Planning and Environmental Consultants

EIAR Addendum Report

Umma More Renewable Energy Development, Co. Westmeath

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INTRODUCTION

Background

Umma More Ltd. applied to An Bord Pleánala for planning permission to construct a renewable energy development which will comprise 9 No. wind turbines, and associated infrastructure in the townland of Umma More, and adjacent townlands, in Co. Westmeath. The application was submitted to An Bord Pleanála on the 16th March 2023 and was assigned An Bord Pleánala case reference ABP-316051-23.

On 19th February 2024, An Bord Pleanála issued a decision to refuse planning permission under case reference ABP-316051-23, generally in accordance with the Inspector's recommendations pertaining to contravention to local policy and the methodology applied to the collision risk modelling of avian receptors and its implication in the Appropriate Assessment. The Inspector also identified a note regarding the Hill of Uisneach should the Board be minded to request further information on the application. Further details on the decision made by An Bord Pleanála are provided in the Response to Submissions document to which this report is appended.

The An Bord Pleanála decision was quashed by order of the High Court, where the Court ordered that the case be remitted back to An Bord Pleanála for a new decision. The case has since been remitted back to An Bord Pleanála and is now a live case, with a new case number assigned (ABP-321595-25).

On 7th February 2025, An Bord Pleánala confirmed that the original decision was quashed by order of the High Court and the case has been remitted back to An Bord Pleanála for a new decision, under the new case reference number ABP-321595-25. The applicant was invited to make any further submissions/observations that they may have on the planning application and specifically on the submission received from the DAU on 22nd May 2023, in accordance with section 37F (1) (c) of the Planning and Development Act 2000, as amended. On the 21st May 2025, An Bord Pleánala requested a response to the submissions that were made on the application following its remittal to An Bord Pleánala in early 2025 (ABP-321595-25).

Purpose of this EIAR Addendum Report

Due to the time elapsed, and in response to the submissions made on the planning application and issued raised in the Inspector's report on the decision (ABP Pl. 316051), this EIAR addendum report (hereafter referred to as the 'EIAR Addendum Report') has been prepared in order to update the EIAR and associated appendices, where appropriate, to allow An Bord Pleanála to complete a robust environmental impact assessment of the Proposed Development.

In the preparation of this EIAR Addendum Report, the project team, as detailed in Chapter 1 Section 1.8 of the previously submitted EIAR, have considered the extent to which each chapter of the EIAR and associated appendices are required to be updated, in particular paying regard to:

- The submissions on the Umma More Renewable Energy Development application files (ABP-316051-23 and ABP-321595-25)
- The issued raised in the Inspector's report on the decision (ABP Pl. 316051);
- Updates to the baseline environment;
- Updates to surveys and assessments;
- Updates to regulations, policy and guidance.

This EIAR Addendum Report should be read as an appendix to the overall Response to Submissions Document. This EIAR Addendum Report presents relevant updates or changes to the previously submitted EIAR and EIAR Appendices where appropriate. For Chapters where the Project team have

confirmed that no relevant updates or changes are necessary, this is outlined under the relevant chapter heading of the EIAR Addendum Report.

Structure and Content of the EIAR Addendum Report

The EIAR Addendum Report follows the same structure as the previously submitted EIAR to facilitate review of relevant changes or updates to the following:

1. *Introduction*
2. *Background to the Proposed Development*
3. *Considerations of Reasonable Alternatives*
4. *Description of the Proposed Development*
5. *Population and Human Health*
6. *Biodiversity (excluding Birds)*
7. *Birds*
8. *Land, Soils and Geology*
9. *Water*
10. *Air and Climate*
11. *Noise and Vibration*
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13. *Cultural Heritage*
14. *Material Assets (including Traffic and Transport, Telecommunications and Aviation)*
15. *Interactions of the Foregoing*
16. *Major Accidents and Natural Disasters*
17. *Schedule of Mitigation Measures*

It is not intended that the EIAR Addendum Report replaces the submitted EIAR, rather the EIAR Addendum Report is read in conjunction with the submitted EIAR. Only the sections of the EIAR where relevant changes or updates have been identified are provided below. For example, in Chapter 1 of the EIAR: *Introduction*, there is only one section that requires relevant changes be identified, *Section 1.5: Need for the Proposed Development*, and so only Section 1.5 is identified below with relevant text for certain elements of that section. For ease of reference, the relevant section numbers from the EIAR are retained in this document.

References to Proposed Development

As identified in Section 1.1.1 in Chapter 1 of the EIAR, for the purposes of the EIAR and this EIAR Addendum Report:

- Where the 'Proposed Development' is referred to, this relates to all the project components described in detail in Chapter 4 of the EIAR i.e Wind Farm Site and Grid Connection as detailed below.
- Where 'the Site' is referred to, this relates to the primary study area for the EIAR, as delineated by the EIAR Site Boundary in green as shown on Figure 1-1.
- Where the 'Wind Farm Site' is referred to, this refers to turbines and associated foundations and hard-standing areas, meteorological mast, junction accommodation works, access roads, temporary construction compound, underground cabling, spoil management, site drainage, tree felling and all ancillary works and apparatus. The planning application for the Wind Farm Site has been made to An Bord Pleanála in accordance with the provisions of Section 37E of the Planning and Development Act 2000, as amended.
- Where 'Grid Connection' is referred to, this refers to the temporary construction compound and 110kV onsite substation, and associated underground 110kV cabling connecting to the

existing Thornsberry 110kV substation, subject to a future planning application under Section 182A of the Planning and Development Act, 2000, as amended.

1. INTRODUCTION

1.5 Need for Proposed Development

1.5.1 Overview

In July 2021, the Climate Action and Low Carbon Development (Amendment) Act 2021 was signed into law, committing Ireland to reach a legally binding target of net-zero emissions no later than 2050, and a cut of 51% by 2030 (compared to 2018 levels). On this pathway to decarbonisation, the Government published the National Climate Action Plan 2025 (CAP25)[1] reaffirming the renewable electricity target of 80% by 2030, without compromising security of energy supply. The Proposed Development is expected to be operational between 2030 to 2035 and would therefore contribute to the 2030 target or future energy targets beyond 2030.

In July 2024, the EPA published '*Irelands Provisional Greenhouse Gas Emissions 1990-2023*'[2] which stated a provisional total of national greenhouse gas emissions (excluding Land Use, Land Use Change and Forestry (LULUCF)) for 2023 to be 55.01 million tonnes carbon dioxide equivalent ($MtCO_2eq$) which is 6.8% lower than emissions in 2022 (60.76 $MtCO_2eq$). Ireland's 2023 emissions are below the 1990 baseline for the first time in three decades.

In 2023, the energy industries, transport and agriculture sectors accounted for 73.5% of total greenhouse gas emissions. Agriculture is the single largest contributor to the overall emissions, at 37.8%. Transport, energy industries and the residential sector are the next largest contributors, at 21.4%, 14.3% and 9.7%, respectively. The report further states that there was a substantial reduction in coal, natural gas and peat used in electricity generation (-22.1%, -13.9% and -13% respectively), and renewable energy usage increased from 39% in 2022 to 40.7% in 2023. The report highlights that whilst emissions are beginning to reduce, transformative measures will be needed to meet National Climate ambitions.

The critical need for renewable energy is underscored by European legislation. RED III[3] contains a presumption in favour of renewable projects being in the '*overriding public interest and serving public health and safety*'. This presumption was introduced prior to the enactment of RED III in the Council Regulation (EU) 2022/2577 (laying down a framework to accelerate the deployment of renewable energy) detailed below in Section 1.5.2. The prioritisation of renewable energy projects in European law has been acknowledged by the Irish judicial system, most recently in the Carrownagowan Wind Farm judgement ([2024] IEHC 549), the Toole II judgment ([2024] IEHC 610) and in particular the Coolglass Wind Farm judgement ([2025] IEHC 1) which emphasises the importance of national climate and renewable energy policy when assessing renewable energy projects.

As such, the Proposed Development is critical to helping Ireland address these challenges as well as addressing the country's over-dependence on imported fossil fuels. The need for the Proposed Development is driven by the following factors:

1. *A legal commitment from Ireland to limit greenhouse gas emissions under the Kyoto protocol to reduce global warming;*
2. *A requirement to increase Ireland's national energy security as set out in Ireland's Transition to a Low Carbon Energy Future 2015-2030;*

[1] *Department of Environment, Climate and Communications (2025) Climate Action Plan 2025*
[2] *Ireland's Provisional Greenhouse Gas Emissions (1990-2023)* <https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/EPA-Provisional-GHG-Report-Jul24-v6.pdf>
[3] *Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652.*

3. *A requirement to diversify Ireland's energy sources, with a view to achievement of national renewable energy targets and an avoidance of significant fines from the EU (the EU Renewables Directive);*
4. *Climate Action Plan 2025 which aims to ensure that Ireland achieves its legally binding target (the Climate Action and Low Carbon Development (Amendment) Act 2021) of net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030;*
5. *Increasing energy price stability in Ireland through reducing an over reliance on imported fossil fuels;*
6. *Provision of cost-effective power production for Ireland which would deliver local benefits; and*
7. *To facilitate the Government in meeting its ambitious 80% renewable energy target by 2030.*

In November 2024, the World Meteorological Organisation (WMO) published the State of the Global Climate 2024 Report.[4] The report provides a summary on the state of the climate indicators in 2024 with sections on key climate indicators, extreme events and impacts. The key messages in the report include:

- Greenhouse gases reached record observed levels in 2023. Real time data indicate that they continued to rise in 2024.
- January – September 2024 global mean surface air temperature was 1.54 ± 0.13°C above the pre-industrial average.
- Glacier mass loss from 2021/2022 to 2023/2024 represents the most negative three-year glacier mass balance on record, and seven of the ten most negative annual glacier mass balances since 1950 have occurred since 2016.
- The strong 2023/2024 El Niño followed three consecutive years of La Niña from late 2020 to early 2023.
    - El Niño conditions were established by mid-2023, became strong by the end of 2023 and dissipated by the second quarter of 2024
- Extreme weather continued to lead to severe socio-economic impacts. Extreme heat affected many parts of the world.
- Food security, population displacement and impacts on vulnerable populations continue to be of mounting concern in 2024, with weather and climate hazards exacerbating the situation in many parts of the world.

There has been a substantial worldwide energy transition, with renewable capacity additions increasing by nearly 60% from 2022, totalling 565 gigawatts (GW).[5] This growth represents the highest rate observed in the past two decades, signalling a significant momentum toward achieving the clean energy goal set at the United Nations Framework Convention on Climate Change (UNFCCC) 28th Conference of the Parties (COP28) meeting in 2023, and reiterated at the 29th Conference of the Parties (COP29) in Azerbaijan in 2024, to triple renewable energy capacity globally to 11,000 GW by 2030. Considering existing policies and market conditions, the International Energy Agency (IEA) predicts that there will be approximately 5,500GW of new renewable capacity becoming operational by 2030. This implies that global renewable capacity additions will continue to increase every year, reaching almost 940GW annually by 2030 – 70% more than the record level achieved last year. Solar PV and wind together account for 95% of all renewable capacity growth through the end of this decade due to their growing economic attractiveness in almost all countries.

[4] *World Meteorological Organisation (2025) State of the Global Climate 2024 <https://library.wmo.int/records/item/69455-state-of-the-global-climate-2024>*
[5] *IEA (2024), Renewables 2023, IEA, Paris <https://www.iea.org/reports/renewables-2023>*

The recent joint publication of WMO and International Renewable Energy Agency on Climate-driven Global Renewable Energy Potential Resources and Energy Demand in 2023[6] underscores the inherent links between renewable energy resources and weather and climate conditions. It calls for better integration of climate variability considerations into energy resource operation, management, and planning to enhance effectiveness and sustainability in these regions

1.5.1.1 Climate Change and Greenhouse Gas Emissions

At the Paris climate conference (COP21) in December 2015, 195 countries adopted the first-ever universal, legally binding global climate deal. The agreement sets out a global action plan to avoid dangerous climate change by limiting global warming to well below 2°C above pre-industrial levels. Under the agreement, Governments also agreed on the need for global emissions to peak as soon as possible, recognising that this will take longer for developing countries and to undertake rapid reductions thereafter in accordance with the best available science. The 2023 climate conference (COP28) in December 2023 in Dubai resulted in the first agreement explicitly calling for the transition away from fossil fuels, the United Arab Emirates (UAE) Consensus. This text raised concerns over the achievement of limiting warming below 1.5°C, as the text to 'phase out as soon as possible inefficient fossil fuel subsidies' does not address energy poverty or the just transition. The UAE Consensus further calls for more explicit near-term goals in the lead up to 2050, calling for the world to cut greenhouse gas emissions by 43% as compared to 2019 levels. The most recent climate conference (COP29) took place in Azerbaijan in November 2024 and focused on accelerating global efforts to address climate change, in particular global efforts related to climate finance. The New Collective Quantified Goal on Climate Finance (NCQG) was agreed in the final days of COP29 with developed nations agreeing to triple finance to developing countries, with commitments increasing from USD 100 billion annually to USD 300 billion annually by 2035. Significant progress was made in the discussions surrounding carbon markets, with nearly 200 nations agreeing on critical rules under Article 6 of the Paris Agreement. The adoption of these rules is seen as a crucial step towards operationalising a robust and credible carbon market.

In March 2021 the government approved the Climate Action and Low Carbon Development (Amendment) Bill which provide plans to facilitate the 'transition to a climate resilient and climate neutral economy by the end of year 2050'[7] and includes for a 51% reduction in emissions by 2030. Furthermore, government approval was given in February 2021 to draft amendments to the Petroleum and Other Minerals Development Act 1960 which will give statutory effect to ending the issuing of new licences for the exploration and extraction of gas. The Bill, entitled an Act, was passed into law in July 2021 and will manage the implementation of a suite of policies to assist in achieving a 7% average yearly reduction in overall greenhouse gas emissions over the next decade.

