thresholds;*
2. *Epidemiological studies have shown associations between living near wind turbines and annoyance;*
3. *Infrasound and low-frequency sound do not present unique health risks;*
4. *Annoyance seems more strongly related to individual characteristics than noise from turbines".*

In 2016, a publication by the Ministry of the Environment in the Federal State of Baden Wuerttemberg, Germany (Ratzel *et al.*, 2016) stated in its conclusion that infrasound and low-frequency noise "are an everyday part of our technical and natural environment" that can be found everywhere and is caused by a large number of different natural and technical sources and compared with other such sources, wind turbines make no considerable contribution to it and the level of infrasound caused by turbines is low. It further concluded that the infrasound levels generated wind turbines lie clearly below the limits of human perception, stating that *"already at a distance of 150 m, it is well below the human limits of perception. Accordingly, it is even lower at the usual distances from residential areas. Effects on health caused by infrasound below the perception thresholds have not been scientifically proven. Together with the health authorities, we in Baden-Württemberg have come to the conclusion that adverse effects relating to infrasound from wind turbines cannot be expected on the basis of the evidence at hand. The measurement results of wind turbines also show no acoustic abnormalities for the frequency range of audible sound. Wind turbines can thus be assessed like other installations according to the specifications of the TA Lärm* [German noise prevention regulations]. *It can be concluded that, given the respective compliance with legal and professional technical requirements for planning and approval, harmful effects of noise from wind turbines cannot be deduced"* (Ratzel *et al.*, 2016).

A 2018 study published in Environment International Journal (Bräuner *et al.*, 2018) examined the association between long-term exposure to wind turbine noise and the incidence of myocardial infraction (MI). The study concluded that *"the results of this comprehensive cohort study lend little support to a causal association between outdoor long-term wind-turbine noise*

*exposure and MI. However, there were only few cases in the highest exposure groups and our findings need reproduction."* Another study, published in the Journal of American Heart Association by Bräuner *et al.* (2019), investigated the association between long-term exposure to wind turbine noise and the risk of stroke and concluded that *"this comprehensive cohort study lends no support to an association between long-term WTN* [wind turbine noise] *exposure and stroke risk"*. Another article published in the Environmental Research Journal (Poulsen *et al.*, 2018) examined the potential link between wind turbine noise and adverse birth outcomes and found no associations between the two.

In relation to infrasound, the following extract from the EPA document *Guidance Note for Noise Assessment of Wind Turbine Operations at EPA Licensed Sites (NG3)* (EPA, 2011) states that *"There is similarly no significant infrasound from wind turbines. Infrasound is high level sound at frequencies below 20 Hz. This was a prominent feature of passive yaw "downwind" turbines where the blades were positioned downwind of the tower which resulted in a characteristic "thump" as each blade passed through the wake caused by the turbine tower. With modern active yaw turbines (i.e. the blades are upwind of the tower and the turbine is turned to face into the wind by a wind direction sensor on the nacelle activating a yaw motor) this is no longer a significant feature."*.

With respect to infrasonic noise levels below the hearing threshold, the World Health Organisation (WHO) document *Community Noise* (WHO, 1995) has stated that *"There is no reliable evidence that infrasounds below the hearing threshold produce physiological or psychological effects."*.

In terms of night time noise and sleep disturbance, in 2009, the WHO issued *Night-time Noise Guidelines for Europe* (WHO, 2009). The report stated that in two European countries studied (Switzerland and The Netherlands) almost 50% of the population are exposed to night-time noise in excess of 45dB $L_{night}$. It quotes some effects at quite low night-time levels and proposed an ideal noise level of 40dB $L_{night}$ outside residences. This, however, is a yearly average. It does accept that this is essentially unachievable and suggests an interim value of 45dB $L_{night}$ outside, again a yearly average.

The current Irish 2006 WEDGs state that *"A fixed limit of 43dB(A) will protect sleep inside properties during the night"*. The Draft Revised 2019 WEDGs (Ireland) propose a change to the approach in applying limits on noise from wind turbines, including during night-time. This is currently the subject of consultation and is discussed in further detail in Chapter 12 (Noise and Vibration).

In 2018, the WHO also carried out a review on environmental noise (Basner and McGuire, 2018). While the review mainly concentrated on road, rail and aircraft noise, it did briefly discuss wind turbine noise and concluded that *"The results of the six identified studies that measured self-reported sleep disturbance are consistent, four of the studies found an association between wind turbine noise levels and increased sleep disturbance. However, the evidence that wind turbine noise affects sleep is still limited. This finding is supported by other recent reviews on wind turbine noise and sleep disturbance. Three of the studies referred to noise specifically in the questions which could have led to a bias in the results. Also, while the results from four out of the six studies suggest that sleep disturbance due to wind turbine may occur when noise levels are above 40 or 45 dBA, for two of the studies less than ten percent of the participants were exposed to these higher noise levels. Therefore, it is difficult to make conclusions on populations exposed to these higher levels. In addition, noise levels were calculated using different methods and different noise metrics were reported in the studies."* (Basner and McGuire, 2018).

In October 2018, the WHO published the *'Environmental Noise Guidelines for the European Region'*, an update on the 2009 Guidelines, and noted the following: *"For the relationship between wind turbine noise and prevalence of hypertension, three cross-sectional studies were identified, with a total of 1830 participants (van den Berg et al., 2008; Pedersen, 2011; Pedersen & Larsman, 2008; Pedersen & Persson Waye, 2004; 2007). The number of cases was not reported. All studies found a positive association between exposure to wind turbine noise and the prevalence of hypertension, but none was statistically significant. The lowest levels in studies were either <30 or <32.5 $L_{den}$. No meta-analysis was performed, since too many parameters were unknown and/or unclear. Due to very serious risk of bias and imprecision in the results, this evidence was rated very low quality"……."The same studies also looked at exposure to wind turbine noise and self-reported cardiovascular disease, but none found an association. No evidence was available for other measures of cardiovascular disease. As a result, only evidence rated very low quality was available for no considerable effect of audible noise (greater than 20 Hz) from wind turbines or wind farms on self-reported cardiovascular disease"* (WHO, 2018).

The WHO 2018 Guidelines also state that *"For average noise exposure, the GDG* [Guideline Development Group] *conditionally recommends reducing noise levels produced by wind turbines below 45 dB $L_{den}$ as wind turbine noise above this level is associated with adverse health effects"*. The GDG do note however that aside from a potential for annoyance, the evidence relating to any health effects associated with wind turbine noise is either absent or of poor quality. There is therefore a possibility that the effects caused by attitudes towards wind farms may be difficult to tell apart from any potential effects from wind turbine noise. The GDG also note that there are more people exposed to noise from sources such as road traffic than from wind turbines and any benefits associated with reducing exposure to wind turbine noise may be unclear. Taking account of the above, the GDG recommends that the development of any policies for wind energy development ensure that noise exposure is kept below guideline values. They note that this can be achieved via multiple methods, but they don't specify that any particular methods should be used. It is concluded that there will be no significant adverse effect on human health as a result of sleep disturbance during the operational phase of the proposed wind farm. The most recent literature is thought to represent large modern turbines, and so there is no reason to suggest that it does not represent the full range of turbine dimensions being proposed.

The referenced publications and studies above outline that there appears little scientific evidence of effects of *Wind Turbine Syndrome* , and wind farms are not a significant source of noise and infrasound, and that traffic and everyday human activity are likely to be more relevant.

Further discussion on noise and infrasound is presented in Chapter 12 (Noise and Vibration).

**Electromagnetic Interference**

When electric current flows, both electric and magnetic fields are produced. The electromagnetic fields (EMF) from electricity are in the extremely low frequency end of the electro-magnetic spectrum. EMF occurs in the home, in the workplace or anywhere that electricity is used. EMF is also naturally generated from earth's geomagnetic field and electric fields from storm clouds.

Guidance from the WHO states that EMF is sometimes cited for potential health effects (WHO, 2007). Concerns expressed in the past include childhood leukaemia, brain tumours and other cancers. Laboratory experiments have provided no reliable evidence that EMF are capable of producing cancer, nor do human epidemiological studies suggest that they cause cancer in

general. Furthermore, the Health Promotion Agency in the UK stated, in November 2007, that *"there is little scientific evidence to support these claims and the current body of evidence does not show that exposure to EMF below guideline levels presents a human health hazard"*.