The Climate Action and Low Carbon Development (Amendment) Act 2021 also outlines the obligations of An Bord Pleanála and/or local authority in assisting the country reach these targets. Section 15 of the Act states as follows:

'Section 15. F33 (1) A relevant body shall, in so far as practicable, perform its functions in a manner consistent with—

a) *the most recent approved climate action plan,*
b) *the most recent approved national long term climate action strategy,*
c) *the most recent approved national adaptation framework and approved sectoral adaptation plans,*
d) *the furtherance of the national climate objective, and*

[6] *International Renewable Energy Agency + WMO (2024) 2023 Year in Review: Climate-driven Global Renewable Energy Potential Resources and Energy Demand <https://wmo.int/publication-series/2023-year-review-climate-driven-global-renewable-energy-potential-resources-and-energy-demand>*
[7] *Rialtas na hÉireann 2021. Climate Action and Low Carbon Development (Amendment) Bill 2021 https://www.gov.ie/en/publication/984d2-climate-action-and-low-carbon-development-amendment-bill-2020/*

e) the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State.'

The obligations set out by the Climate Action and Low Carbon Development (Amendment) Act 2021 were upheld in the *Coolglass Wind Farm limited v. An Bord Pleanála* judgement delivered on 10th January 2025. Whilst under appeal by An Bord Pleanála to the Supreme Court, this judgement provides clarity on the obligations imposed on public bodies under section 15 of the Climate Action and Low Carbon Development (Amendment) Act 2021 in relation to renewable energy developments.

In the judgement, Mr Justice Humphreys undertook a detailed consideration of the interpretation of section 15 of the Climate Act and concluded that:

> *"...all vectors of interpretation point strongly in the same direction – the need for an imperative reading of s. 15(1) in line with what it says, namely that the board and any other relevant body is required to act in conformity with the climate plans and objectives set out in the subsection unless it is impracticable to do so....*
>
> *That does not mean allowing an application which is prohibited by law. That wouldn't be practicable apart from anything else. But it does mean exercising discretionary and evaluative powers in whatever way is most likely to be consistent with the relevant plans and objectives.'*

As part of Mr Justice Humphrey's consideration of the interpretation of section 15 of the Climate Act, he states in his judgement that "*an immediate end to business as usual is a precondition for planetary survival*". In summary, section 15 of the Climate Action and Low Carbon Development (Amendment) Act 2021 requires the relevant authority to engage in its own independent consideration of the impact of a proposed development on the State achieving its climate targets and to exercise its discretion in a manner which supports the achievement of those targets.[8]

In February 2022, the International Panel on Climate Change (IPCC) released the report 'Working Group II-Climate Change 2022: Impacts, Adaptation and Vulnerability'[9] regarding the impacts of climate change on nature and human activity. The report states that global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO_2 and other greenhouse gas emissions occur in the coming decades. the report identifies four key risks for Europe with most becoming more severe at 2 °C global warming levels (GWL) compared with 1.5 °C GWL. From 3°C GWL, severe risks remain for many sectors in Europe. The four key risks identified are:

1) Key Risk 1: Mortality and morbidity of people and changes in ecosystems due to heat
2) Key Risk 2: Heat and drought stress on crops
3) Key Risk 3: Water scarcity
4) Key Risk 4: Flooding and sea level rise

In April 2022, the IPCC released the report 'Working Group-III – Climate Change 2022: Mitigation of Climate Change', which assesses literature on the scientific, technological, environmental, economic and social aspects of mitigation of climate change. The report reflects new findings in the relevant literature and builds on previous IPCC reports, including the WGIII contribution to the IPCC's Fifth Assessment Report (AR5), the WGI and WGII contributions to Sixth Assessment Report (AR6) and the three Special Reports in the Sixth Assessment cycle. This report outlines developments in emission reduction and mitigation efforts, assessing the impact of national climate pledges in relation to long-term emissions goals in a global context.; and states that *'Unless there are immediate and deep emissions reductions across all sectors, limiting global warming to 1.5°C will be beyond reach.'*

[8] *Beauchamps [2025] https://beauchamps.ie/publications/1327*
[9] *Climate Change 2022: Impacts, Adaptation and Vulnerability. Working Group II Contribution to the IPCC Sixth Assessment Report. Available at: https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf*

In November 2023, the IPCC published the 'AR6 Synthesis Report: Climate Change 2023'[10], and is the final product of the AR6 of the IPCC. It summarizes the state of knowledge of climate change, its widespread impacts and risks, and climate change mitigation and adaptation. It confirms that the unsustainable and unequal energy and land use as well as historical use of fossil fuels have unequivocally caused global warming, with global temperatures approximately 1.1°C above 1850-1900 levels. A substantial 'emissions gap' exists between global greenhouse gas emissions in 2030 associated with the implementation of NDCs announced prior to COP26, Parties to the Paris Agreement have two years to submit updated NDCs for the period up to 2035, ambition will need to be ratchetted up in order to limit warming to 1.5°C.

In May 2025, the EPA[11] reported, for the 2023 year, that the energy sector contributed to 14.3% of Ireland's total emissions. The latest EPA projections show that currently implemented policies and measures (WEM) will result in Ireland achieving a total greenhouse gas emission reduction of 8.4% on 2005 levels by 2030, significantly short of Irelands 2030 target under the EU Effort Sharing Regulation (ESR), i.e., 42% reduction of emissions compared to 2005 levels by 2030, and also lower than the 9% reduction projected in the 2024 report.[12] If policies and measures in the higher ambition (WAM) scenario are implemented, EPA projections show that Ireland can achieve a reduction of 26% by 2030. The EPA projections show that agriculture and transport emissions form the majority of ESR emissions; combined they represent 59.2% and 63.2% of emissions in 2023 (latest inventory data) and 2030, respectively. Decarbonisation of power generation is a key measure, not only in the energy sector, but for other energy intensive sectors, such as transport and agriculture, whose activities result in high levels of greenhouse gas emissions.

The '*National Energy Projections 2024*'[13], published annually by the Sustainable Energy Authority of Ireland (SEAI), state that in 2022, 87% of all energy used in Ireland was from fossil fuels, 12% from renewable sources and the remainder from others such as waste and electricity imports. By 2030, fossil fuels could still provide most of Ireland's energy, ranging from 70% in the WEM scenario to 62% in the most ambitious WAM scenario. The deployment of renewables needs to outpace the growth of energy demand for the absolute reductions in greenhouse gas emissions that are required to be met. The SEAI National Energy Projections state that there was a notable reduction in greenhouse gas emissions from the electricity sector in 2023. This reduction in fossil fuel use was primarily driven by an increase in electricity imports with 2023 seeing a record level of electricity net imports. This trend has increased further in 2024, where the level of net imports in the first half of 2024 has already exceeded all of 2023. Consequently, the sectoral emissions ceiling for electricity for the first carbon budget period will be much closer to being achieved than previously projected. However, it is still projected that by the end of the second budget period, the total exceedance in the electricity sector is projected to be 6.8MtCO_2eq, or 11%, and 5.2MtCO_2eq, or 9%, in the WEM and WAM scenarios, respectively.

CAP25[14] was published on the 15th of April 2025 by the Department of the Environment, Climate and Communications (DECC). Following on from Climate Action Plans 2019, 2021, 2023, and 2024, CAP25 sets out the roadmap to deliver on Ireland's climate ambition. It aligns with the legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by Government in July 2022 following the Climate Action and Low Carbon Development (Amendment) Act 2021, which commits Ireland to a legally binding target of net-zero greenhouse gas emissions no later than 2050, and the reduction of 51% by 2030 mentioned above. CAP25 sets out an ambitious course of action over the coming years to address the impacts which climate may have on Irelands environment, society, economic and natural resources. CAP25 clearly recognises that Ireland must significantly step up its

[10] *IPCC Sixth Assessment Synthesis Report, Intergovernmental Panel on Climate Change AR6 Report: Climate Change 2023*
[11] *Ireland's Greenhouse Gas Emission Projections 2024-2055 (May 2025)* < Ireland's Greenhouse Gas Emissions Projections 2024-2055 | Environmental Protection Agency >
[12] *Irelands Greenhouse Gas Emission Projections 2023-2050 (May 2024)* < Ireland's Greenhouse Gas Emissions Projections 2023-2050 | Environmental Protection Agency
[13] *SEAI National Energy Projections 2024 Report.* <https://www.seai.ie/sites/default/files/publications/National-Energy-Projections-Report-2024.pdf>
[14] *Government of Ireland (2025) Climate Action Plan 2025* <https://www.gov.ie/en/department-of-the-environment-climate-and-communications/publications/climate-action-plan-2025/>

commitments to tackle climate disruption. CAP25 reidentifies the need to increase the share of electricity demand generated from renewable sources by to up to 80% where achievable and cost effective, without compromising security of electricity supply and a need for 9GW of onshore wind generation. In 2023, Ireland had 4.74GW of installed wind capacity, up 4.5% on the previous year; the Sustainable Energy Authority of Ireland (SEAI) provisional estimate for installed wind capacity in 2024 is 4.85GW, based on EirGrid data to the end of August, and ESB-Networks data to the end of September.[15] As of January 2025, there were 6.3GW of wind energy capacity installed on the island of Ireland; Of this, 4.9GW was installed in the Republic of Ireland.[16] When all data from 2024 is recorded an updated carbon intensity factor for the Irish national grid will be published.

CAP25 presents clear and unequivocal support for the provision of additional renewable energy generation and presents yet further policy support for increased wind energy.

CAP25 sets out the following targets for electricity generation and transmission:

- Share of electricity demand generated from renewable sources to up to 80% where achievable and cost effective, without compromising security of electricity supply;
  - Onshore Wind Capacity: up to 9GW
  - Offshore Wind Capacity: 5GW (minimum)
  - Solar PV Capacity: 8GW
- Ensure that 20-30% of system demand is flexible by 2030;
- Ensure electricity generation grid connection policies and regular rounds of connection offers which facilitate timely connecting of renewables, provides a locational signal and supports flexible technologies.

It is estimated that the Proposed Development, with an estimated installed capacity of 55.8MW will result in the net displacement of approximately 41,580 tonnes of carbon dioxide equivalent (CO_2e) per annum. The carbon offsets resulting from the Proposed Development are described in detail in Chapter 10 Air & Climate, and further detailed in Section 10.3.3 below.

1.5.2 Energy Security

At a national level, Ireland currently has one of the highest external dependencies on imported sources. A report by the Sustainable Energy Authority of Ireland (SEAI), published in September 2020 (Energy Security in Ireland, 2020 Report), presents national energy statistics on energy production and consumption in Ireland during 2018. Renewable energy sources (which include wind) accounted for 32.5% of Ireland's gross electricity consumption in 2018, which was well over halfway to Ireland's 2020 target of 40%. EirGrid in their '*All Island Generation Capacity Statement 2022 - 2031'* (October 2022), states that new wind farms commissioned in Ireland in 2021 brought total wind installed capacity to over 4,300MW, contributing to the overall RES-E percentage of 36.4% with wind energy accounting for 32.5%.Prior to 2015, Irelands import dependency of energy was over 90% but dropped to 71% in 2016 with the Corrib gas field starting production. Since 2018, Ireland's import dependency has been increasing as the output from the Corrib gas field reduces faster than we are adding new renewable sources. In 2021, our import dependency for energy was 80% compared to the EU average of 57.5%[17].

Total indigenous energy production in Ireland reached its highest level ever in 2018, of 5,048 kilotonnes of oil equivalent (ktoe), but has fallen since due to declining natural gas and peat production. The overall renewable energy share for gross final energy consumption for 2021 was 12.5%, however, due to a low wind year for renewable generation in 2021, we used more coal and oil for electricity generation, which increased the carbon intensity of our electricity by 12.5%. We also supplemented our indigenous

[15] *SEAI (December 2024) Energy in Ireland 2024 Report* <https://www.seai.ie/sites/default/files/publications/energy-in-ireland-2024.pdf>
[16] *EirGrid,* https://www.eirgrid.ie/grid/system-and-renewable-data-reports
[17] *Energy in Ireland – 2022 Report, SEAI, December 2022*

electricity generation with 1600 GWh of net imports through the interconnects with Northern Ireland (‘*Energy in Ireland – 2022 Report ,* SEAI, December 2022).

Ireland continues to be hugely energy import-dependent leaving it exposed to large energy price fluctuations as a minimum and possibility of fuel shortages if a major energy crisis were to occur. The international fossil fuel market is growing increasingly expensive and is increasingly affected by international politics which can add to price fluctuations. This volatility will be increased as carbon prices increase in the future. This has implications for every Irish citizen.

The SEAI has stated that our heavy dependence on imported fossil fuels, *“is a lost opportunity in terms of keeping this money here in Ireland and further developing our abundant renewable resources”*[18].

The cost of carbon credits is included in all electricity traded, and the price of electricity generated by coal is particularly vulnerable due to its high carbon emissions per unit of electricity generated. Coal and peat generate almost 5% of Ireland’s electricity, while gas generates 51%, but the Climate Action Plan calls for an aggregate reduction in carbon dioxide emissions in the electricity sector of 62-81% (compared to 2018 levels) by 2050. Any steps to reduce this dependence on imported fossil fuels will add to financial autonomy and stability in Ireland. The use of Ireland’s indigenous energy resources, such as wind, will contribute to a reduction in energy imports.

The Energy White Paper 2015[19] notes “There will be a substantial increase in the cost of carbon in the short and medium term, through the EU Emissions Trading Scheme”. Any steps to reduce dependence on imported fossil fuels will add to financial autonomy and stability in Ireland. As the White Paper notes:

“In the longer term, fossil fuels will be largely replaced by renewable sources”.