The aforementioned Australian NHMRC study (Merlin *et al*., 2015) concluded in relation to EMF that *"There is no direct evidence on whether there is an association between electromagnetic radiation produced by wind farms and health outcomes. Extremely low-frequency electromagnetic radiation is the only potentially important electromagnetic emission from wind turbines. Limited evidence suggests that the level of extremely low-frequency electromagnetic radiation close to wind farms is less than average levels measured inside and outside Australian suburban homes. There is no consistent evidence of human health effects from exposure to extremely low-frequency electromagnetic radiation at much higher levels than is present near wind farms."*

EirGrid has produced a number of publications EMF and health, most recently *"The Electricity Grid and Your Health"* (May 2019) which provides more information on EMF and electricity in terms of health and states that *"the consensus from health and regulatory authorities is that extremely low frequency EMFs do not present a health risk"*. Information on EMF currently provided by EirGrid[28] states that *"the most common concern about EMFs from power lines is a fear that magnetic fields could be associated with childhood leukaemia"*, however, *"recent studies conducted in the UK, France, Denmark and the US have not established associations between a home near transmission lines and childhood leukaemia" and "Based on this history and its own review of research, the World Health Organization states there is no evidence to conclude that exposure to low-level EMFs is harmful to human health"* (EirGrid, 2024).

**Shadow Flicker**

'Shadow flicker' is an effect that occurs when the rotating blades of a wind turbine cast a moving shadow over an observer or a building. The effect is predominantly experienced indoors where a moving shadow passes over a window in a nearby property and results in a rapid change or flicker in the incoming sunlight. Shadow flicker is predominantly an annoyance, but concerns have been raised that the flicker can trigger seizures in persons with photosensitive epilepsy.

The Wind Energy Guidance Note prepared in the UK for the Renewables Advisory Board and Department for Business, Enterprise and Regulatory Reform (BERR) in 2007 states that *"The operating frequency of a wind turbine will be relevant in determining whether or not shadow flicker can cause health effects in human beings. The National Society for Epilepsy advises that only 3.5 % of the 1 in 200 people in the UK who have epilepsy suffer from photosensitive epilepsy. The frequency at which photosensitive epilepsy may be triggered varies from person to person but generally it is between 2.5 and 30 flashes per second (hertz). Most commercial wind turbines in the UK rotate much more slowly than this, at between 0.3 and 1.0 hertz. Therefore, health effects arising from shadow flicker will not have the potential to occur unless the operating frequency of a particular turbine is between 2.5 and 30 hertz and all other pre-conditions for shadow flicker effects to occur exist." The note also states that "Shadow flicker is therefore more likely to be relevant in considering the potential effects on residential amenity [than human health]"*.

Similarly, the aforementioned Australian NHMRC study (Merlin *et al*., 2015) discusses shadow flicker and states that *"The Environment Protection and Heritage Council of Australia (EPHC; 2010) notes that the risk of seizures from modern wind turbines is negligible, given that less than 0.5% of the*

[28] https://www.eirgrid.ie/emfs (Accessed March 2025).

*population are subject to epilepsy at any point in time and, of this proportion, 5% are vulnerable to strobe lighting (light flashes). In the majority of circumstances (>95% of the time), the frequency threshold for individuals susceptible to strobe lighting is >8 Hz, with the remainder affected by frequencies >2.5 Hz. The EPHC estimates that the probability of conventional horizontal-axis wind turbines causing an epileptic seizure for an individual experiencing shadow flicker is <1 in 10 million in the general population."*

The 2006 WEDGs state that *"At distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low"* (DHLGH, 2006), The Draft Revised 2019 WEDGs state *"Generally only properties within 130 degrees either side of north, relative to the turbines, can be affected at these latitudes in the UK and Ireland- turbines do not cast long shadows on their southern side"*. Additionally, the Draft Revised 2019 WEDGs state *"the time period in which a neighbouring property may be affected by shadow flicker is completely predictable from the relative locations of the wind turbine and the property. Modern wind turbines have the facility to measure sunlight levels and to reduce or stop turbine rotation if the conditions that would lead to shadow flicker at any neighbouring property occur. With careful site design and appropriate mitigation, and most critically the use of appropriate equipment and computer software, no existing dwelling or other affected property (e.g. existing work places or schools) should experience shadow flicker"*.

Modelling can be used to predict the strength and duration of potential shadow flicker during daylight hours for every day of the year (DHLGH, 2019). A Shadow Flicker Study detailing the outcome of modelling for the potential for shadow flicker from the proposed wind farm has been undertaken. Further discussion on the modelling outcomes and assessment of Shadow Flicker effects is presented in Chapter 10 (Shadow Flicker).

**Psychological Effects**

The potential for adverse effects on psychological health, such as anxiety and stress, caused by concern in relation to visual appearance, noise emissions, shadow flicker and other issues, is often highlighted in relation to wind farms. A community may also experience annoyance arising from increased traffic or noise from the construction works. The potential effects on a person's overall psychological well-being is difficult to assess as there are no direct measurements that can be used. While it is possible to predict noise emissions and shadow flicker, for example, the same scientific certainty cannot be used in predicting psychological impacts. The aforementioned 2014 Health Canada report referenced above looked at a number of measures of stress and noted no association with exposure to wind turbine noise.

The potential degree of psychological impact can be both positive and negative. There can be a positive impact, whereby people may look forward to better employment opportunities generated by a major infrastructure development in a rural area or the benefits that may be gained from the Community Benefit Funds. In terms of negative impacts, this can be where somebody is annoyed by for example, the visual appearance of the wind turbines. This annoyance is not a medical health impact, as such. If a person were to develop a psychological illness, such as anxiety or depression, this would be a medical health impact.

In this case, it is useful to look at experience from other operational wind farms to determine if significant psychological effects are reported and published. If this was the case, it would be expected to find recorded evidence of increased levels of depression or anxiety in the vicinity of other wind farms, however, definitive findings on such were not evident in the peer-reviewed literature referenced above.

## 5.4 POTENTIAL EFFECTS

### 5.4.1 Do nothing Scenario

In the Do-Nothing Scenario, the existing lands will continue to be utilised for existing land uses, including agriculture and forestry, with little or no changes in the baseline at the site.

In terms of forestry, activities such as periodic tree felling (Coillte lands) will continue with the movement of equipment and personnel associated with same.

Opportunities for local employment and additional economical spend associated with the proposed project will not occur.

National and local health benefits associated with replacing fossil fuels with renewable wind energy, as well as the provision of renewable electricity supply to the grid, from the proposed project will not be realised and alternative candidate sites will need to be identified, either onshore or offshore, to ensure Ireland meets it commitments to reducing carbon emissions.

### 5.4.2 Population

#### *5.4.2.1 Construction Phase*

##### 5.4.2.1.1 Land Use

The construction of the proposed wind farm will involve short-term land use change primarily for the excavation of two borrow pits areas, two temporary construction compounds, three temporary deposition areas, turbine foundations and hardstandings, the construction of internal access roads, on-site electrical substation, and associated ancillary services.

The two borrow pit areas and one deposition area located in the east will be reseeded with grass and reinstated to its existing form on completion of the construction phase which is anticipated to last for approximately 24 months.

Following the construction of the wind farm, the two temporary construction compounds and adjacent deposition areas within the wind farm will be replanted with native forestry as part of a biodiversity enhancement proposals (see Chapter 6 Biodiversity).

Although there will be long-term changes to land use within the proposed wind farm site boundary to facilitate the construction of turbines and associated infrastructure, it is not predicted that the construction phase will impact on existing land uses in the surrounding or wider area.

Proposed GCO One will require works beyond the proposed wind farm site boundary, as a section of the proposed GCO One (approximately 8.45 km) will be installed in the public road network and approximately 3.55 km within third party lands. Proposed GCO Two does not require works beyond the proposed wind farm site boundary, as it will connect into the existing 110 kV Great Island-Kilkenny overhead line which passes over the east of the proposed wind farm site. This cable will cross approximately 2.3 km of third party lands.

Facilitating of works will be required at the proposed TDR works areas on the public road network and at private properties to accommodate the delivery of turbine components at 13 no. areas (see Appendix 2-1 of the EIAR).

It is not anticipated that the proposed project will have a significant effect on the land use associated with the proposed GCO One and proposed TDR works areas where required along

public road corridors and at private properties during the construction phase. Some temporary localised diversions and traffic management will be utilised in some road sections. This will have a permanent slight neutral effect.