1.5.4 Increasing Energy Consumption

As detailed above, CAP25 reaffirms the need for 9GW of onshore wind generation in order for Ireland to meet its 2030 targets. CAP25 further identified that the revised National Planning Framework[20] includes policy support for the development and upgrading of electricity grid infrastructure, the delivery of renewable electricity generation capacity, and the introduction of regional renewable electricity capacity allocations for each of the three Regional Assemblies by 2030. In accordance with the relevant National Policy Objectives, Regional Assemblies and Local Authorities must plan for sufficient wind and solar energy development in order to achieve the targeted regional renewable electricity capacity allocations outlined in the draft National Planning Framework, taking into account factors influencing delivery including attrition rates and changes to energised capacity levels, in addition to current installed energised capacity.[21]

[18] *Dr Eimear Cotter, Head of Low Carbon Technologies, SEAI - "Energy Security in Ireland 2015”*
[19] *Ireland’s Transition to a Low Carbon Energy Future 2015-2030 (Department of Communications, Energy & Natural Resources, 2015)*
[20] *Department of Housing, Local Government and Heritage (2025) Draft Revision of National Planning Framework* <https://www.gov.ie/en/department-of-housing-local-government-and-heritage/press-releases/draft-revision-of-national-planning-framework-open-for-public-consultation/>
[21] *Ibid.*

2. BACKGROUND AND POLICY

The Response to Submissions Document, to which this EIAR Addendum Report is Appended, provides an updated planning policy context summary in respect of the Proposed Development to reflect the current policy background to account for changes or new additions in the intervening years. This updated context is set out in Section 2 of the Response to Submissions Document and can be reviewed in conjunction with Chapter 2: Background, of the EIAR.

2.1 Cumulative Impact Assessment

2.1.7 Methodology for Cumulative Assessment of Projects

Assessment material for the cumulative impact assessment was compiled on the relevant developments within the vicinity of the Proposed Development. The material was gathered through an updated search in June 2025 of relevant online Planning Registers, reviews of relevant EIAR (or historical EIS) documents, planning application details and planning drawings, and served to identify past and future projects, their activities and their environmental impacts.

Given the nature of the Proposed Development, a focus in this updated search was given to wind farm developments within the relevant cumulative assessment boundaries. The identified proposed, permitted and existing wind farm developments identified in the submitted EIAR remains the same. The Bellair Wind Farm located north of the proposed Lemanaghan Wind Farm has recently come into the public domain as a project. The project itself is at early project stages, and at the time of writing, no further details of project (turbine layout, no. of turbines or project scale) are in the public domain and as such, the Bellair project has been screened out of relevant assessments i.e landscape and visual, cultural heritage and birds. Similarly, singular domestic turbines with a tip height of 50 metres or less, were identified and considered in relevant assessments (i.e birds), and scoped out of relevant assessments if at a distance greater than 5km from turbines as they would not cause any potential for significant cumulative effects (i.e landscape and visual effects).

3. SITE SELECTION AND REASONABLE ALTERNATIVES

A typographical error was identified in the list of constraints and associated buffers identified in Section 3.2.6.1 of the EIAR, when referencing the relevant constraints illustrated in Figure 3-2 of the EIAR. The text incorrectly referenced a minimum 720-metre buffer from residential dwellings, the text should have referenced a minimum 740-metre buffer from residential dwellings. It is noted that the correct setback of 740m was referenced in the map legend in Figure 3-2 and the reference to 720m in the text was clearly a typographical error. This typographical error was acknowledged by the Inspector in Section 12.1.7 of their report.

There are no further revisions to Chapter 3: Site Selection & Reasonable Alternatives.

4. DESCRIPTION OF THE PROPOSED DEVELOPMENT

There are no updates to this Section of the EIAR.

5. POPULATION AND HUMAN HEALTH

5.2 Population

5.2.1 Receiving Environment

An updated search of Westmeath County Council planning portal, and nationwide Eircode database was undertaken in June 2025. There are 3 no. new inhabitable dwellings that have been identified within 2.5km of proposed turbines. Whilst new planning applications were identified beyond 2.5km of proposed turbines, given the results of the shadow flicker and noise modelling presented in the EIAR it was identified that any new inhabitable dwellings outside 2.5km from the Proposed Development turbines could be screened out for detailed assessment, and subsequent shadow flicker and noise modelling.

The new properties identified are included as property no. 342, no. 343 and no. 344 on the updated dwellings list, and are all located outside the 740-metre buffer (4 x tip height setback) from proposed turbines. All three properties have been modelled for potential shadow flicker and noise impacts. Further details on the shadow flicker and noise modelling results of these sensitive receptors are identified in Section 5.4: Shadow Flicker Assessment Results, and Section 11: Noise and Vibration, below.

5.2.2 Population Trends

In the period between the 2016 and the 2022 Census, the population of Ireland increased by 8.06%. During this time, the population of County Westmeath grew by 8.06% to 96,221 persons. Other population statistics for the State, County Westmeath and the Population Study Area (as defined in Section 5.2.1 in Chapter 5 of the EIAR) have been obtained from the Central Statistics Office (CSO) and are presented in Table 5-1.

Table 5-1 Population 2016 – 2022 (Source: CSO)

Area	Population Change		Percentage Population Change
	2016	2022	2016– 2022
State	4,761,865	5,149,139	8.1%
County Westmeath	88,770	96,221	8.4%
Population Study Area	1,279	1,289	0.8%

The data presented in Table 5-1 shows that the population of the Population Study Area increased by 0.78% between 2016 and 2022. There is a small increase in population growth for the Population Study Area, although the population growth rate is lower than that of the County. When the population data is examined in closer detail, it shows that the rate of population increase within the Population Study Area is unevenly spread through the DEDs. Umma DED increased by 7.7%, whereas the population in Ballymore DED witnessed a population increase of only 0.1%. The population in Drumraney DED decreased by -4.4%, from 273 to 261. Ballymore DED has a significantly larger population in comparison to both Umma DED and Drumraney DED with a total of 735 persons residing here in 2022. In 2022, Drumraney DED and Umma DED had populations of 261 and 293 persons respectively. The preliminary results from the 2022 Census shows an increase in the population of the State by 8.1%, from 4,761,865 in 2016, to 5,149,139 in 2022.

5.2.3 Population Density

The population densities recorded within the State, County Westmeath and the Population Study Area during the 2016 and 2022 Census are shown in Table 5-2.

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

Area	(Projected) Population Density (Persons per square kilometre)	
	2016	2022
State	67.77	73.28
County Westmeath	50.55	54.80
Population Study Area	**23.77**	**23.65**

The population density of the Population Study Area recorded during the 2022 Census was 23.65 persons per km^2. This figure is significantly lower than the national population density of 73.28 persons per km^2 and the county population density of 54.80 persons per km^2. These findings indicate that the Population Study Area has a low population density.

Similar to the trends observed in Section 5.2.2 above, the population density recorded across the Population Study Area varies between DEDs. The 2022 Census shows Umma DED has the lowest population density, at 14.15 persons per km^2, Drumraney DED has a population density of 20.08 persons per km^2, and Ballymore DED has the highest population density, at 35.34 persons per km^2.

5.2.4 Household Statistics

The number of households and average household size recorded within the State, County Westmeath and the Population Study Area during the 2016 and 2022 Censuses are shown in Table 5-3.

Table 5-3 Number of Household and Average Household Size 2016 – 2022 (Source: CSO)

Area	2016		2022	
	No. of Households	Avg. Size (persons)	No. of Households	Avg. Size (persons)
State	1,702,289	2.7	1,841,152	2.7
County Westmeath	31,813	2.8	34,087	2.8
Population Study Area	**446**	**2.9**	**456**	**2.8**

In general, the figures in Table 5-3 show that the number of households within the State and County has increased from 2016 to 2022. The number of households in the Population Study Area has also increased slightly. However, the average size of the household from 2016 to 2022 within the Population Study Area has decreased slightly from 2.9 to 2.8. Average household size recorded within the Population Study Area during the 2022 Census is the same as the County and slightly higher than the State level. The average household size recorded across the Population Study Area varies between DEDs. Drumraney and Ballymore DEDs had the highest, with 2.9 persons per household recorded in 2022, while Umma DED was lower with an average of 2.8 persons per household in 2022.

5.2.5 Age Structure

Table 5-4 presents the population percentages of the State, County Westmeath and Population Study Area within different age groups as defined by the Central Statistics Office during the 2022 Census. This data is also displayed in Figure 5-2.

Table 5-4 Population per Age Category in 2022 (Source: CSO)

Area	Age Category				
	2022				
	0 - 14	15 – 24	25 - 44	45 - 64	65 +
State	19.7%	12.5%	27.6%	25.1%	15.1%
County Westmeath	20.6%	12.3%	26.9%	25.3%	14.9%
Population Study Area	**21.3%**	**12.0%**	**23.7%**	**27.5%**	**15.4%**

The proportion of the Population Study Area population is broadly similar to those recorded at national and county level for most categories. For the Population Study Area, the highest population percentage occurs within the 45-64 age category in 2022.

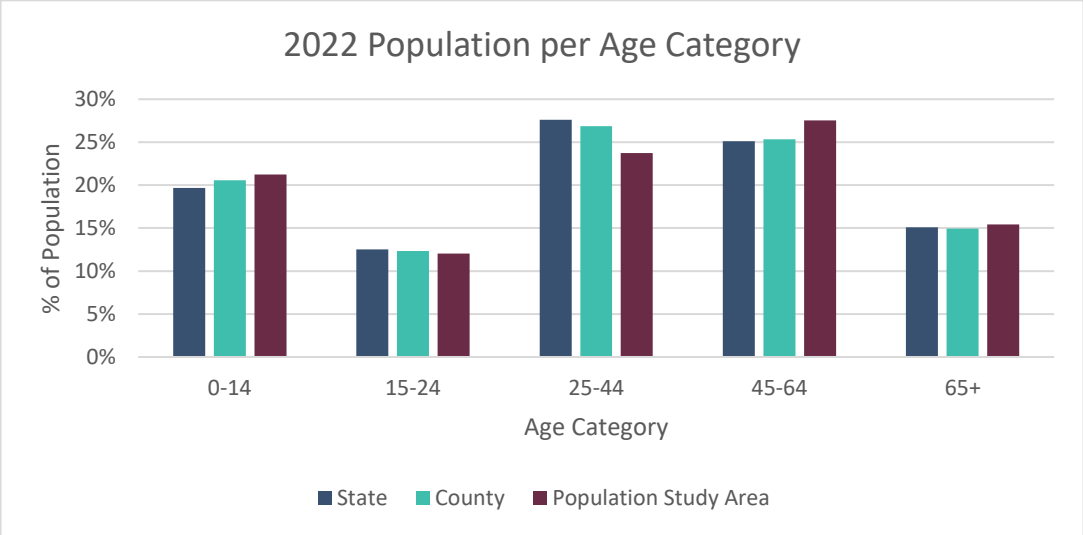

Figure 5-1 Population per Age Category in 2022 (Source: CSO)

5.2.6 Employment and Economic Activity

5.2.6.1 Economic Status of the Population Study Area

The labour force consists of those who are able to work, i.e. those who are aged 15+, out of full-time education and not performing duties that prevent them from working. In 2022, there were 2,320,297 (91.7%) persons in the labour force in the State. Table 5-5 shows the percentage of the total population aged 15+ who were in the labour force during the 2022 Census. This figure is further broken down into the percentages that were at work or unemployed. It also shows the percentage of the total population aged 15+ who were not in the labour force, i.e. those who were students, retired, unable to work or performing home duties.

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

Status		Republic of Ireland	County	Population Study Area
% of population aged 15+ who are in the labour force		**61.2%**	**60.81%**	**62.99%**
% of which are:	At work	91.7%	91%	94.34%
	First time job seeker	1.4%	1.69%	0.36%
	Unemployed	7.0%	7.79%	5.29%
% of population aged 15+ who are not in the labour force		**38.8%**	**39.19%**	**37.01%**
% of which are:	Student	28.6%	27.04%	30.75%
	Home duties	17.0%	18.03%	19.25%
	Retired	41.0%	40.25%	40.37%
	Unable to work	11.8%	12.77%	8.07%
	Other	1.7%	1.91%	1.55%

Overall, the principal economic status of those living in the Population Study Area is broadly similar to that recorded at State and County level. During the 2022 Census, the percentage of people over the age of 15 who were in the labour force was similar at both state (61.2%) and county (60.8%) level, but slightly higher within the Population Study Area with 63% in the labour force. Of those who were not in the labour force during the 2022 Census, the highest percentage of the Population Study Area population were 'Retired' individuals, similar to state and county populations.

5.2.7 Land-Use

5.2.7.1 Equine Industry

There are a number of stud farms, stables, bloodstock farms and equestrian facilities in the wider vicinity of the Wind Farm Site. The closest registered stud farm to the Wind Farm Site is Kerr's Stud, located approximately 1.3km southeast of the closest proposed turbine and is identified as property no. 79 in the shadow flicker and noise assessment tables. The Shinglis Stud is located approximately 2.7km northeast from the closet turbine, Belville Stables located approximately 6.5km southwest of the closest turbine and Farnagh Stud located 8.3km southwest from the closest turbine.

A submission on the application identifies Bryanbeg bloodstock farm as a proximate farm to the Proposed Development, however, the exact location of such is unavailable. In the absence of a confirmed location, the closest property to a proposed turbine within or in close proximity to the Bryanbeg townland is assumed for the purposes of precautionary assessment. The property selected is approximately 1.6km west of the closest proposed turbine and is identified as property no. 114 in the shadow flicker and noise assessment tables.