There will be changes to the land use for the farmland and forestry being utilised for the proposed wind farm, as those lands will then be used to accommodate electrical infrastructure. This will have a permanent slight neutral effect.

Overall, it is not anticipated that the proposed project will have a significant effect on land use. Any likely effects on population receptors in terms of land use are therefore predicted to be neutral, imperceptible and short-term.

Chapter 8 (Land, Soils and Geology) outlines the baseline environment in terms of land use and contains a detailed assessment of impacts associated with the proposed project on lands, soils and geological receptors.

#### 5.4.2.1.2 Population Trends

It is anticipated that those working on the construction phase of the proposed project will commute from the local area or wider region daily. Where relevant, some individual personnel may choose to live locally or commute for a portion or duration of the construction phase (24 months).

It is not predicted that the construction phase of the proposed project will have an significant impact on local or wider population trends, such as population levels, density, age or household size. Any likely effects on population trends in the area would be direct, neutral to positive, imperceptible, and short-term.

#### 5.4.2.1.3 Property Receptors & Residential Amenity

Negative effects on local property receptors (including residential, educational, and commercial properties) as a result of the construction works can arise from construction activity at the wind farm site, as well as on the local road network, such as from increased traffic movements associated with vehicles accessing the wind farm site or works associated with the proposed GCO One (if constructed) and the proposed TDR works areas, resulting in potential increases in emissions locally (e.g., noise, vibration and emissions to air (including dust)). This may also have potential to impact on local residents' enjoyment of their homes, i.e., residential amenity. Residential amenity relates to the human experience of a person'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 site setting and local character, land-use activities in the area and the relative degree of peace and tranquillity experienced at the residence.

Due the size of the development area, the proposed wind farm site will be accessed via five site entrances and three temporary road crossings to enable construction works at separate sections of the site. This will also help minimise congestion and traffic levels on the local road network at any particular entrance.

The haul routes proposed are existing public roads which are already used by heavy goods vehicles (HGVs), however, there will be a short-term increase in (traffic volume) effects during the construction phase due to increased vehicle trips in the vicinity and on-site construction activity.

The design of the proposed wind farm site has included a minimum set-back distance of 720 m (i.e., four times the tallest tip height being considered) between the curtilage of sensitive property receptors and the 10 proposed turbine locations, which will reduce the potential for construction of the wind turbine infrastructure to have a significant effect on residential amenity.

As mentioned, there will be some additional works required off site to facilitate the proposed GCO One (if chosen), and turbine delivery (see Chapter 2 (Description of the Proposed Project)). Furthermore, the works are small scale and transient in nature, and mostly constitute temporary works along the public road. They may result in temporary localised noise and dust emissions, and there may also be some traffic management implications for road users. These effects are assessed in detail in the Chapter 14 (Air Quality and Climate), Chapter 12 (Noise and Vibration), Chapter 13 (Landscape and Visual Impact Assessment) and Chapter 16 (Traffic and Transport).

Although the proposed GCO One and proposed TDR works areas will be located near sensitive receptors, they will be similar to any other normal road works that might be carried out. Significant impact on property receptors and residential amenity associated with these works is unlikely. Any likely effects on property receptors in the area of these proposed works would be direct, negative, temporary and not significant.

Overall, based on the predicted effects outlined above (inc. dust, noise, road traffic etc.), and given the distance between sensitive property receptors and the proposed wind farm site, significant impact on sensitive property receptors and residential amenity associated with the construction phase of the proposed wind farm is unlikely. Any likely effects on property receptors / residential amenity in the area would be direct, negative, slight, and short-term.

#### 5.4.2.1.4 Property values

It is not anticipated that the construction works for the proposed wind farm will have a significant effect on local property values. A major UK study entitled *"The Effect of Wind Farms on House Prices"* carried out in March 2014, discussed in more detail in Section 5.3.2.4.1, noted that *"The econometric analysis established that construction of wind farms at the sites examined across England and Wales has not had a detectable negative impact on house price growth within a 5 km radius of the sites"*. Furthermore, the 2023 CERIS working paper entitled *'Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach'* found that there are *"no significant reduction in house price beyond 1 km for all specifications"* and the results indicate that the effects on house value is not persistent and diminishes over time.

Therefore, based on the available published studies discussed in this chapter, it is reasonable to infer that the construction phase of the proposed wind farm will similarly not have a significant effect on local property values.

Construction works for the wind farm will be carried out within the site boundary and traffic associated with travel to the site will use existing public roads. Works associated with the proposed GCO One and the proposed TDR works areas will be localised, relatively minor and temporary. Works associated with GCO Two will be within the proposed wind farm site boundary.

Based on the above, it predicted that significant effects on property value in the area due to the construction phase of the proposed wind farm are unlikely. Any effects on property value in the area would likely be direct, negative, slight, and short-term.

#### 5.4.2.1.5 Employment / Economy

The proposed project will create and support direct and indirect employment during the construction phase at local level, primarily through local construction workforce on site, and at regional and national level, through more specialised construction services and supply of building materials.

It is anticipated that the wind farm will have the following effects locally:

- Development activities such as site monitoring/surveys, site investigations, legal fees, consultancy studies during pre-construction and construction works, etc.;
- Spending locally by construction employees; and
- Accommodation and sustenance will be required in the locality for those workers on site.

Guidance from a 2009 IWEA and Deloitte study[29] states "*Our analysis has shown that the wind energy sector in Ireland can support 1.50 jobs per MW to be installed on the island*". This number includes construction, operation and maintenance of all wind farms. Based on the proposed wind farm's estimated maximum capacity of 72 MW, this equates to approximately 108 jobs across a number of different sectors (including development (contracts, financing etc), planning, construction, operation and maintenance, support services, and research and development (R&D)). Construction provides the majority of the jobs opportunities available from the wind energy sector (IWEA and Deloitte, 2009). The IWEA and Deloitte study (2009) estimated that 68% of the Irish wind energy jobs created are within the construction sector. It is therefore estimated that approximately 74 persons will be directly employed during the construction period.

Throughout the construction phase, there is potential for materials such as quarried products and concrete supplies, as well as machinery and equipment and associated operatives, to be sourced locally, which will support local business, as well as direct and indirect employment. Furthermore, the local area and region will experience a benefit from secondary investment associated with increased visitors and spend within the area, as well as potential increased activity in the local hospitality and café/restaurant service industries driven by use of these by construction staff. The proposed wind farm will be a valuable contribution to Kilkenny County Council's economic aims for further development of its green economy.

The construction of the proposed wind farm will have an estimated capital cost in the region of up to €93.6 million[30] and an estimated 11% of the total capital cost will relate to civil engineering works (i.e., site works) (The Irish Wind Farmers' Association (MnaG), n.d.)[31] which has the potential to support local contractors and suppliers. The *"Life-cycle of an Onshore Wind Farm published"* by IWEA in March 2019 stated that *"One recent 169 MW windfarm project estimated that €20 million was spent with local suppliers and contractors within 30 kilometres of the site during construction"*.

Therefore, it is predicted that the construction phase of the proposed project is likely to have direct and indirect positive, slight to moderate, short-term effects on employment and economy in the local area, wider County, and South East Region.

[29] IWEA and Deloitte, *Jobs and Investment in Irish Wind Energy: Powering Ireland's Economy* (2009).
[30] Using an average investment cost of €1.3 million per MW – SEAI, *A Macroeconomic Analysis of Onshore Wind Development to 2020* (2015).
[31] Irish Wind Farmers Association - FAQ | Meitheal na Gaoithe Irish Wind Farmers Association (mnag.ie) - https://mnag.ie/frequently-asked-questions/ (Accessed March 2025).

#### 5.4.2.1.6 Tourism / recreation

As set out in Section 5.3.2.6, there are a number of relevant tourist attractions and public amenities in County Kilkenny and in the wider area surrounding the wind farm site (e.g., attractions have been noted within 10 km). The nearest visitor site identified is approximately 4 km away. The closest trails/walks identified to the proposed wind farm site is approximately 4.5 km.

No existing designated tourist sites or walkways/trails were identified as intersecting with or within the wind farm application boundary.

Intermittent and temporary traffic effects due to movement of vehicles, as well as plant and machinery, related to the proposed project, and the requirement for abnormal loads related to the delivery of the turbines to site may impact local road traffic during the construction phase due to the increased road traffic movements. Abnormal loads will occur at set times and along designated routes. Therefore, there is potential for effects to local and tourist road users in the area during these periods.

No other direct effects on tourism activity are anticipated during the construction phase. Therefore, it is predicted that the construction phase of the proposed project is likely to have an indirect, neutral to negative, not significant, short-term effect on local tourism.

### *5.4.2.2 Operational Phase*

#### 5.4.2.2.1 Land Use

Original land use where the installed permanent infrastructure is located will change, with the exception of the two proposed borrow pits, two temporary construction compounds and deposition areas, and any other works areas (see Chapter 2 Description of the Proposed Project), which will be reinstated post construction.

Figure 2-1 (see Chapter 2 Description of the Proposed Project) outlines the final configuration of the internal roads.

Significant impact on land use at the proposed wind farm site associated with the operational phase of the proposed project is unlikely. The proposed project will not result in permanent land use change in the wider area beyond the proposed wind farm site boundary. Operational phase effects on population in terms of change of land use at the site are therefore likely to be positive, slight to moderate, and long-term.

#### 5.4.2.2.2 Population Trends

A survey of the public perception of wind power in Scotland and Ireland carried out by researchers at the University of St. Andrews, Fife and The Macaulay Institute, Aberdeen (Warren *et al*., 2005) found that large majorities of people are strongly in favour of their local wind farm and that positive attitudes to wind power increase through time and with proximity to wind farms. Retrospective questioning regarding pre- and post-construction attitudes at existing wind farms noted that those who changed to a more positive attitude following construction of the wind farm, gave reasons 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%)"* (Warren *et al*., 2005).

The proposed project has the potential to bring significant positive benefits to local communities through provision of a Community Benefit Fund, proposed in line with industry

best practice, which is in accordance with the terms and conditions of the Government's Renewable Electricity Support Scheme (RESS). The Ballyfasy Wind Farm Community Benefit Fund proposal is set out in Appendix 1-7 Community Engagement Report of this EIAR. Support from the Community Benefit Fund could potentially make the local area attractive for people to move to, which may result in a marginal increase in local population numbers.

It is not anticipated that the proposed project will have a significant effect on population trends locally or in County Kilkenny. Operational phase effects in terms of population trends are therefore likely to be neutral, not significant to slight, and long-term.

#### 5.4.2.2.3 Property Receptors & Residential Amenity

The turbine layout at the proposed wind farm site has been designed with cognisance of the local population and sensitive receptor locations. As mentioned, the Draft Revised 2019 WEDGs recommend a minimum setback distance of four times the tip height from a proposed turbine to the curtilage of any residential property and the proposed wind farm complies with this recommendation. Extensive consideration has been given to the layout of the site and the positions of the 10 no. turbines in ensuring sufficient set-back distances from sensitive receptors and adjustment for noise, shadow flicker, visual impact and telecommunication impacts.

A minimum setback distance of 720 m has been applied based on a maximum turbine tip height of 180 m considered for the proposed project (i.e., 180 m x 4 = four times the tip height) and will therefore provide an adequate setback distance.

These considerations during the design, planning and EIA phase, in accordance with the relevant guidelines, are designed to minimise the potential effects on property receptors and residential amenity from the proposed wind farm.

There will be a potential for low levels of additional traffic on local roads (i.e., for site maintenance).

As mentioned, a Ballyfasy Wind Farm Community Benefit Fund will be established in accordance with the terms and conditions of the Government's RESS. The Community Benefit Fund will be positive for those residing in the local area. Those living in closest proximity should be priority beneficiaries and as such some of the fund is designated for 'Near Neighbour' payments. However, broader community benefits apply as well. A Community Benefit Fund worth €2/MWh (megawatt hour) of generated electricity for the operational period has been pledged by the applicant. The potential effects on human beings at their residences during the operational phase are assessed in the following chapters; Chapter 14 (Air Quality and Climate), Chapter 12 (Noise and Vibration), Chapter 13 (Landscape and Visual Impact Assessment) and Chapter 16 (Traffic and Transport).

Impacts in terms of environmental factors and human health are discussed in Section 5.4.3.

A significant effect on local property receptors and residential amenity during the operational phase is unlikely. Any likely effects in terms of property receptors and residential amenity during the operational phase are therefore considered to be negative, slight, and long-term.

#### 5.4.2.2.4 Property values

Based on the literature reviewed, it is not anticipated that the operational phase of the proposed wind farm will have significant effect on local property values.

A major UK study entitled *"The Effect of Wind Farms on House Prices"* carried out in March 2014, discussed in more detail in Section 5.3.2.4, noted that *"The econometric analysis established that construction of wind farms at the sites examined across England and Wales has not had a detectable negative impact on house price growth within a 5 km radius of the sites"*. Furthermore, the 2023 CERIS working paper entitled *'Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach'* found that there are *"no significant reduction in house price beyond 1 km for all specifications"* and the results indicate that the effects on house value is not persistent and diminishes over time.

Therefore, based on the available published studies presented in this chapter, it is reasonable to conclude that significant effects on property value in the area due to the operational phase of the proposed wind farm are unlikely. Any effect on property value in the area would likely be direct, negative, slight, and short to medium-term.

#### 5.4.2.2.5 Employment / Economy

It is anticipated that there will be ongoing local employment on the site throughout the operational phase of the proposed wind farm relating to turbine servicing/maintenance, breakdowns/faults, inspections, and substation maintenance, as well as maintaining the internal access roads, drainage, and other ongoing site work. Once operational, it is estimated that the wind farm will support 20-26 jobs in operation and maintenance (based on 0.36 jobs per MW[32]).

Although only a small proportion of these jobs are likely to be directly based in the wind farm site, it is likely that the operational phase will support indirect jobs, such as suppliers, consultants, research institutions and universities, financial services, energy sector roles, and hospitality and service industry roles, and benefit the wider employment profile.

Furthermore, there may occasionally be a requirement for additional people to visit site if a particular task requires it. Some local employment or contract opportunities may develop over the lifetime of the wind farm from occasional specific requirements.

Economic benefits from operational activities will include ongoing purchases of local materials, supplies, services and equipment required for the operational phase of the wind farm, as well as local spend generated from technical operational and maintenance staff such as on local hospitality facilities, accommodation and services (e.g., by maintenance workers and contractors).

The impact of the Community Benefit Fund is likely to enhance the local economy, with potential for substantial funding for local projects in support of relevant UN Sustainable Development Goals (SDGs), clubs, charities and near neighbours, which will be invested in the local area.

In addition, the proposed wind farm will require payment of rates to Kilkenny County Council which will provide additional revenue for their work around the county.

Positive economic effects will also be felt in the wider area due to the ongoing benefits of renewable electricity generation. The energy generated will feed directly into the national electricity transmission system, providing a sustainable electricity source and a low impact

32 https://opus.lib.uts.edu.au/bitstream/10453/43718/1/Rutovitzetal2015Calculatingglobalenergysectorjobsmethodology.pdf.

energy supply to the country's domestic and industrial consumers. This is a significant, positive long-term effect for electricity consumers.

Therefore, it is anticipated that the operational phase of the proposed wind farm is likely to have direct and indirect positive, slight to moderate, long-term effects on employment and economy in the local area, County, the South East Region, and nationally.

#### 5.4.2.2.6 Tourism / recreation

As noted previously, Fáilte Ireland surveyed tourists' perceptions in relation to wind farms in the Irish landscape in 2007 and 2012. Results were positive, with approximately 80% of tourists considering the presence of wind farms to either have no impact or a positive impact on their sightseeing.

In addition, when asked if further wind farm development in Ireland would influence their decision to holiday in Ireland again, over 70% of responses cited no impact or a positive impact on their return to Ireland. Similarly, the 2017 study carried out by BiGGAR Economics examined the link, if any, between onshore wind energy development and the sustainable tourism sector in Scotland and did not find a direct relationship between tourism and the wind energy sector in itself. However, it did conclude that the increase in wind farm development did not negatively impact employment in the sustainable tourism industry in Scotland (BiGGAR, 2017).

As noted previously, there are a number of relevant tourism attractions and public amenities in County Kilkenny and in the wider area surrounding the wind farm site (e.g., attractions have been noted within 10 km). The nearest visitor site identified is approximately 4 km away. The closest trails/walks identified to the proposed wind farm site are approximately 4.5 km.

The proposed wind farm will be visible from a number of features in the area (as discussed in Chapter 13 (Landscape and Visual Impact Assessment) of this EIAR.