There have been no known studies carried out in Ireland on the impacts of wind farms on the equine industry. In 2014 Marshall Day Acoustics published a document entitled *'Summary of research of noise effects on Animals'*. The Marshall Day study specifically assessed the impacts of varying levels of noise on horses in three differing behavioural settings. The three behavioural settings studied included horses in stables, breeding mares and racing horses.

Horses in Stables

The study by Marshall Day Acoustics found that horses, stabled at the Flemington Racecourse Australia at the same time as a music concert on the site, when exposed to $L_{Aeq,15min}$ of 54-70 dB showed little response to the music noise unless the noise was particularly impulsive. The horses stabled at Flemington Racecourse were thoroughbreds, and stables were located 200 metres from the concert.

Breeding Mares

A study by Le Blanc et al (1991) and summarised by Marshall Day studied the effects of simulated aircraft noise over 100 dB and visual stimuli on pregnant mares. The study focused on pregnancy success, behaviour, cardiac function, hormonal production and rate of habitation. Le Blanc concluded the following:

> *Le Blanc et al (1991) found that birth success of pregnant mares was not affected by F-14 jet aircraft noise. While the 'fright-flight' reaction was initially observed, the mares did adapt to the noise.*

Racehorses

Marshall Day Acoustics concluded the following in relation to their study on the impacts of noise on racehorses:

> *Marshall Day Acoustics have observed horses grazing in paddocks directly under the main approach path of the Christchurch International Airport where noise levels are in excess of 90 dB (LAmax) during an aircraft flyover. Although these horses are arguably "used to" the noise, there was generally little recognition by them of an aircraft passing, let alone any sign of disturbance. This tends to support the conclusions by Le Blanc et al (1991).*

5.2.7.1.2 *Guidance*

In the absence of national policy or guidance in relation of the development of wind farms near stud farms/equestrian centres, MKO have reviewed the British Horse Society's *'Advice on Wind Turbines and Horses – Guidance for Planners and Developers'*. A copy of the guidance document is included in Appendix 5-1 of this EIAR.

The British Horse Society policy statement states the following in relating to the siting of wind turbines in the vicinity of equine businesses:

> *The BHS strongly recommends that the views and concerns of local equestrians should be recognised and taken into account when determining separation distances and that normally a minimum separation distance of 200m or three times blade tip height (whichever is greater) will be required between a turbine and any route used by horses or a business with horses.*

5.2.7.2 Discussion

On a precautionary basis, working on the assumption that every inhabitable dwelling owns a horse or horses, the closest inhabitable dwelling is located approximately 757 metres from the nearest proposed turbine location. As mentioned previously, the closest registered stud farm/equestrian facility is Kerr's Stud located approximately 1.3km southeast of the closest proposed turbine. In both instances, the proposed turbines are at a distance beyond that of the British Horse Society's recommended minimum separation distance of 200 metres as noted above, and the minimum separation distance from proposed turbines exceeds the 555 metres separation distance (based on three times the turbine blade tip height of 185 metres) between a turbine and any business with horses.

On a precautionary assumption, two registered stud farms are located within the Shadow Flicker Study Area (1.62km), these properties are identified as House ID no.'s 79 & 114. As identified below in Section 5.7.6.1, no shadow flicker will occur at House ID no. 79 and the assumed location for Bryanbeg Bloodstock Farm (House ID no. 114) shows no exceedances of the Guidelines threshold of 30 minutes per day or 30 hours per year (once the regional sunshine average of 30.07% is considered).

All relevant properties have been assessed for the potential for noise impacts, and as identified in Section 11.8.2. the predicted operational noise levels at all the Noise Assessment Locations and Noise Sensitive Receptors lie below the Guidelines daytime and night time Noise Limits, and there will be no significant residual effects.

5.5 Health Impacts of Wind Farms

Introduction

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

National Guidance

The EPA 2022 EIAR Guidelines advise that "*in an EIAR, the assessment of impacts on population and human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in this EIAR e.g., under the environmental factors of air, water, soil etc.*" Environmental impacts from the Proposed Development which may also have an impact on population and human health are discussed in this chapter section but addressed in more detail in the following chapters and relevant sections of the EIAR Addendum Report: Chapter 8 Land Soil and Geology, Chapter 9 Water, Chapter 10 Air Quality and Climate, Chapter 11 Noise and Vibration, Chapter 12 Landscape and Visual, Chapter 14 Material Assets (including Traffic and Transport).

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

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

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

2022) note that the above approach follows the 2002 EPA guidelines already in place which details the following:

> *'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'.*

IEMA Guidance 2017

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

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

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

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

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

EIA Significance Matrix for Human Health, IEMA Guidance 2022

The IEMA Working Group 2022 published *Determining Significance For Human Health In Environmental Impact Assessment* in response to gaps and inconsistencies across existing guidance documents as to how health is assessed in EIA, particularly with regard to significance. The aim of this report is to assist and streamline discussions for consultants producing the assessments and for the decision makers who are reviewing the assessments. The report states that an EIA must identify, describe and assess the direct and indirect significant effects in an appropriate manner of a proposed

development on human health. It must include the information that may reasonably be required for reaching a reasoned conclusion on the significant effects, taking into account current knowledge and methods of assessment.

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

5.6 Property Values

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

In 2023 CERIS published a working paper entitled *'Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach'*.[22] This paper looked at wind turbine developments in Donegal, Leitrim, Sligo, Mayo, Galway, Kerry and Cork and associated property values. This working paper utilised satellite imagery to identify individual turbines and sourced its housing data from www.daft.ie; while the published price on Daft is not equivalent to the final agreed sale price, it was assumed that the listing and transaction prices are correlated. The findings of this research revealed a potential decrease in property values of -14.7% within a 0-1km radius of a wind turbine. However, the sample size of only 225 houses within this range does not adequately represent the broader landscape of Irish rural housing and the distribution of wind turbines. The author states that there are '*no significant reductions in house prices beyond 1km'* and that the effects seen within the 1km band were not persistent and diminished over the operational lifetime of the turbines. Considering that this is a working paper, based on a small sample size where local conditions have the potential to disproportionately impact on the local housing market, further research is required before relying on its findings.

In September 2023, the Energy Policy Journal published 'Commercial wind turbines and residential home values: new evidence from the universe of land-based wind projects in the United States.'[23] This study targeted urban counties in the United Stated with populations over 250,000 persons, and found that on average, after a commercial wind energy project is announced, houses located within 1 mile of a proposed wind energy project experience a decrease in value of 11% relative to homes located within 3-5 miles of the proposed wind energy project. The decline in property values was found to recover post construction with property value impacts becoming relatively small (~2%) and statistically insignificant 9 years or more after project announcement (roughly 5 years after operation begins). This suggests that the housing market is reacting negatively to the expectation of likely impacts (after announcement) and the heightened activity during construction, but after operation begins, those negative perceptions and related home price impacts appear to fade.

As identified in Section 5.6 in the EIAR, extensive research in the United States provides a broader perspective. The 2009 and 2013 studies by the Lawrence Berkeley National Laboratory (LBNL) analysed thousands of home sales near wind farms and found no measurable, consistent impact on

[22] *Centre for Economic Research on Inclusivity and Sustainability (2023) Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach.* <https://www.universityofgalway.ie/media/researchsites/ceris/files/WP-2023-01.pdf>
[23] *Energy Policy (2023) Commercial wind turbines and residential home values: new evidence from the universe of land-based wind projects in the United States. Available at:* https://www.sciencedirect.com/science/article/pii/S0301421523004226

property values. A 2023 study published in *Energy Policy* reported temporary value decreases post-announcement but found these effects faded once the wind farms became operational. In the UK, studies commissioned by RenewableUK (2014) and Climate Exchange (2016) concluded that wind farms do not have a consistent negative impact on property prices. Instead, county-wide market trends drive local house prices rather than the presence of wind farms.

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

Property Values and Grid Infrastructure

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

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

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

5.7 Shadow Flicker

5.7.6 Shadow Flicker Assessment Results

Following submission of the Wind Farm Site planning application to An Bord Pleanála on 16th March 2023, it was identified that there was a formatting error within Table 5-9 in Chapter 5 of the EIAR. The formatting error in question is in Table 5-9 '*Maximum Potential Daily & Annual Shadow Flicker – Proposed Umma More Renewable Energy Development'* and is relating to the identification of participating properties in the Proposed Development. Tables 5-10 (Daily) and Table 5-11(Annual) presents the shadow flicker mitigation strategy for the Proposed Development, identifying properties that are not participating in the Proposed Development. Due to the formatting error in identifying participating properties in Table 5-9, this carried through to Table 5-10 and Table 5-11.

As identified in Section 12.3.16 in the Inspectors Report, a submission as made by the Applicant on 5th April 2023 to correct the formatting error and is available on the ABP case file. The clarification document stated '*For clarification, the shadow flicker assessment results, including the modelling presented within Chapter 5 of the EIAR are accurate and the above tables do not present any changes in the residual impact assessment. The formatting error which gave rise to the incorrect identification of participating properties in Table 5-9 and subsequent updates to Table 5-10 and Table 5-11 has been*

rectified and updated tables are presented in this briefing note. The Likely Significance of Effects and Associated Mitigation Measures (EIAR Chapter 5, Section 5.9.3.10) remains the same, as does the findings of the shadow flicker assessment.'

As identified in Section 5.1.1 above, 3 no. new inhabitable dwellings were identified in the updated housing search that was undertaken in June 2025. For completeness, the shadow flicker assessment results and mitigation tables identified in the clarification briefing note are included below as well as the modelling results for the 3 no. new properties identified in the updated property search.

5.7.6.1 Daily and Annual Shadow Flicker

There are no changes to the shadow flicker assessment assumptions, as described in the previously submitted EIAR.

The ReSoft WindFarm computer software was used to model the predicted daily and annual shadow flicker levels in significant detail, identifying the predicted daily start and end times, maximum daily duration, and the individual turbines predicted to give rise to shadow flicker. Table 5-9 below list the predicted daily shadow flicker at each property, with the results from the as submitted EIAR and the updated shadow flicker assessment results shown. Table 5-9 also lists the annual shadow flicker calculated for each property when the regional average of 30.07% sunshine is taken into account, to give a more accurate annual average shadow flicker prediction. Table 5-9 below also outlines whether a shadow flicker mitigation strategy is required for each property to mitigate potential exceedances of the daily and/or annual threshold figure.

A total of 118 No. receptors have been modelled as part of the shadow flicker assessment, the results of which are presented in Table 5-9. Former residential dwellings termed as "derelict" within this assessment are defined as properties that are currently in an uninhabitable condition.

Table 5.9 Maximum Potential Daily & Annual Shadow Flicker – Proposed Umma More Renewable Energy Development

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
1	618187	745934	Derelict	571	T4	01:09:00	140:42:00	42:18:28	3, 4	No*	No*
2	618399	747936	Dwelling	757	T1	00:51:36	73:30:00	22:06:04	1, 2,	No**	No
3	619841	746630	Dwelling	759	T5	01:30:00	198:48:00	59:46:41	2, 3, 4, 5, 6, 7	Yes	Yes
4	621453	745239	Dwelling	759	T7	00:40:12	71:30:00	21:29:59	7, 9,	No**	No
5	618915	745338	Dwelling	763	T4	00:37:48	69:30:00	20:53:54	5, 8,	Yes	No
6	620556	746589	Dwelling	767	T6	01:09:00	87:06:00	26:11:26	5, 6,	No**	No
7	618087	745667	Dwelling	770	T4	00:54:00	71:48:00	21:35:24	4,	Yes	No
8	621320	746366	Dwelling	777	T7	00:49:48	82:18:00	24:44:50	6, 7,	Yes	No
9	618475	748140	Dwelling	779	T1	00:51:36	42:48:00	12:52:11	1,	No**	No
10	621172	744654	Dwelling	808	T9	00:51:36	55:48:00	16:46:43	8, 9,	Yes	No
11	618036	745676	Dwelling	809	T4	00:52:12	79:00:00	23:45:18	4,	Yes	No
12	618376	748045	Dwelling	818	T1	00:48:36	52:24:00	15:45:23	1,	No**	No
13	619889	747394	Dwelling	829	T1	00:49:12	128:18:00	38:34:45	1, 2, 3,	Yes	Yes
14	618287	747683	Dwelling	833	T1	00:46:48	73:30:00	22:06:04	1, 2,	Yes	No
15	618174	747340	Dwelling	847	T2	00:46:12	109:54:00	33:02:47	1, 2, 3,	Yes	Yes
16	618208	747455	Dwelling	847	T2	00:46:12	104:00:00	31:16:20	1, 2, 3,	Yes	Yes
17	618264	747610	Dwelling	860	T1	00:46:12	86:12:00	25:55:12	1, 2,	Yes	No
18	619952	747921	Dwelling	861	T1	00:45:00	61:24:00	18:27:45	1, 2,	Yes	No
19	620818	746596	Dwelling	868	T7	00:42:00	67:36:00	20:19:37	6,	Yes	No
20	618250	747779	Dwelling	873	T1	00:45:00	67:00:00	20:08:48	1, 2,	Yes	No
21	618929	745223	Dwelling	878	T4	00:34:48	57:12:00	17:11:59	8	Yes	No

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
22	618121	747256	Dwelling	885	T2	00:44:24	96:48:00	29:06:26	1, 2, 3,	Yes	No
23	621200	744540	Dwelling	898	T9	00:39:00	33:12:00	9:58:59	8, 9,	Yes	No
24	621312	746517	Dwelling	900	T7	00:37:48	38:30:00	11:34:36	6, 7,	Yes	No
25	618422	748301	Dwelling	919	T1	00:42:00	40:54:00	12:17:54	1,	Yes	No
26	618380	748267	Dwelling	930	T1	00:43:48	33:18:00	10:00:47	1,	No**	No
27	621461	746453	Dwelling	931	T7	00:41:24	63:36:00	19:07:27	6, 7	Yes	No
28	618077	746968	Dwelling	941	T3	00:42:36	120:54:00	36:21:14	1, 2, 3, 4	Yes	Yes
29	621434	744955	Dwelling	946	T9	00:55:48	52:30:00	15:47:11	9,	No**	No
30	621149	744413	Dwelling	947	T9	00:11:24	3:24:00	1:01:21	N/A	No	No
31	620140	746850	Dwelling	956	T6	00:45:00	70:06:00	21:04:43	2, 3	Yes	No
32	621238	744491	Dwelling	959	T9	00:36:00	28:36:00	8:35:59	8	Yes	No
33	618042	747109	Dwelling	960	T2	00:40:48	108:18:00	32:33:55	1, 2, 3	No**	No**
34	620699	744161	Dwelling	963	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
35	620376	744130	Dwelling	981	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
36	621274	744492	Dwelling	986	T9	00:37:48	32:12:00	9:40:57	9	Yes	No
37	621203	744407	Dwelling	989	T9	00:22:12	10:18:00	3:05:50	N/A	No	No
38	621233	746652	Dwelling	989	T7	00:33:00	22:12:00	6:40:31	6	Yes	No
39	621280	746636	Dwelling	993	T7	00:32:24	17:54:00	5:22:57	6	Yes	No
40	621314	744527	Dwelling	997	T9	00:42:36	41:24:00	12:26:55	9	Yes	No
41	617957	746743	Dwelling	998	T3	00:40:12	98:06:00	29:29:53	2, 3, 4	Yes	No
42	621833	746010	Dwelling	999	T7	00:39:36	45:42:00	13:44:30	7	Yes	No
43	618447	748447	Dwelling	1003	T1	00:39:00	42:54:00	12:53:59	1	Yes	No

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
44	621462	744804	Dwelling	1007	T9	00:48:00	33:06:00	9:57:11	9	Yes	No
45	618372	748380	Dwelling	1008	T1	00:38:24	40:48:00	12:16:06	1	Yes	No
46	621478	744839	Dwelling	1013	T9	00:49:12	32:18:00	9:42:45	9	Yes	No
47	617996	746982	Dwelling	1020	T2	00:39:00	116:12:00	34:56:27	1, 2, 3, 4	Yes	Yes
48	621453	744698	Dwelling	1035	T9	00:41:24	36:00:00	10:49:30	9	Yes	No
49	620423	744066	Dwelling	1040	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
50	620144	747524	Dwelling	1040	T1	00:38:24	59:06:00	17:46:16	1, 2	Yes	No
51	617960	747157	Dwelling	1041	T2	00:37:48	84:48:00	25:29:56	1, 2, 3	Yes	No
52	620494	744059	Dwelling	1044	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
53	621347	744492	Dwelling	1044	T9	00:40:48	37:54:00	11:23:47	9	Yes	No
54	618372	748440	Dwelling	1050	T1	00:36:36	42:36:00	12:48:35	1	Yes	No
55	618835	745029	Dwelling	1056	T4	00:32:24	20:00:00	6:00:50	8	Yes	No
56	620477	746929	Dwelling	1062	T6	00:28:12	62:36:00	18:49:25	N/A	No	No
57	620936	744114	Dwelling	1081	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
58	617910	747172	Dwelling	1091	T2	00:36:36	77:36:00	23:20:02	1, 2, 3	Yes	No
59	621651	744955	Dwelling	1097	T7	00:34:12	17:36:00	5:17:32	9	Yes	No
60	621886	745261	Dwelling	1115	T7	00:36:36	35:36:00	10:42:17	7	Yes	No
61	620218	747506	Dwelling	1116	T1	00:36:00	50:36:00	15:12:55	1, 2	Yes	No
62	618449	748599	Dwelling	1119	T1	00:30:36	21:18:00	6:24:17	1	Yes	No
63	618359	748530	Dwelling	1123	T1	00:34:12	37:00:00	11:07:33	1	Yes	No
64	621608	744868	Dwelling	1132	T7	00:46:12	26:06:00	7:50:53	9	Yes	No
65	621814	746367	Dwelling	1135	T7	00:36:00	24:42:00	7:25:38	7	Yes	No

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
66	621953	746099	Dwelling	1140	T7	00:34:48	18:42:00	5:37:23	7	Yes	No
67	619592	748749	Dwelling	1148	T1	00:00:00	0:00:00	0:00:00	N/A	No	No
68	617851	747114	Dwelling	1151	T2	00:34:48	80:30:00	24:12:21	1, 2, 3	Yes	No
69	617846	747216	Dwelling	1156	T2	00:34:12	69:00:00	20:44:53	1, 2, 3	Yes	No
70	617831	747309	Dwelling	1180	T2	00:33:36	58:00:00	17:26:25	1, 2, 3	Yes	No
71	621896	746322	Dwelling	1181	T7	00:34:48	20:48:00	6:15:16	7	Yes	No
72	621926	746313	Dwelling	1202	T7	00:34:12	19:36:00	5:53:37	7	Yes	No
73	621990	745273	Dwelling	1206	T7	00:34:12	28:12:00	8:28:47	7	Yes	No
74	617548	746289	Dwelling	1207	T4	00:33:00	29:36:00	8:54:02	4	Yes	No
75	620952	746948	Dwelling	1220	T7	00:23:24	10:12:00	3:04:02	N/A	No	No
76	620298	743884	Dwelling	1238	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
77	621296	744152	Derelict	1240	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
78	619544	748873	Dwelling	1245	T1	00:00:00	0:00:00	0:00:00	N/A	No	No
79	620373	743851	Dwelling	1258	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
80	622071	745331	Dwelling	1261	T7	00:32:24	24:30:00	7:22:01	7	No**	No
81	621174	746964	Dwelling	1270	T7	00:28:48	25:00:00	7:31:03	N/A	No	No
82	621000	747004	Dwelling	1280	T7	00:22:48	10:00:00	3:00:25	N/A	No	No
83	620245	743844	Dwelling	1285	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
84	618416	748813	Dwelling	1314	T1	00:00:00	0:00:00	0:00:00	N/A	No	No
85	622082	746291	Dwelling	1332	T7	00:30:36	15:00:00	4:30:38	7	Yes	No
86	619669	744029	Dwelling	1355	T8	00:00:00	0:00:00	0:00:00	N/A	No	No
87	617397	745840	Dwelling	1361	T4	00:29:24	13:00:00	3:54:32	N/A	No	No

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daly Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)	Mitigation Strategy Required (Annual)
88	622205	746027	Dwelling	1363	T7	00:29:24	12:12:00	3:40:07	N/A	No	No
89	617498	745482	Dwelling	1376	T4	00:30:36	20:30:00	6:09:51	4	Yes	No
90	620170	743767	Dwelling	1376	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
91	617444	745580	Dwelling	1386	T4	00:30:00	16:24:00	4:55:53	4	Yes	No
92	617494	745416	Dwelling	1409	T4	00:30:00	23:06:00	6:56:46	4	Yes	No
93	617586	746998	Dwelling	1415	T3	00:28:48	42:18:00	12:43:10	N/A	No	No
94	621151	747129	Dwelling	1426	T7	00:22:12	10:12:00	3:04:02	N/A	No	No
95	622285	745942	Dwelling	1426	T7	00:28:12	10:48:00	3:14:51	N/A	No	No
96	622295	745509	Dwelling	1438	T7	00:27:36	10:30:00	3:09:26	N/A	No	No
97	618860	749119	Dwelling	1439	T1	00:00:00	0:00:00	0:00:00	N/A	No	No
98	617289	746117	Dwelling	1448	T4	00:27:36	10:06:00	3:02:13	N/A	No	No
99	617278	746093	Dwelling	1459	T4	00:27:36	10:24:00	3:07:38	N/A	No	No
100	620195	743672	Dwelling	1463	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
101	622364	745714	Dwelling	1490	T7	00:26:24	9:48:00	2:56:49	N/A	No	No
102	620071	743671	Dwelling	1495	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
103	618406	749020	Dwelling	1498	T1	00:00:00	0:00:00	0:00:00	N/A	No	No
104	619132	749208	Dwelling	1505	T1	00:00:00	0:00:00	0:00:00	N/A	No	No
105	621024	743677	Dwelling	1519	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
106	620058	743635	Dwelling	1533	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
107	619204	749238	Dwelling	1537	T1	00:00:00	0:00:00	0:00:00	N/A	No	No
108	621159	747263	Dwelling	1559	T7	00:00:00	0:00:00	0:00:00	N/A	No	No
109	622263	745001	Dwelling	1568	T7	00:27:00	14:00:00	4:12:35	N/A	No	No

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110	617260	745546	Dwelling	1571	T4	00:26:24	11:54:00	3:34:42	N/A	No	No
111	618430	749128	Dwelling	1583	T1	00:00:00	0:00:00	0:00:00	N/A	No	No
112	622455	745549	Dwelling	1591	T7	00:25:12	7:48:00	2:20:44	N/A	No	No
113	619965	743600	Dwelling	1595	T9	00:00:00	0:00:00	0:00:00	N/A	No	No
114	617184	746449	Dwelling	1596	T4	00:25:12	9:00:00	2:42:23	N/A	No	No
115	619373	749288	Dwelling	1605	T1	00:00:00	0:00:00	0:00:00	N/A	No	No
342	621367	746409	Dwelling	792	T7	00:46:12	73:40:12	22:09:08	6,7,9	Yes	No
343	618209	747431	Dwelling	838	T2	00:46:48	109:10:12	32:49:37	1,2,3	Yes	Yes
344	622099	746381	Dwelling	1388	T7	00:30:00	14:34:12	4:22:52	7	Yes	No

* Derelict Property

**Participating Property

Of the 118 No. properties modelled; it is predicted that 73 properties may experience daily shadow flicker levels in excess of the Guidelines threshold of 30 minutes per day. This prediction is assuming theoretical precautionary conditions (i.e. 100% sunshine on all days where the shadow of the turbines passes over a house, wind blowing in the correct direction, no screening present, etc.) and in the absence of any mitigation measures.

Of these 73 No. properties:

- 72 No. properties are inhabitable dwellings (including 7 Participating Properties); and
- 1 No. property is a derelict property

Of the 118 no. properties modelled, when the regional sunshine average (i.e. the mean number of sunshine hours throughout the year) of 30.07% is taken into account, the Guidelines limit of 30 hours per year is predicted to be exceeded at 8 of the inhabitable dwellings, 7 of which are third party properties.

Additionally, it is worth reiterating that the predicted shadow flicker listed in Table 5-9 is considered conservative and in reality, the occurrence and/or duration of shadow flicker at these properties is likely to be eliminated or significantly reduced as the following items are not considered by the model:

- Receivers may be screened by topography, cloud cover and/or vegetation/built form i.e. adjacent buildings, farm buildings, garages or barns;
- Each receiver will not have windows facing in all directions onto the wind turbines.
- At distances, greater than 500-1000m '*the rotor blade of a wind turbine will not appear to be chopping the light but the turbine will be regarded as an object with the sun behind it. Therefore, it is generally not necessary to consider shadow casting at such distances'* (Danish Wind Industry Association, accessed 2010).

Section 5.9.3 below outlines the mitigation strategies which may be employed at the potentially affected properties to ensure that the Guidelines are complied with at any dwelling within the Shadow Flicker Study Area. The same mitigation strategies, outlined in Section 5.9.3, could be taken further to achieve stricter shadow flicker controls, should the shadow flicker requirements of the draft Guidelines be adopted in advance of a planning decision being made on the Wind Farm Site.

5.7.6.2 Cumulative Shadow Flicker

For the assessment of cumulative shadow flicker, any other existing, permitted or proposed wind farms are considered where the project's ten times rotor diameter shadow flicker study area are located within the Shadow Flicker Study Area of ten times the rotor diameter for the Proposed Development. As identified in Section 2.1.1 above, the closest wind farm remains the proposed Lemanaghan Wind Farm located 16.3km southwest of the Wind Farm Site at its closest point and as such the ten times rotor diameter shadow flicker study for this proposed project would not overlap with that of the Proposed Development ten times rotor diameter Shadow Flicker Study Area. Therefore, there is no change from Section 5.7.6.2 in the EIAR as it remains that no cumulative shadow flicker assessment is required.

5.9 Likely Significant Effects and Associated Mitigation Measures

5.9.2 Construction Phase

The following impact assessment sections of the EIAR pertaining to Health have been considered and additional detail provided where applicable in accordance with guidance as set out in Section 5.5 above.

5.9.2.1 Health and Safety

Pre-Mitigation Effects

Construction of the Proposed Development will necessitate the presence of a construction site. Construction sites and the machinery used on them pose a potential health and safety hazard to construction workers if site rules are not properly implemented. This will have a short-term potential significant negative effect.

Proposed Mitigation Measures

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

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

The following measures will be implemented:

- A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. This will be prepared on a preliminary basis at the procurement stage and developed further at construction stage.
- All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project. Safepass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required. The developer is required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety and Health Plan. Public safety will be addressed by restricting Site access during construction. Fencing will be erected in areas of the Site where uncontrolled access is not permitted.
- Goal posts will be established, where necessary, under overhead electricity lines for the entirety of the construction phase of the Wind Farm Site.
- The suitability of machinery and equipment for use near power lines will be risk assessed.
- All staff will be trained on operating voltages of overhead electricity lines running the Site. All staff will be trained to be aware of the risks associated with overhead lines. All contractors that may visit the Sites are made aware of the location of lines before they come on to Site.
- Barriers will run parallel to the overhead line at a minimum horizontal distance of 6 metres on plan from the nearest overhead line conductor wire.
- When activities must be carried out beneath overhead lines, e.g., component delivery or substation construction, a Site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used prior to any works. Overhead line proximity detection equipment will be fitted to machinery when such works are required.