The proposed project is not anticipated to have a significant impact on tourism and amenity in the local area or wider region. It is considered that the proposed wind farm will likely have a neutral, slight, long-term effect on the tourism experience and numbers in the vicinity of the proposed wind farm site.

## 5.4.3 Human Health

### *5.4.3.1 Construction Phase*

#### 5.4.3.1.1 Air quality and dust

The construction of the turbine infrastructure and erection of the turbines will take place away from residential properties with at least 720 m or greater distance from the proposed turbines to all sensitive properties. Dust is typically predictable in its dispersion and studies show that the majority of dust deposition occurs close to its creation. The nature of dust creation and deposition depends on the type of works, ground conditions and weather conditions.

There is at most a medium risk of dust soiling impacts and a low risk of dust-related human health impacts associated with the proposed works. As a result, best practice dust mitigation measures associated with medium-risk works will be implemented to ensure there are no significant impacts at nearby sensitive receptors. In the absence of mitigation, dust impacts are predicted to be direct, short-term, negative and slight.

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase, particularly due to the increase in HGVs accessing the proposed wind farm site. The construction stage traffic has been reviewed and a detailed air quality assessment has been scoped out. None of the road links impacted by the proposed project satisfy the Transport Infrastructure Ireland (TII) scoping assessment criteria as described in Chapter 14 (Air Quality and Climate). It can, therefore, be determined that the construction stage traffic will have a short-term, direct, negative and imperceptible effect on air quality.

#### 5.4.3.1.2 Noise and Vibration

In general, the distances between the construction activities associated with the proposed project and the nearest noise sensitive locations (NSL's) are such that there will be no significant noise and vibration effects at NSL's. The source noise levels referred to in Chapter 12 (Noise and Vibration) are indicative of the type of plant items and activities associated with the construction of the proposed project. The highest predicted noise levels are expected to occur for only short periods of time at a very limited number of properties. Construction noise levels will be lower than these levels for most of the time at most properties in the vicinity of the proposed project (see Chapter 12 (Noise and Vibration) for further details).

Noise and vibration effects in terms of the construction phase activities at the wind farm site (including general construction of turbines and hardstand areas, construction of site roads, borrow pits, substation construction, onsite cabling, onsite grid connection, and construction traffic) will be negative, short-term to temporary, and not significant.

There will be works required at the proposed TDR works areas and along the route of the proposed GCO One (GCO One is external to the proposed wind farm and utilised the local road network, GCO Two lies within the proposed wind farm site) during the construction phase, however, these will be short-term in nature. This will result in a potential temporary, not significant, negative effect on human health associated with noise and vibration.

#### 5.4.3.1.3 Water Quality

During the construction phase of the proposed project, risk of accidental pollution impacting local water quality could potentially arise from the following sources:

- Accidental release of oils, fuels, and other contaminants from construction phase vehicles (on-site and off-site);
- Spillage or leakage of chemicals and fuel / hydrocarbons stored on site;
- Run-off from materials and waste temporarily stored onsite;
- Spillage or leakage of oils and fuels stored and used in the refuelling, operation, and maintenance of construction plant, machinery and vehicles; and
- Spillages arising during the delivery and use of concrete and cement for turbine foundations, roads and hardstanding areas.

The key receptors in terms of water quality impacts and human health are the construction personnel due to the potential for direct contact with polluting substances and water during the construction activities, as detailed in Chapter 9 (Hydrology and Hydrogeology). It is anticipated that any incidents related to accidental release, mobilisation, spillage or leakage of substances would likely be localised, contained, and managed in line with mitigation set out within Chapter 9 (Hydrology and Hydrogeology) and the CEMP (Appendix 2-6). Significant adverse effects on human health due to water quality effects associated with the proposed project is unlikely. Any likely effects related to water quality impacting on human health, from a polluting incident,

would be negative, indirect or direct depending on the incident, temporary to short-term, and not significant to slight.

#### 5.4.3.1.4 Land / Soils

Human health-related impacts associated with soil contamination during the construction activities are primarily associated with dust from material extraction and transport of soils and excavated rock, which is discussed under Air Quality above and in Chapter 14 (Air Quality and Climate), and risks of spills or leaks from construction vehicles, plant, and machinery, which could result in localised contamination of soils. Other negative effects include the typical risks to construction personnel associated with earthworks and large excavations such as falling from heights, engulfment, drowning. The key receptors in terms of soil impacts on human health are the construction personnel due to the potential for direct contact, ingestion or inhalation with polluting substances and soil (which may potentially contain hydrocarbon concentrations from site activities (potential minor leaks and spills of fuels, oils, and paint)) during the construction activities, e.g., excavation / earthworks activities. It is anticipated that any incidents related to accidental release, mobilisation, spillage or leakage of substances would likely be localised, contained, and managed in line with mitigation set out within Chapter 8 (Land, Soils and Geology) and the CEMP (Appendix 2-6).

Taking account of the baseline environmental setting and the proposed mitigation measures during the construction phase, human health risks associated with exposure to contaminants (i.e., via direct contact, ingestion, or inhalation), as well as typical risks described (e.g., falling from heights), resulting from the proposed project are not anticipated, and significant adverse effects on human health due to soil quality effects associated with the proposed project are unlikely. Any likely effects related to soil quality, excavation and earthworks impacting on human health, such as from a polluting incident, would be localised, negative, imperceptible to slight, temporary to short-term, not significant, and unlikely to cause a discernible change to health status of human health receptors.

#### 5.4.3.1.5 Traffic

Negative effects on road users in terms of traffic are primarily due to traffic delays associated with construction works and vehicle movements, and the associated traffic management measures, such as signage and diversions. Traffic movements associated with the construction phase of the proposed project, such as those associated with the proposed TDR, the proposed TDR works areas, and works along the route of the GCO One , have the potential to cause impact to local road users.

None of the junctions impacted were above the 10% threshold set out in Traffic and Transport Assessment Guidelines (TII, 2022). Construction haul route traffic assessment found that average and peak traffic volumes will not be significant and temporary to short-term in duration. Chapter 16 (Traffic and Transport) provides a detailed assessment of impacts associated with construction phase traffic. Effects associated with traffic volumes is variable and is assessed in terms of peak and average activities. Peak traffic volumes are considered the worst-case scenario the proposed project is envisaged to generate with regards to traffic. Outside of the peak scenario, traffic associated with the proposed project will be below this worst-case impact. During the construction programme, there will be days when construction generated traffic will be lower than the average traffic. Advanced works to accommodate Abnormal Indivisible Loads (AILs) would be considered imperceptible due to limited works required on the routes.

Significant adverse effects on road users human health related to construction phase traffic are considered unlikely. Any likely effects associated with construction phase traffic on sensitive receptors would be negative, not significant, and temporary to short-term.

The appointed Contractor and haulage company will be responsible for the temporary traffic management, agreements, and licensing with the Local Authorities and an Garda Síochána during the construction phase.

#### 5.4.3.1.6 Health and Safety

All activities carried out by the appointed Contractor on the proposed project will be in accordance with the requirements of the *Safety, Health and Welfare at Work Act 2005* as amended and Regulations made under this Act. The CEMP sets out the Health and Safety requirements for the project including the erection of fencing, signage and notification of commencement of works to the Health and Safety Authority (HSA). This will apply to whatever final turbine dimensions are chosen from the entire proposed range of turbine dimensions.

The proposed TDR to allow for the transport of the turbines to the proposed wind farm site will involve some works as discussed in Chapter 2 of the EIAR (Description of the Proposed Project). These works will be carried out to the relevant construction and road safety guidelines. When the turbine components are being transported, they will have a Garda escort, and will be carried out at night when there is less traffic on the road. The proposed turbine delivery works allow for the entire range of proposed turbine dimensions.

With adherence to the proper health and safety guidelines throughout the construction phase of the proposed project, significant adverse effects in terms of health and safety related to construction phase are considered unlikely.

### *5.4.3.2 Operational Phase*

#### 5.4.3.2.1 Air quality and dust

The existing environment surrounding the proposed project currently has a high standard in relation to air quality and current levels of key pollutants are significantly lower than their respective limit values (as per latest EPA Air Quality Monitoring Network and annual air quality reporting data). Refer to Chapter 14 (Air Quality and Climate) for further details.