- Information on safe clearances will be provided to all staff and visitors.
- Signage indicating locations and health and safety measures regarding overhead lines will be erected in canteens and on Site.
- All staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the Site Health and Safety Plan.

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

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

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

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

The Proposed Development will connect to the existing Thornsberry 110kV substation. Grid Connection via Thornsberry will comprise an on-site 110kV substation and underground electrical cabling, measuring approximately 31km in total, predominantly located within the public road

corridors. Health and safety guidelines for working within and around electrical substations and overhead lines will be adhered to on site.

Residual Effect

With the implementation of the above, there will be a short-term potential slight negative residual effect on health and safety during the construction phase of the Proposed Development.

Significance of Effects

Based on the assessment above there will be no significant direct and indirect effects on health and safety during the construction phase of the Proposed Development.

5.9.2.7 Air (Dust & Exhaust Emissions)

Pre-Mitigation Effects

Potential dust and exhaust emission sources during the construction phase of the Proposed Development include construction of new access roads and upgrading of existing access tracks, and excavation and construction of turbine foundations and substation, temporary construction compounds, and laying of underground cabling.

An increase in dust emissions has the potential to cause a nuisance to sensitive receptors in the immediate vicinity of the Site. The entry and exit of construction vehicles from the Site may result in the transfer of mud to the public road, particularly if the weather is wet. This may cause nuisance to residents and other road users. These effects will not be significant and will be relatively short-term in duration. The potential dust effects that may occur during the construction phase of the Proposed Development are further described in Chapter 10: Air and Climate and in Section 10 below.

Proposed Mitigation Measures

As discussed in Section 4.4.2 of Chapter 4, aggregate material for the construction of roads, substation and turbine hardstanding areas will be imported from nearby quarries. The quarries that could potentially provide stone and concrete for the Proposed Development, along with the specified construction haul routes are listed in Section 4.4 of Chapter 4. Truck wheels will be washed where necessary to remove mud and dirt before leaving the Site. All plant and materials vehicles shall be stored in the dedicated compound area. Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and compaction. Construction traffic will be restricted to defined routes and a speed limit will be implemented.

In periods of extended dry weather, dust suppression may be necessary, and along haul roads to ensure dust does not cause a nuisance. If necessary, water will be taken from the Site's drainage system, and will be pumped into a bowser or water spreader to dampen down haul roads and the temporary construction compound to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.

The active construction area along the underground electrical cabling route will be small, ranging from 150-300 metres in length at any one time. Should separate crews be used during the construction phase they will generally be separated by 1-2 kilometres. All construction machinery will be maintained in good operational order while on-site, minimising any emissions that are likely to arise. Aggregate materials for the construction of the underground electrical cabling route will be sourced from local quarries to reduce emissions associated with vehicle movements.

Potential dust emissions during the construction period will not be significant and will be relatively short-term in duration.

Residual Effects

Following the implementation of the above mitigation measures, there will be a short-term slight effect due to dust emissions from the construction of the Proposed Development.

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects.

5.9.2.10 Water Quality

Section 9.5.2.11 in Chapter 9 of the EIAR details the impact assessment on potential effects on human health relative to hydrological and hydrogeological environment. In the interest of clarity, and in consideration of the guidance detailed in Section 5.2, the potential health effects associated with the hydrological environment are detailed below and further in Section 9.5.3 below.

Wind Farm Site

Potential health effects are associated with negative impacts on public and private water supplies and potential flooding. There are no mapped public or group water scheme groundwater protection zones in the area of the Wind Farm Site. Notwithstanding this, the proposed site design and mitigation measures ensures that the potential for impacts on the water environment will not be significant.

Flooding of property can cause inundation with contaminated flood water. Flood waters can carry waterborne disease and contamination/effluent. Exposure to such flood waters can cause temporary health issues. A detailed Stage III Flood Risk Assessment has been caried out for the proposed Wind Farm Site, summarised in Section 9.3.5. This Flood Risk Assessment, combined with the assessment of changes in permeable surfaces (Section 9.5.3.1) demonstrates that the risk of the Wind Farm Site works contributing to downstream flooding is insignificant. On-site (construction phase) drainage control measures will ensure no downstream increase in local flood risk.

Grid Connection

Potential health effects from the Grid Connection underground electrical cabling route are associated with negative impacts (i.e. contamination) on public and private water supplies and potential alteration of flooding risks. An assessment of potential impacts on private and public water supplies is completed at Section 9.3.12, and no significant effects will occur. Therefore, no health effects are likely to occur.

Flooding of property can cause inundation with contaminated flood water. Flood waters can carry waterborne disease and contamination/effluent. Exposure to such flood waters can cause temporary health issues. The Flood Risk Identification (undertaken at Section 9.3.5) has also shown that the risk of the Grid Connection works contributing to downstream flooding is also very low, as the works footprint is small, the works are for the most part along existing roads, and the duration of the works is short. On-site (construction phase) drainage control measures along the Grid Connection underground electrical cabling route will ensure no downstream increase in local flood risk.

Mitigation and Monitoring Measures

A bespoke drainage design which includes but is not limited to interceptor drains, check dams, swales and ponds will be implemented on the Site. Chapter 9 of the EIAR details all best practice and mitigation measures to minimise the potential for entrainment of suspended sediment or potential

hydrocarbon leak. Please see Chapter 9 for details and Chapter 18 for a full list of mitigation and monitoring measures for the Proposed Development.

Residual Impacts

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

Significance of Effects

The effects on water quality during the construction phase of the Proposed Development are considered to be not significant.

5.9.3 Operational Phase

5.9.3.5 Property Values

Pre-Mitigation Impacts

Wind Farm Site

As noted in Section 5.6 above, the available scientific literature demonstrates that there is insufficient evidence from the scientific literature and studies conducted to determine that there is the potential for a significant effect on property values as a result of the Wind Farm Site. The impact assessment on property values outlined below takes a precautionary approach and assumes that based on the inconclusive evidence summarised above in Section 5.6, there is the potential for short-term slight impacts on property values located within 1km of the proposed turbines during the early operational phase of the Wind Farm Site.

Grid Connection

As noted in Section 5.6 above, the conclusions from available Eirgrid studies indicate that property values (residential and agricultural) show no correlation with the presence of grid infrastructure in the area, with opinions on nearby grid infrastructure diminishing over time. In some cases, property values were demonstrated to increase however, causation with grid infrastructure cannot be determined. There is no potential for impact on property values in the area.

Mitigation and Monitoring Measures

- All mitigation relevant to property values, outlined above and the corresponding chapters: Chapter 10 Air & Climate, Chapter 11 Noise and Vibration, Chapter 13 Landscape, and Chapter 14 Material Assets, will be implemented in order to reduce insofar as possible, impacts on property values at properties located in the vicinity of Wind Farm Site. Please refer to Chapter 1 Schedule of Mitigation and Monitoring Measures for a full list of measures.
- The Wind Farm Site has been designed in accordance with the parameters set out in the Guidelines and with cognisance of the draft Guidelines, adhering to the required setback distances from sensitive receptors set out in those documents.
- The available scientific literature on the topic is inconclusive, with large scale studies conducted in the UK concluding that property values are generally driven by market conditions rather than proximity to wind farms. These studies comprise a much larger sample size than then only Irish study on the topic, a working paper, where the

small sample size has the potential to result in individual circumstances having had an outsized bearing on the conclusions drawn from the study.
- The available literature that does identify a short-term decrease in property values all note that the decrease in value reduces and becomes statistically insignificant, in general, 5 years after the commencement of the operational phase.

Residual Effect

It can be concluded that there is the potential for a short term negative not significant impact on property values from the operational phase of the Wind Farm Site.

Significance of Effects

The effect on property values due to the Wind Farm Site is not significant.

5.9.3.10 Shadow Flicker

Pre-Mitigation Effects

Of the 118 No. properties modelled; it is predicted that 73 properties may experience daily shadow flicker levels above the Guidelines threshold of 30 minutes per day.

Assuming theoretical precautionary conditions, a total of 73 properties may experience daily shadow flicker in excess of the Guidelines threshold of 30 minutes per day. Of these 73 properties, 1 is derelict, and 7 no. inhabitable dwellings are Participating Properties. The Guidelines total annual guideline limit of 30 hours is exceeded at 9 properties once the regional sunshine average of 30.07% is considered. Of these 9 properties, 8 properties are inhabitable dwellings and 7 of which are third party properties, and 1 no. property is derelict.

Proposed Mitigation Measures

In order to demonstrate how the SCADA control system can be applied to switch off particular turbines at the relevant times and dates, Table 5-10 below lists the 65 properties at which a shadow flicker mitigation strategy may be necessary to ensure the Guidelines 30-minute per day shadow flicker threshold is not exceeded. In this case, the relevant turbine(s) would be programmed to switch off for the time required to reduce daily shadow flicker to below the Guidelines limit of 30 minutes. The SCADA control system would be utilised to control shadow flicker in the absence of being able to agree alternative mitigation measures with the relevant property owner. The mitigation strategy outlined in Table 5-10 below is based on the theoretical precautionary scenario. The details presented in Table 5-10 list the days per year and the turbines that could be programmed to switch off at specific times, in order to reduce daily shadow flicker to a maximum of 28 minutes, which is below the Guidelines limit of 30 minutes.

Table 5-10 Shadow Flicker Mitigation Strategy for Daily Shadow Flicker Exceedance – Turbine Numbers and Dates

Property No.	No. of Days 30min/day Threshold is Exceeded	Turbine(s) Producing Shadow Flicker Exceedance	Days of Year When Mitigation May be Required (Days)	Days of Year When Mitigation May be Required (Dates)*
3	237	2, 3, 4, 5, 6, 7	1-18, 20-27, 44-53, 80-99, 140-203, 245-264, 292-300, 319-365	1st January – 18th January, 20th January - 27th January, 13th February - 22nd February, 21st March - 31st March, 20th May - 22nd July, 1st - 21st September, 19th - 27th October, 15th November - 31st December
5	40	5, 8,	85-95, 164-181 250-260,	26th March - 5th April, 13th June - 30th June, 7th -17th September
7	69	4	138-206	18th May – 25th July
8	88	6, 7,	1-29, 50-58, 316-365,	1st January - 29th January, 19th February - 27th February, 12th November - 31st December
10	87	8, 9	129-215	9th May – 3rd August
11	80	4	133-212	13th May - 31st July
13	249	1, 2, 3	12-50, 78-107, 238-267, 295-334, 353-358	12th January – 19th February, 19th March – 17th April, 26th August - 24th September, 22nd October – 30th November, 19th December – 24th December
14	83	1,2	26-46, 85-103, 241-261, 299-320	26th January - 15th February, 26th March - 13th April, 29th August - 18th September, 26th October - 16th November
15	125	1, 2, 3,	10-31, 64-83, 118-137, 207-227, 262-281, 315-336	10th January - 31st January, 5th March - 24th March, 28th April - 17th May, 26th July - 15th August, 19th September - 8th October, 11th November - 2nd December

Property No.	No. of Days 30min/day Threshold is Exceeded	Turbine(s) Producing Shadow Flicker Exceedance	Days of Year When Mitigation May be Required (Days)	Days of Year When Mitigation May be Required (Dates)*
16	136	1, 2, 3,	1-15, 17-18, 52-71, 107-126, 219-238, 274-294, 327-329, 331-365	1st January - 15th January, 17th-18th January, 21 February - 12th March, 17 April - 6th May, 7 August - 2th August, 1 October - 21 October, 23rd - 25th November, 27th November - 31st December
17	85	1, 2,	33-53, 92-111, 233-253, 291-312,	4th February - 22nd February, 2nd April - 21st April, 21 August - 10 September, 18th October - 8th November
18	72	1, 2,	21-35, 60-80, 264-284, 310-324	21st January - 4th February, 1st March - 21st March, 21 September - 11th October, 6th November - 20th November
19	73	6	1-26, 319-365	1st January - 26th January, 12th November - 31st December
20	75	1, 2,	20-38, 75-92, 253-270, , 307-326,	20th January - 7th April, 16th March - 2nd April, 10th September - 27th September, 3rd November - 22 November
21	24	8	94-105, 240-251,	4th April - 15th April, 28 August – 8th September
22	108	1, 2, 3,	23-39, 74-91, 124-142, 203-220, 254-272, 306-322,	23 January - 8th February, 15th March - 1st April, 4th May – 22nd May, 22 July - 8th August, 11th September – 29th September, 2 November - 18th November
23	58	8, 9,	153-190, 162-181,	3rd June - 9th July,
24	45	6, 7,	1-11, 46-47, 298-299, 335-336, 338-365	1st January - 11th January, 15th February – 16th February, 25th-26th October, 1st-2nd December, 4th December - 31st December
25	41	1,	17-36, 309-329,	17th January - 5th February, 5th November - 25th November

Property No.	No. of Days 30min/day Threshold is Exceeded	Turbine(s) Producing Shadow Flicker Exceedance	Days of Year When Mitigation May be Required (Days)	Days of Year When Mitigation May be Required (Dates)*
27	121	6, 7	40-59, 285-305	9th February – 28th February, 12th October - 1st November
28	148	1, 2, 3, 4	1-7, 11, 49-65, 101-119, 153-191, 225-243, 280-297, 335, 339-365	1st January - 7th January, 11th January, 18th February - 6th March, 11th April - 29th April, 3rd June - 10th July, 13th August - 31st August, 7th October - 24th October, 1st December, 5th December - 31st December
31	33	2, 3	68-73, 109-118, 226-235, 271-277,	9th March - 14th March, 19th - 28th April, 14 August – 23rd August, 28th September - 4th October
32	30	8	157-186,	6th June - 5th July
36	20	9	162-181,	11th June – 30th June
38	20	6	26-35, 310-319	26th January – 4th February, 6th November - 15th November
39	9	6	34-37, 308-312	3rd February - 6th February, 4 November - 8th November
40	46	9	149-194	29th May - 13th July
41	98	2,3,4	18-37, 72-85, 120-134, 211-225, 260-273, 309-328,	18th January - 6th February, 13th March- 26th March, 30th April - 14th May, 30th July - 13th August, 17th September – 30th September, 5th November - 24th November
42	27	7	59-71, 273-286,	28th February - 12th March, 30th September - 13th October
43	64	1	1-22, 324-365	1st January - 22 January, 20 November – 31st December
44	34	9	111-127, 217-233	21 April – 7th May, 5th August – 21st August