There will be little to no emissions to air during the operational phase of the proposed wind farm. Any emissions will mainly result from occasional maintenance vehicle use associated with maintenance personnel's occasional visits, inspections and maintenance work required at the proposed wind farm. Any vehicular activity has the potential to create nuisance dust and exhaust emissions locally, however, vehicle movements associated with the operational phase are anticipated to be intermittent and consistent with typical vehicle use and frequency within the local environment.

Furthermore, by definition of the Transport Infrastructure Ireland (TII) criteria referenced in Chapter 14 (Air Quality and Climate) and Chapter 16 (Traffic and Transport), there are no road links deemed as affected as a result of the proposed project. Therefore, no further assessment using the 2022 TII guidance was required for the operational phase of the proposed project as there is no potential for significant effects to air quality as a result of vehicle emissions. Therefore, effects are considered long-term, direct, negative and imperceptible.

Therefore, significant adverse effects related to air and dust emissions impacting human health during the operation phase are considered unlikely. Any likely effects associated with air quality are anticipated to be indirect slight, positive, and long-term.

Chapter 14 (Air Quality and Climate) provides a more detail in relation to operational phase air quality and associated emissions.

#### 5.4.3.2.2 Noise and vibration

The findings of the noise and vibration assessment Chapter 12 (Noise and Vibration) confirmed that with the exception of locations H270, H271, H272 and H557, it is considered that no significant effect is associated with the operation of proposed project, since the predicted turbine noise levels will be within the relevant best practice noise criteria curves for wind farms for the worst case turbine type.

At the four locations identified with potential exceedances, which is presented as the worst-case scenario in this assessment, the magnitude of the predicted cumulative exceedances is not considered significant in the context of environmental noise. These exceedances are slightly above the applicable wind turbine noise criteria; on that basis, the significance of the effect before mitigation can be defined as having a potentially moderate effect.

While noise levels at low wind speeds will increase due to the development and specifically the operation of the turbines, the predicted levels will remain low, albeit new sources of noise will be introduced to the soundscape at some locations. At others location there is existing turbine noise from operational wind farms to varying degrees.

In terms of the proposed on-site substation, will typically be operational on a continuous basis. Chapter 12 (Noise and Vibration) has assessed the potential effect associated with the operation of the substation at the nearest NSL. The level of operational noise associated with this infrastructure is predicted to be low, and it is concluded that there will be no significant noise emissions from the operation of the substation at any NSL. Furthermore, the predicted noise levels for each are well below the criterion for fixed mechanical plant outlined in Chapter 12 (Noise and Vibration), and are unlikely to result in any significant adverse effects at nearby NSLs.

Vibration effects are not predicted during the operational phase. Furthermore, due to the distance of the proposed infrastructure from sensitive locations, vibration effects are not likely at any NSL.

The detailed assessment of noise and vibration associated with the proposed project is presented in Chapter 12 (Noise and Vibration).

#### 5.4.3.2.3 Water Quality

During the operational phase of the proposed project, accidental pollution impacting local water quality as a result of operational and maintenance activity is not anticipated. However, risk of accidental pollution is still associated with the following:

- Spillage or leakage of machinery on site through routine site maintenance activity during the operational phase;
- Spillages arising relating to the use of substation and hardstanding areas; and
- Risk of pollution from site traffic through the accidental release of oils, fuels, and other contaminants from vehicles.

The key receptors in terms of water quality effects and human health are maintenance personnel due to the potential for direct contact with polluting substances and water during the maintenance activities, as detailed in Chapter 9 (Hydrology and Hydrogeology). It is anticipated that any incidents related to accidental release, mobilisation, spillage or leakage of substances would be localised, contained, and managed in line with mitigation measures set out within Chapter 9 (Hydrology and Hydrogeology).

Overall, significant adverse effects on water quality associated with the operational phase of the proposed project is unlikely. Therefore, any likely effects related to water quality impacting on human health, resulting from a polluting incident, are considered indirect or direct depending on the incident, negative, temporary to short-term, and not significant.

#### 5.4.3.2.4 Land and Soil

Human health related impacts associated with soil contamination during the operational activities are primarily associated with the risks of spills or leaks from maintenance vehicles and machinery, which could result in localised contamination of soils.

The key receptors in terms of soil impacts on human health are the maintenance personnel due to the potential for direct contact with polluting substances and soil during maintenance activities. It is anticipated that any incidents related to accidental release, mobilisation, spillage or leakage of substances would likely be localised, contained, and managed in line with mitigation set out within Chapter 8 (Land, Soils and Geology).

Overall, human health risks associated with exposure to polluting substances and soil during maintenance activities are not anticipated, and significant adverse effects on human health due to soil quality effects associated with the proposed project are unlikely. Any likely effects on human health resulting from a polluting incident impacting soil quality, would be localised, direct, negative, short-term, and not significant.

#### 5.4.3.2.5 Traffic

It is anticipated that the operational phase will generate very little traffic movements (e.g., six movements per day, consisting of three arriving and three departing). The operational traffic volumes were assessed against the TII TTA Guidelines thresholds and were found to be sub-threshold (refer to Chapter 16 (Traffic and Transport)). Therefore, significant effects on human health related to operational phase traffic are considered unlikely. Furthermore, the maintenance of the visibility splays undertaken during the operational phase will have a positive effect on the safety aspect of the access to the wind farm site. The potential effects associated with the operational phase are therefore considered to be neutral, imperceptible, and long-term.

#### 5.4.3.2.6 Wind turbine health effects

**Noise and Infrasound**

The referenced publications and studies outlined within this chapter indicate that there appears to be little scientific evidence of effects of “Wind Turbine Syndrome”, and that wind farms are not a significant source of noise and infrasound, and that traffic and everyday human activity are likely to be more relevant.

In general, the distances between the proposed wind farm infrastructure and the nearest property receptors are such that significant noise and vibration effects at these receptors are unlikely.

Furthermore, as mentioned above, based on the outcomes of the wind turbine noise assessment undertaken in Chapter 12 (Noise and Vibration), the predicted noise levels associated with operational wind turbines at the proposed wind farm will be within best practice noise criteria. Chapter 12 (Noise and Vibration) states that low frequency noise and infrasound associated with wind turbines is expected to be below perceptibility thresholds and are not likely to result in any significant effects at NSLs. There are no criteria proposed to assess low frequency noise or infrasound as part of the EIAR.

Therefore, it is predicted that wind turbine noise associated with the proposed project will be not significant. It is therefore concluded that human health effects cited as an outcome of wind turbine noise and infrasound (such as nausea, disturbance of sleep, and tinnitus (ringing in the ear)) generated during the operational phase of the proposed wind farm is unlikely. Any effect in terms of wind turbine noise associated with the operational phase works would be negative, slight and long-term.

Effects described in terms of noise should be considered in terms that the effect is variable, and that the assessment considers the locations with the potential for greatest impact (i.e., the potential worst-case associated effects at the NSLs).

**Electromagnetic interference**

The proposed underground electrical cables will adhere to the international guidelines for ELF-EMF (Extremely Low Frequency Magnetic Field) which are described by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This is a formal advisory agency to the WHO. The proposed wind farm will also adhere to the EU guidelines for human exposure to EMF (Electric Magnetic Field). As the ICNIRP guidelines will not be exceeded, even directly above the underground cables, there will be no associated operational effects on Human Health.

The on-site substation for the proposed wind farm will be located as indicated in the Planning Drawings (see Appendix 1-1) of this EIAR. The distance from the nearest sensitive receptor to this on-site substation is approximately 445 m. The construction and electrical components of the substations and associated cabling will be to ESB and EirGrid specifications within the parameters assessed. No health agency has concluded that exposure to EMF from power lines and other electrical sources is a cause of any long-term adverse effects on human, plant or animal health.

Based on the above, this assessment concludes that significant effects on human health as a result of electromagnetic radiation are unlikely. Therefore, this assessment concludes that any effect in terms electromagnetic radiation / EMF on human health will likely be neutral, not significant and long-term.

**Shadow flicker**

Wind turbines can cast long shadows when the sun is low in the sky. 'Shadow flicker' is an effect that occurs when the rotating blades of a wind turbine cast a moving shadow over a building. The effect is experienced indoors where a moving shadow passes over a window in a nearby property and results in a rapid change or flicker in the incoming sunlight. Rotating wind turbine blades can cause brightness levels to vary periodically at locations where they obstruct the sun's rays. This can result in a nuisance when the shadow is cast over the windows of a building,

primarily concerned with residential properties. This intermittent shadow flicker can be a cause of annoyance at residences near wind turbines.