Property No.	No. of Days 30min/day Threshold is Exceeded	Turbine(s) Producing Shadow Flicker Exceedance	Days of Year When Mitigation May be Required (Days)	Days of Year When Mitigation May be Required (Dates)*
45	37	1	14-31, 314-332,	14th January – 31st January, 10th November – 28th November
46	31	9	107-122, 222-236	17th April - 2nd May, 10th August – 24th August
47	131	1, 2, 3, 4	1-8, 51-64, 100-113, 146-163, 182-199, , 232-245, 281-294, 332-333, 337-365	1st January - 8th January, 20th February - 5th march, 10th April – 23rd April, 26th May - 12th June, 1st July - 18th July, 20th August - 2nd September, 8th October – 21st October, 18th November – 29th November, 3rd December - 31st December
48	40	9	121-140, 203-222	1st May – 20th May, 22nd July - 10th August
50	44	1, 2	58-65, 99-112, 231-245, 280-286,	27th February – 6th March, 9th April - 22nd April, 19th August – 2nd September, 7th October – 13th October
51	69	1,2,3	40-50, 84-96, 128-137, 208-217, 249-261, 295-306,	9th February - 19th February, 25th March - 6th April, 8th May -17th May, 27th July - 5th August, 6th September – 18th September, 22nd October – 2nd November
53	42	9	151-192	31st May - 11th July
54	48	1	2-3, 6-26, 319-340, 342-344	2nd January - 3rd January, 6th January - 26th January, 15th November - 6th December, 8 December - 10th December
55	18	8	108-116, 229-237	18th April - 26th April, 17th August - 25th August
58	54	1,2,3	41-50, 84-93, 125-131, 213-219, 252-261, 296-305,	10th February - 19th February, 25th March - 3rd April, 5th May - 11th May, 1st August - 7th August, 9th September - 18th September, 23rd October - 1st November
59	15	9	96-103, 241-247	6th April - 13th April, 29th August - 4th September

Property No.	No. of Days 30min/day Threshold is Exceeded	Turbine(s) Producing Shadow Flicker Exceedance	Days of Year When Mitigation May be Required (Days)	Days of Year When Mitigation May be Required (Dates)*
60	25	7	126-138, 206-217	6th May - 18th May, 25th July-5th August
61	31	1,2	62-65, 100-110, 234-244, 279-283,	3rd March-6th March, 10th April -20th April, 22nd August-1st September, 6th October- 10th October
62	10	1	351-360	17th December - 26th December
63	55	1	1-16, 327-365	1stJanuary -16th January, 23rd November - 31st December
64	19	9	103-112, 232-240	13th April - 22nd April, 20th August - 28th August
65	26	7	30-42, 303-315	30th January - 11th February, 30th October - 11th November
66	17	7	56-64, 281-288	25th February - 5th March, 8th October - 15th October
68	37	1,2,3	47-54,89-96, 128-130, 215-216, 249-259, 291-298	16th February - 23rd February, 30th March - 6th April, 8th May - 10th May, 3rd August - 4th August, 6th September - 16th September, 18th October - 25th October
69	36	1,2,3	41-47,81-88, 121-123, 222-224, , 257-264, 299-305	10th February - 16th February, 22nd March - 29th March, 1st May - 3rd May, 10th August - 12th August, 14th September - 21st September, 26th October - 1st November
70	31	1,2,3	36-40, 74-81, 114-116, 229-231, 265-271, 306-310	5th February - 9th February, 15th March - 22nd March, 24th April - 26th April, 17th August - 19th August, 22nd September - 28th September, 2nd November - 6th November
71	20	7	38-47, 298-307	7th February - 16th February, 25th October - 3rd November

Property No.	No. of Days 30min/day Threshold is Exceeded	Turbine(s) Producing Shadow Flicker Exceedance	Days of Year When Mitigation May be Required (Days)	Days of Year When Mitigation May be Required (Dates)*
72	18	7	40-48, 297-305	9th February - 17th February, 24th October - 1st November
73	16	7	122-129, 215-222	2nd May - 9th May, 3rd August - 10th August
74	13	4	71-76, 269-275	12th March - 17th March, 26th September - 2nd October
85	42	7	38-58, 286-306	7th February – 27th February, 13th October – 2nd November
89	9	4	130-133, 211-215	10th May - 13th May, 30th July - 3rd August
91	2	4	121,223	1st May, 11th August
92	6	4	135-137, 207-209	15th May – 17th May, 26th July – 28th July
342	127	6, 7	1-26, 49-55, 290-296, 319-365	1st January – 26th January, 18th February – 23rd February, 17th October – 22nd October, 15th November 31st December
343	205	1, 2, 3	1 – 21, 54-73, 110-129, 216-235, 272-292, 325-365	1st January – 21st January, 22nd February – 14th March, 20th April – 9th May, 4th August – 23rd August, 29th September – 19th October, 21st November – 31st December
344	6	7	43-45, 300-302	12th February – 14th February, 27th October – 29th October

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

Overall, the details presented in Table 5-10 demonstrate that using the turbine control system, it will be possible to reduce the level of shadow flicker at any affected property to below the Guidelines daily limit of 30 minutes, by programming the relevant turbines to switch off at the required dates and times.

Table 5-11 lists the 7 properties at which a shadow flicker mitigation strategy may be necessary to ensure the Guidelines 30-hour annual shadow flicker threshold is not exceeded. In this case, the relevant turbine(s) would be programmed to switch off for the time required to ensure that the annual shadow flicker limit of 30 hours annually is not exceeded. The SCADA control system would be utilised to control shadow flicker in the absence of being able to agree suitable alternative mitigation measures with the relevant property owner. Table 5-11 below illustrates the relevant turbines that may need to be controlled, based on the '*worst-case impact*' of shadow flicker impacts modelled.

Table 5-11 Shadow Flicker Mitigation Strategy for Annual Shadow Flicker Exceedance

Property No.	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Turbine(s) Producing Shadow Flicker Exceedance	Post-mitigation Maximum Annual Shadow Flicker (hrs:mins:sec)
3	59:46:41	2,3,4,5,6,7	≤30:00:00
13	38:34:35	1, 2, 3	≤30:00:00
15	33:02:47	1,2,3	≤30:00:00
16	31:16:20	1,2,3	≤30:00:00
28	36:21:14	1,2,3,4	≤30:00:00
47	34:56:27	1,2,3,4,	≤30:00:00
343	32:49:37	1,2,3	≤30:00:00

Notwithstanding the approach set out above should shadow flicker associated with the Proposed Development be perceived to cause a nuisance at any home, the affected homeowner is invited to engage with the Developer. Should a complaint or query in relation to shadow flicker be received within 12 months of commissioning of the wind farm, field investigation/monitoring will be carried out by the wind farm operator at the affected property. The homeowner will be asked to log the date, time and duration of shadow flicker events occurring on at least five different days. The provided log will be compared with the predicted occurrence of shadow flicker at the residence, and if necessary, a field investigation will be carried out.

Residual Effect

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

Significance of Effects

Based on the assessment above and the mitigation measures proposed there will be no significant effects related to shadow flicker.

6. BIODIVERSITY

6.3 Requirements for Ecological Impact Assessment

European Legislation

Habitats and species of European importance are provided legal protection under the EU Habitats Directive 92/43/EEC (the Habitats Directive) and the EU Birds Directive 2009/147/EC (the Birds Directive) this legislation forms the cornerstone of Europe's nature conservation within the EU. It is built around two pillars: the Natura 2000 network of protected sites (hereafter referred to as European sites[24]) and the strict system of species protection. Both the Habitats and Bird Directives have been transposed into Irish law by Part XAB of the Planning and Development Acts 2000 (as amended) (from a land use planning perspective) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011).

Annex I of the Habitats Directive lists habitat types whose conservation requires the designation of Special Areas of Conservation (SAC). Priority habitats, such as Turloughs, which are in danger of disappearing within the EU territory are also listed in Annex I. Annex II of the Directive lists animal and plant species (e.g. marsh fritillary, Atlantic salmon, and Killarney fern) whose conservation also requires the designation of SAC. Annex IV lists animal and plant species in need of strict protection such as lesser horseshoe bat and otter, and Annex V lists animal and plant species whose taking in the wild and exploitation may be subject to management measures. In Ireland, species listed under Annex V include Irish hare, common frog and pine marten. Species can be listed in more than one Annex, as is the case with otter and lesser horseshoe bat which are listed in both Annex II and Annex IV.

The disturbance of species under Article 12 of the Habitats Directive (and in particular avoidance of deliberate disturbance of Annex IV species, particularly during the period of breeding, rearing, hibernation and migration and avoidance of deterioration or destruction of breeding sites or resting places) has been specifically assessed in this chapter.

The Birds Directive instructs Member States to take measures to maintain populations of all bird species naturally occurring in the wild state in the EU (Article 2). According to Recital 1 of the Birds Directive, Council Directive 79/409/EEC on the conservation of wild birds was substantially amended several times and in the interests of clarity and rationality, the Birds Directive codifies Council Directive 79/409/EEC. Such measures may include the maintenance and/or re-establishment of habitats in order to sustain these bird populations (Article 3). A subset of bird species has been identified in the Directive and are listed in Annex I as requiring special conservation measures in relation to their habitats. These species have been listed on account of inter alia: their risk of extinction; vulnerability to specific changes in their habitat; and/or due to their relatively small population size or restricted distribution. Special Protection Areas (SPAs) are to be identified and classified for these Annex I listed species and for regularly occurring migratory species, paying particular attention to the protection of wetlands (Article 4).

[24] *The term Natura 2000 network was replaced by 'European site' under the EU (Environmental Impact Assessment and Habitats) Regulations 2011 S.I. No. 473 of 2011.*

National Legislation

The Wildlife Act, (as amended), is the principal piece of legislation governing protection of wildlife in Ireland. The Wildlife Act provides strict protection for species of conservation value. The Wildlife Act conserves wildlife (including game) and protects certain wild creatures and flora. These species are therefore considered in this report as ecological receptors.

Natural Heritage Areas (NHAs) and Proposed Natural Heritage Areas (pNHAs) are heritage sites that are designated for the protection of flora, fauna, habitats and geological sites. Only NHAs are designated under the Wildlife (Amendment) Act 2017. NHAs are legally protected from damage from the date they are formally proposed for designation[25]. A list of pNHAs were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. However, these sites are considered to be of significance for wildlife and habitats as they may form statutory designated sites in the future.

The Flora (Protection) Order 2022 (S.I. No. 235) lists the species, hybrids and/or subspecies of flora protected under Section 21 of the Wildlife Acts. It provides protection to a wide variety of protected plant species in Ireland including vascular plants, mosses, liverworts, lichens and stoneworts. Under the Flora Protection Order it is illegal to cut, pick, collect, uproot or damage, injure or destroy species listed or their flowers, fruits, seeds or spores or wilfully damage, alter, destroy or interfere with their habitat (unless under licence).

National Policy

Irelands 4th National Biodiversity Action Plan 2023-2030 (Department of Housing, Local Government and Heritage, 2024) (the "NBAP") strives for a "whole of government, whole of society" approach to the governance and conservation of biodiversity. It demonstrates Ireland's continuing commitment to meeting and acting on its obligations to protect Ireland's biodiversity for the benefit of future generations and will implement this through a number of key targets, actions and objectives.

The Wildlife (Amendment) Act 2023 introduced a new public sector duty on biodiversity. The legislation provides that every public body, as listed in the Act, is obliged to have regard to the objectives and targets in the NBAP. The NBAP sets out five key objectives as follows:

- Objective 1: Adopt a Whole-of Government, Whole of-Society Approach to Biodiversity. Proposed actions include capacity and resource reviews across Government; determining responsibilities for the expanding biodiversity agenda providing support for communities, citizen scientists and business; and mechanisms for the governance and review of this National Biodiversity Action Plan.
- Objective 2: Meet Urgent Conservation and Restoration Needs. Supporting actions will build on existing conservation measures. Efforts to tackle Invasive Alien Species will be elevated. The protected area network will be expanded to include the Marine Protected Areas. The ambition of the EU Biodiversity Strategy will be considered as part of an evolving work programme across Government.
- Objective 3: Secure Nature's Contribution to People. Actions highlight the relationship between nature and people in Ireland. These include recognising the tangible and intangible values of biodiversity, promoting nature's importance to our culture and heritage and recognising how biodiversity supports our society and our economy.
- Objective 4: Enhance the Evidence Base for Action on Biodiversity. This objective focuses on biodiversity research needs, as well as the development and strengthening of long-term monitoring programmes that will underpin and strengthen future

[25] https://www.npws.ie/protected-sites/nha (accessed January 2024).

decision-making. Action will also focus on collaboration to advance ecosystem accounting that will contribute towards natural capital accounts.

- Objective 5: Strengthen Ireland's Contribution to International Biodiversity Initiatives. Collaboration with other countries and across the island of Ireland will play a key role in the realisation of this Objective. Ireland will strengthen its contribution to international biodiversity initiatives and international governance processes, such as the United Nations Convention on Biological Diversity.