Shadow flicker is largely dictated by the relative position of the turbine(s) and the window, in combination with weather conditions (i.e., presence of direct sunlight, wind speed and wind direction) and the time of day and year (i.e., affecting the position of the sun). Shadow flicker will occur if the turbine rotors are located between an observer within a dwelling and the sun. The frequency of the flicker effect is related to the frequency of the rotating turbine blades. It can also be dependent on the number of individual turbine rotors that are casting shadows on a window.

Chapter 10 (Shadow Flicker) discusses the shadow flicker phenomenon in detail and sets out the criteria which determine the occurrence of shadow flicker, which is summarised as:

- The presence of screening;
- The location and orientation of the property;
- The distance of the property from turbines;
- The presence of direct sunlight;
- The time of day and year;
- Wind speed;
- Direction of wind; and
- The presence of people.

The shadow flicker model undertaken provides a detailed report and illustration of the potential shadow effects on the identified shadow flicker receptors.

Modelling of predicted shadow flicker occurrence is presented and discussed in Chapter 10 (Shadow Flicker).

The Applicant is committed to minimising any adverse effects from the proposed wind farm on the local community. The Applicant has committed to zero shadow flicker occurrence.

The implementation of mitigation measures to screen shadow flicker effects from sensitive receptors and/or implement wind turbine control measures in accordance with a defined Turbine Shutdown scheme will ensure that any residual shadow flicker effects from the proposed project will be almost entirely eliminated at any shadow flicker receptors. This will be the case irrespective of which turbine dimensions are selected within the turbine range. As noted previously, the immediate shutdown of a turbine(s) is subject to the technical capabilities of turbine technology where controlled and safe slow-down of blade rotation is required, lasting between 1 and 2 minutes at most. This would have an imperceptible long-term effect.

**Health benefits**

Aside from the potential socio-economic benefits discussed within this chapter, there are significant environmental benefits associated with the operation of the proposed wind farm. The current and historical practice of fossil fuel combustion with the associated release of a range of pollutants including particulate matter, oxides of nitrogen, sulphur dioxide, carbon dioxide and many others is well documented. The release of these pollutants from the power generation sector is also a major contributor to global warming and the resulting changing effects on our climate.

The phasing out of electricity generation from burning fuels in Ireland is a key step in achieving Ireland's 2030 decarbonisation ambition as set out in the Ireland's Climate Action Plan 2025

(CAP25)[33] and the placement of fossil fuels in electricity generation by clean renewable wind energy will have significant benefits for air quality and slowing down global warming.

The proposed wind farm will play a significant role in contributing to the country's national renewable electricity production and carbon emissions reduction targets by 2030, while also supporting a growing economy and population. During operation, the proposed wind farm will eliminate the need to generate the equivalent amount of electricity from fossil fuels, and it will therefore help to reduce total national greenhouse gas emissions. As a result, it will reduce our dependence on external energy sources, help improve our energy security of supply and make a major contribution to Ireland's CAP25, which has set a target of 9 GW of onshore wind capacity by 2030.

The contribution of the proposed wind farm to a decrease in reliance on fossil fuel combustion will have a moderate positive long-term effect on the health and well-being of the general population.

#### *5.4.3.3 Decommissioning Phase*

The wind turbines 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 machines, subject to planning permission being obtained, or the site will be decommissioned fully, with the exception of the electricity substation and site roads and drainage.

Upon decommissioning of the proposed wind farm project, the wind turbines will be disassembled in reverse order to how they were erected. All above ground turbine components will be separated, cut up to allow them fit on a standard articulated lorry and removed off-site for recycling.

Turbine foundations will remain in place underground and along with hardstands will be allowed to revegetate naturally. Leaving the turbine foundations and hardstands in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete and stone from the ground could result in potentially needless environment nuisances such as noise, dust and/or vibration. There would be no real environmental benefit from removing the foundations, as the concrete is underground, stable and inert if untouched. The site roadways will be in use for additional purposes to the operation of the wind farm (e.g. for forest/agricultural access) by the time the decommissioning of the project is to commence, and therefore it is more appropriate to leave the site roads in situ for future use.

The on-site substation and 110 kV grid connection will not be removed at the end of the useful life of the wind farm project as it will form part of the national electricity network. Therefore, the substation will be retained as a permanent structure and will not be decommissioned.

Should decommissioning be required, the activities required to facilitate wind turbine decommissioning and removal from site will be similar to those outlined for the construction phase, albeit in reverse and to a lesser extent and duration than during the construction stage. Therefore, for the purpose of this assessment, it is anticipated that the impacts on population and human health receptors associated with decommissioning phase will be no greater than those identified for the construction phase.

[33] https://assets.gov.ie/static/documents/Climate_Action_Plan_2025_updated_cover.pdf (Published April 2025).

## 5.5 Mitigation Measures

### 5.5.1 Embedded Mitigation

The design of the wind farm has included a minimum setback distance of four times the tip height from a proposed turbine to the curtilage of any residential property. A minimum set back of 720 m has been included in the design which is in line with the minimum setback requirements stated in the 2006 and Draft Revised 2019 WEDGs.

Extensive consideration has been given to the layout of the wind farm site and the positions of the 10 no. turbines in ensuring sufficient set-back distances from sensitive receptors and adjustment for noise, avoidance of environmental constraints, consideration of shadow flicker and visual impacts.

### 5.5.2 Construction Phase

No specific mitigation is proposed in relation population and human health during the construction phase other than what has already been set out within the CEMP (see Appendix 2-6) and other chapters of this EIAR.

Where required, mitigation measures for other environmental aspects associated with the proposed project which may interact with the human environment are set out in the relevant chapters of this EIAR, namely:

- Chapter 8 Land, Soils and Geology;
- Chapter 9 Hydrology and Hydrogeology;
- Chapter 10 Shadow Flicker;
- Chapter 11 Material Assets;
- Chapter 12 Noise and Vibration;
- Chapter 13 Landscape and Visual Impact Assessment (LVIA);
- Chapter 14 Air Quality and Climate;
- Chapter 16 Traffic and Transport; and
- Chapter 17 Major Accidents and Natural Disasters.

A cross reference of environmental factors is also presented in Chapter 18 (Interaction of the Foregoing).

All activities carried out by the appointed Contractor during the construction phase will be in accordance with the requirements of the Safety, Health and Welfare at Work Act 2005 as amended and Regulations made under this Act.

Health and safety plans will be developed prior to any construction taking place. A Health and Safety Plan covering all aspects of the construction process will outline Health and Safety requirements in detail. At the procurement stage, the Health and Safety Plan will be prepared on a preliminary basis and developed further at construction stage, with all hazards and risks identified and assessed.

The proposed TDR to allow for the transport of the turbines to the wind farm site will involve some minor works, improvements and modifications at 13 no. locations to facilitate delivery of oversized loads and turbine delivery, as discussed in Chapter 2 (Description of the Proposed Project) of the EIAR. These works will be carried out to the relevant construction and road safety guidelines, and will allow for the proposed turbine dimensions. Turbine components will

be being transported at night when there is less traffic on the road, and will be accompanied by Garda escort.

The potential for health and safety and environmental related risks / effects are greatly minimised through compliance with appropriate health and safety guidelines and the CEMP throughout the construction phase.

### 5.5.3 Operational Phase

No specific mitigation in relation to the operational phase and the population and human health assessment is proposed other than what has already been set out within the chapters of this EIAR. All activities carried out during the operational phase will be in accordance with the requirements of the Safety, Health and Welfare at Work Act 2005 as amended and Regulations made under this Act.

Where required, specific mitigation measures for other environmental factors discussed previously which may interact with the human environment health are discussed in their respective chapters of this EIAR. A cross reference of environmental factors is also presented in Chapter 18 (Interaction of the Foregoing).

- Chapter 8 Land, Soils and Geology;
- Chapter 9 Hydrology and Hydrogeology;
- Chapter 10 Shadow Flicker;
- Chapter 11 Material Assets;
- Chapter 12 Noise and Vibration;
- Chapter 13 Landscape and Visual Impact Assessment;
- Chapter 14 Air Quality and Climate;
- Chapter 16 Traffic and Transport; and
- Chapter 17 Major Accidents and Natural Disasters.

### 5.5.4 Decommissioning Phase

As stated previously the wind turbines 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 machines, subject to planning permission being obtained, or the site will be decommissioned fully, with the exception of the electricity substation and site roads and drainage.

Should decommissioning be required, the activities required to facilitate wind turbine decommissioning and removal from site will be similar to those outlined for the construction phase, albeit in reverse and to a lesser extent and duration than during the construction stage.

All activities carried out by the appointed Contractor during the decommissioning phase will be in accordance with the requirements of the Safety, Health and Welfare at Work Act 2005 as amended and Regulations made under this Act.

Therefore, it is anticipated that the effects on population and human health receptors associated with the decommissioning phase will be no greater than those identified for the construction phase.

No specific mitigation is proposed for the decommissioning phase in respect of effects on population and human health.

## 5.6 Residual Effects

### 5.6.1 Construction Phase

The proposed project will have a slight, positive residual effect on the local population through an influx of construction workers in the short-term. This influx is likely to cause a slight increase in local population over a short period of time resulting in a boost to the local economy through use of accommodation and spend in local shops and restaurants. Local suppliers will also receive additional business from the proposed project. This will have a moderate, short term, positive effect on the local economic activity.

It is considered likely that there will be a brief to temporary, imperceptible, negative residual effect on traffic, tourism and recreation amenity as a result of traffic delays associated with construction works and vehicle movements, and the associated traffic management measures, during the construction phase following the communication of guidance and information to the public on alternative available transport routes / diversions where required.

A short-term, negative and not significant residual effect is likely as a result of construction phase traffic (primarily associated with noise and dust) on residential amenity and sensitive receptors.

Short-term, slight residual effects are predicted on residential amenity and property values and neutral imperceptible effects on the local population and land use.

### 5.6.2 Operational Phase

The proposed project will provide clean energy from a renewable resource and help to achieve targets in national energy and climate change policies. This is a direct, positive, long-term residual effect for the country which will benefit the local population and communities.

In terms of population, the residual effects are expected to be positive particularly in terms of local economy, employment, tourism and amenity. Following the implementation of the mitigation measures prescribed in the relevant chapters of the EIAR, the operation of the proposed project is unlikely to have significant negative residual effects on the local or wider population.

The establishment of a Community Benefit Fund will be a long-term positive contribution to the local community in general. This aspect of the proposed project will have a positive long-term effect on the individuals living in the local community, including contributing to a positive effect on individuals physical and psychological health through the development of community led projects and maximising the level of local involvement in terms of influencing how the funds are spent.

Based on the literature reviewed, there is currently no reliable evidence to link wind turbines to adverse health impacts. Every community will have vulnerable individuals, however, the health status of the community can only be established to certain level (i.e., small area statistics). Individual health status or potential vulnerability of individual receptors cannot be known or assessed. Emission limits and management, such as for noise or dust, allow for the protection of the most vulnerable, and so long as the limits are met, vulnerable individuals and the wider community are protected. Emissions arising from the operational phase of the proposed project (i.e., air, dust, noise and vibration) are predicted to fall below the limits and/or thresholds set,

therefore it is anticipated that significant adverse effects on health, even amongst the vulnerable, are unlikely.

Following the implementation of the mitigation measures set out in the relevant chapters of the EIAR, the operation of the proposed project is unlikely to have significant negative residual effects on the human health.

Overall, it is considered likely that there will be a long-term, slight, positive residual effect on the local population and human health as a result of the proposed project.

### 5.6.3 Decommissioning Phase

As mentioned, the wind turbines proposed as part of the proposed wind farm are expected to have a lifespan of 35-years. Following the end of their lifespan, the wind turbines may be replaced with a new set of machines, subject to planning permission being obtained, or the site may be decommissioned fully, with the exception of the electricity substation and grid connection. The activities required to facilitate wind turbine decommissioning and removal from site will be similar to those outlined for the construction phase, albeit in reverses and to a lesser extent and duration than during the construction stage.

It is anticipated that residual effects on population and human health receptors associated with decommissioning works will be no greater than those identified for the construction phase.

## 5.7 CUMULATIVE EFFECTS

In the assessment of cumulative effects, any other existing, permitted, or proposed projects in the surrounding area have been considered where they have the potential to generate in-combination or cumulative effects with the proposed project (see Chapter 1 Introduction).

The potential for cumulative effects on the local population and human health, in particular air quality, water, noise, land / soils, shadow flicker, traffic and visual impacts are discussed in the relevant chapters.

There is potential for an operational phase cumulative effect on noise, shadow flicker and visual impacts associated with wind farms within the study area as the nearest wind farms identified are the Ballymartin (three turbines) and Smithstown Wind Farms (four turbines), with the nearest turbine being at Ballymartin Wind Farm approximately 587 m from proposed turbine T3. The Rahora Wind Farm is located to the north east with the nearest turbine being approximately 2.25 km from proposed turbine T5. The consented Castlebanny Wind Farm boundary is located approximately 1.5 km to the northwest of the proposed wind farm site boundary. One operational wind turbine is also situated approximately 3.8 km south east.

### 5.7.1 Population

Considering other planned renewable energy and electrical upgrade projects in the area, the proposed project would be anticipated to have both a short and long term positive cumulative effect under the topic of population.

#### *5.7.1.1 Land Use*

Considering the other projects in the area, it is not anticipated that the proposed project will have a significant cumulative effect under the topic of land use.

#### 5.7.1.2 Population Trends

Considering the other projects in the area, it is not anticipated that the proposed project will have a significant cumulative effect under the topic of population trends. There is a potential positive cumulative effect in terms of population trends in the event of increased investment in the area from the Community Benefit Fund.

#### 5.7.1.3 Property Receptors/Residential Amenity

In terms of property receptors and residential amenity, it is not anticipated that there will be significant cumulative effects on residential amenity due to the distance and type of projects planned in the local area.

#### 5.7.1.4 Property Value

It is not anticipated that there will be significant cumulative effects for property values due to the nature of the site and the distance and type of projects planned in the local area. Any cumulative effect on property value in the area would likely be direct, negative, slight, and short to medium-term.

#### 5.7.1.5 Employment/Economy

Considering the other projects reviewed in the area, which would all individually contribute to the local employment and economy to varying degrees, the proposed project would be anticipated to have both a short and long term, slight positive cumulative effect under the topic of employment/economy.

#### 5.7.1.6 Tourism

All wind energy projects must now include a Community Benefit Fund, and although the details of how this fund is spent would have to be decided by a committee of representatives from industry and the local community. The Ballyfasy Wind Farm Community Benefit Fund is discussed further in Appendix 1.7 of this EIAR and has been developed in accordance with the terms and conditions of the Government's Renewable Energy Support Scheme (RESS). There is a potential positive cumulative effect for tourism in the event of increased investment in the area from the community benefit fund.

### 5.7.2 Human Health

There is the potential for both positive and negative cumulative effects under the topic of human health.

Negative cumulative effects primarily relate to traffic (road safety and dust)and the presence of additional work machinery being active in the area if the construction phase of the proposed project and other planned renewable energy/grid upgrade projects coincide.

Positive cumulative effects relate to long term improvements in air quality from decarbonising the national grid and contributions to climate targets.

Other developments proposed in the study area consist of smaller scale projects related to upgrades to electrical or water services, roadworks and retention of existing infrastructure.

### 5.7.3 Cumulative Effects Summary

The developments/projects/activities identified during the population and human health cumulative assessment (i.e., within 2 km) are not anticipated to have a significant cumulative

effect on the above population and human health topics due to their type, scale and/or location with respect to the proposed project.

Overall, significant cumulative effects from the proposed project on population and human health when considered alongside the other developments/projects/activities in the area are not anticipated.

## 5.8 CONCLUSION

There is currently no credible evidence to link wind turbines to adverse health impacts. Emission limits, such as for noise or dust, are set to protect those within a community. Compliance with the limits set out in best practice guidelines (described in the relevant chapters on noise and vibration, air quality, shadow flicker) will ensure that individuals and communities are protected.

Design stage considerations, such as turbine locations, and the mitigation measures outlined in the relevant technical chapters will be put in place to ensure that the emissions and effects from the proposed project are in compliance with the standards to ensure that there will be no significant adverse effects on health, even amongst the most vulnerable.

Following consideration of the residual effects, it is considered that the proposed project will not result in a significant negative effect on population and human health in the local and regional area. In summary, there are no likely significant effects during the construction, operation or decommissioning phases.

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