In addition, the National Biodiversity Data Centre published guidance on Pollinator-friendly management of Wind Farms[26]. This identifies an evidence-based action plan for wind farm operators that can help pollinators by employing changes to existing management strategies.

Such policies have informed the evaluation of ecological receptors recorded within the Site and the ecological assessment process.

In summary, the species and habitats provided National and International protection under these legislative and policy documents have been considered in this Ecological Impact Assessment. A detailed assessment of the likelihood of the Proposed Development having either a significant effect or an adverse impact on any relevant European Sites (i.e. SACs, cSACs[27],, SPAs or cSPAs) has been carried out in the Appropriate Assessment Screening Report (AASR) and Natura Impact Statement (NIS). A separate assessment has not been carried out in this chapter, to avoid duplication of assessments. However, the relevant conclusions have been cross-referenced and incorporated.

6.4 Scoping/Review of Relevant Guidance and Sources of Consultation

The assessment methodology is based primarily upon the National Road Authority (NRA) *'s Guidelines for Assessment of Ecological Impacts of National Road Schemes Rev 2* (NRA, 2009a) and the survey methodology is based on the NRA Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (NRA, 2009b). Although these survey methodologies relate to road schemes, these standard guidelines are recognised survey methodologies that ensure good practice regardless of the development type.

In addition, the following guidelines were consulted in the preparation of this document to provide the scope, structure and content of the assessment:

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2018).

This assessment has been carried out in accordance with the Environmental Impact Assessment guidance as outlined in Chapter 1 of the EIAR.

In addition to the above, the following legislation applies with respect to habitats, fauna and water quality in Ireland and has been considered in the preparation of this report:

- The International Convention on Wetlands of International Importance especially Waterfowl Habitat (Concluded at Ramsar, Iran on 2 February 1971)
- S.I. No. 327 of 2012 - European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2012; S.I. No. 386 of 2015 - European Union

[26] https://pollinators.ie/wp-content/uploads/2022/12/Wind-Farm-Pollinator-Guidelines-2022-WEB.pdf *(accessed January 2024).*
[27] *Candidate SAC (cSAC) are afforded the same protection as SACs. The process of making cSAC into SACs by means of Statutory instrument has begun and while the process if ongoing the term SAC will be used to conform with nomenclature used in the National Parks and Wildlife Services (NPWS) databased. The name applies to candidate SPAs.*

Environmental Objectives (Surface Waters) (Amendment) Regulations 2015; S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations 2003 which give further effect to EU Water Framework Directive (2000/60/EC)
- Planning and Development Acts 2000 (as amended)

The following legislation applies with respect to non-native species:

- Regulation 49 and 50 of European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011).

This assessment has been prepared with respect to the various planning policies and strategy guidance documents listed below:

- Westmeath County Development Plan 2021 – 2027.
- Offaly County Development Plan 2021 - 2027
- Regional Spatial and Economic Strategy for the Eastern and Midland.
- National Planning Framework. Ireland 2040 Our Plan.
- National Development Plan 2021-2030.
- Ireland's 4th National Biodiversity Action Plan 2023-2030.

6.5 Methodology

6.5.3 Field Surveys

Comprehensive surveys of the biodiversity of the entire Site were undertaken on various dates during 2021 and 2022 as detailed in the EIAR, and in 2024 and 2025 as detailed below. The following sections describe the ecological surveys that have been undertaken since the EIAR was submitted and where relevant provide details of any updates to methodologies, dates of survey and guidance followed.

6.5.3.1 Multi-disciplinary Walkover Surveys (as per NRA Guidelines, 2009)

A multidisciplinary walkover survey was undertaken on 9th June 2025 to determine whether there have been any changes to the baseline environment since the surveys undertaken in 2021 and 2022. During the updated multi-disciplinary walkover survey of the site undertaken in 2025, no significant changes to the baseline environment were recorded. The results of the surveys were in agreement with those undertaken in 2021 and 2022 to inform the EIAR. Therefore, only the sections of the EIAR regarding bats are detailed below.

6.5.3.3 Terrestrial Fauna Surveys

6.5.3.3.3 *Bat Surveys*

An Addendum Bat Report is included as Appendix 6-2a to this EIAR Addendum Report. This report is to be reviewed in conjunction with Chapter 6: Biodiversity of the EIAR and Appendix 6-2: Bat Report of the EIAR. The Addendum Bat Report incorporates new survey data collected during the survey period April 2024 and September 2024, and considers relevant updates to guidance documents.

The primary purpose of the 2024 bat surveys is to supplement the 2022 baseline dataset with updated seasonal bat data, reassess previously identified Potential Roost Features (PRFs), and incorporate any relevant changes in survey guidance or policy that have occurred since the original assessments.

Previous bat surveys were conducted in 2020 and 2022. In line with current best practice, the Chartered Institute of Ecology and Environmental Management (CIEEM, 2023) advises that ecological data supporting Environmental Impact Assessment should generally be no more than two years old unless the baseline is demonstrably still valid. Given the time elapsed, and the potential for changes in bat activity or habitat use, an updated dataset was considered appropriate to ensure that the ecological assessment remains current.

In line with surveys carried out in 2022, the assessment and mitigation provided in this report has been designed in accordance with NatureScot 2021. Consideration was also given to the Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED) Guidance, which was produced in August 2021 (amended March 2024). The 2024 manual activity surveys were undertaken in accordance with *Bat Surveys for Professional Ecologists – Good Practice Guidelines* (Collins, 2023), which supersedes earlier guidance and includes revised standards for survey effort, species identification, and interpretation of bat activity levels. The updated dataset is used to confirm whether the conclusions of the original assessment remain appropriate, to detect any notable changes in bat species presence or behaviour, and to inform any adjustments to mitigation or avoidance measures, where required.

6.6 Establishing the Ecological Baseline

6.6.2 Ecological Walkover Survey Results

6.6.2.3 Fauna in the Existing Environment

6.6.2.3.6 *Bats*

Bat Habitat Appraisal

Wind Farm Site

The bat habitat appraisal detailed in the Addendum Bat Report (Appendix 6-2a) confirmed that the habitat composition and suitability assessments within the Wind Farm Site remain consistent with previous survey findings. The same eleven habitat types were identified, and the evaluation of habitat suitability for foraging, commuting, and roosting bats was carried out following the updated guidance in Collins (2023). This latest guidance reaffirms the previous classification of habitats on the Wind Farm Site, with improved agricultural grassland (GA1) dominating, wet grassland and conifer plantations present in smaller areas, and linear features such as hedgerows and treelines retaining moderate to high suitability for bats. Roost potential within mature broadleaf trees adjacent to turbines remains unchanged, continuing to offer moderate to high suitability for roosting bats. No significant changes to habitat or suitability assessments were identified during the 2024 bat survey period.

Grid Connection

The bat habitat appraisal detailed in the Addendum Bat Report (Appendix 6-2a) for the Grid Connection temporary construction compound, onsite 110kV substation, and underground electrical cabling route found the habitat composition and suitability assessments unchanged from the 2022 surveys. Habitats along the underground electrical cabling route continue to be dominated by improved agricultural grassland (GA1), with stonewalls (BL1), hedgerows (WL1), and buildings (ED3) also present. Using the updated Collins (2023) guidance, features along the underground electrical cabling route were reassessed as having Low to Moderate suitability for commuting and foraging bats, consistent with the assessment detailed in Chapter 6 of the EIAR. Wet grassland and scrub along the underground electrical cabling route retain their *Negligible* suitability for roosting bats, with no new potential roost features identified. Overall, no significant changes in habitat or bat suitability have been recorded in 2024 for the Grid Connection.

Roost Surveys

Roost inspections and activity surveys conducted in 2020, 2022, 2024 and 2025 identified four structures within the Wind Farm Site with suitable potential bat roost features. These included a derelict building (Umma House), its associated outbuildings, a farm storage shed, and a small shed within cattle holding pen, near Turbine 5. Details of these structures and associated surveys are given in Section 3.2 in Appendix 6-2a Addendum Bat Report. No confirmed roost structures will be directly impacted by the Proposed Development.

Manual Transect Surveys

Manual activity surveys were undertaken during Spring, Summer, and Autumn 2024. Bat activity was recorded during all manual surveys, encompassing both roost emergence and transect surveys. In 2024, Common pipistrelle (*Pipistrellus pipistrellus*) was the most frequently recorded species, with a total of 729 passes, followed by Leisler's bat (*Nyctalus leisleri*) with 243 passes. Myotis species (*Myotis* spp.) were less frequent, with 31 passes recorded, while Soprano pipistrelle (*Pipistrellus pygmaeus*) accounted for 174 passes. Nathusius' pipistrelle (*Pipistrellus nathusii*) and Brown long-eared bat (*Plecotus auritus*) were rare, with 6 and 15 passes recorded respectively. Full detailed results and species composition for the manual transect surveys are provided in Section 3.3 of the Addendum Bat Report (Appendix 6-2a).

Transect surveys in 2024 were carried out at dusk, with a standalone transect in spring and dusk emergence surveys followed by transects in summer and autumn. Survey results were calculated as bat passes per kilometre surveyed to account for differences in effort. Common pipistrelle remained the most frequently recorded species, with activity increasing notably in summer and continuing to rise into autumn, unlike the pattern observed in 2022. Leisler's bat and *Myotis* spp. also showed peak activity in summer. Nathusius' pipistrelle and Brown long-eared bat (*Plecotus auritus*) were both recorded during the 2024 transects but were absent from the 2022 manual transect results. Foraging and commuting activity was concentrated along treelines, particularly around T1, T3, T4, and T5, with multiple species observed foraging near the Umma House derelict stables and mature treelines west of T9. Figures 3-1 to 3-3 of the Addendum Bat Report (Appendix 6-2a) present the spatial distribution of bat activity across the surveys for each survey season for 2024.

Ground-level Static Surveys

Compared with 2022, the 2024 ground-level static detector surveys recorded an increase in total bat passes, rising from 131,359 to 178,525. Common pipistrelle remained the most frequently recorded species, with detections increasing markedly. Soprano pipistrelle activity also rose significantly, while Leisler's bat remained consistent between years. In contrast, detections of *Myotis* spp. and Brown long-eared bat were lower in 2024. Nathusius' pipistrelle was again infrequently recorded but showed an increase in detections from 109 to 506. These changes may reflect genuine variations in bat activity, although differences in survey effort, including longer deployment periods in 2024, may also influence the results. Full detailed results and species composition for the ground-level static surveys are provided in Section 3.4 of the Addendum Bat Report (Appendix 6-2a).

Bat activity was calculated as total bat passes per hour (bpph) per season to account for any bias in survey effort, resulting from varying night lengths between seasons. When compared with 2022, the overall total bat passes in 2024 were higher, however, when the data is standardised per survey effort, as bat passes per hour (bpph), the overall bat activity levels in 2024 were considerably lower across all species. In 2022, Common pipistrelle activity peaked in summer (202.12 bpph) and autumn (217.74), while in 2024 it was relatively stable and significantly reduced (max 34.07 in spring). Similarly, Soprano pipistrelle activity in 2022 was highest in summer (58.27 bpph), contrasting with a spring peak (12.22) in 2024 and lower activity overall. Leisler's bat was notably more active in 2022, especially in summer (35.8 bpph), compared to a maximum of 4.17 in 2024. *Myotis* spp. and Brown long-eared bat activity also declined markedly from 2022 to 2024, particularly in autumn. Nathusius' pipistrelle remained infrequently recorded in both years but was slightly more consistent across seasons in 2024. These

differences likely reflect a combination of factors, including ecological variation between years and differences in total survey effort or weather conditions.

Compared to 2022, bat activity in 2024 followed a broadly similar seasonal pattern, with Common pipistrelle remaining the most widespread and frequently recorded species across all detectors. However, while summer and autumn 2022 showed the highest overall levels of activity — including peak median nightly rates exceeding 200 bpph — spring 2024 emerged as the most active period, albeit with generally lower median nightly values overall a pattern similar to the 2020 seasonal trends.

Overall, the 2024 data indicates a slight shift in seasonal peak activity and reduced nightly bat pass rates, which may reflect differences in detector deployment conditions or environmental factors.

Importance of Bat Population Recorded at the Site

Ecological evaluation within this section follows a methodology that is set out in Chapter three of the *'Guidelines for Assessment of Ecological Impacts of National Roads Schemes'* (NRA, 2009).

The bat population recorded at the Wind Farm Site remains of **Local Importance (Higher Value)**, consistent with the assessment detailed in Chapter 6 of the EIAR. This is based on the continued regular use of the Wind Farm Site by multiple bat species for foraging, commuting, and roosting.

Survey results from 2024 confirmed the presence of two active roosts within the wider Wind Farm Site, including a previously identified transitional roost at Umma House and a smaller roost at the nearby stables. In addition, the 2024 EcoBat analysis demonstrated a notable increase in relative bat activity compared to 2022, particularly for Common pipistrelle, Leisler's bat, and Soprano pipistrelle, with multiple detectors recording high or moderate-high percentile values across seasons.

The increase in site-wide bat activity observed in 2024—alongside the confirmation of a potential roost site—reinforces the continued ecological value of the site for bats. However, the importance level remains appropriately categorised as Local Importance (Higher Value), as no roosts of National or Regional Importance were identified, and the site does not support exceptional population numbers or rare species. Ecological Impact Assessment

6.6.3 Likely Significant Effects During Construction Phase

6.6.3.2 Assessment of Potential Effects on Protected Fauna During Construction

6.6.3.2.3 *Assessment of Potential Effects on Bats*

Table 6-23 Assessment of Potential Impacts on Bats

Description of Effect	As per NatureScot Guidance, wind farms present four potential risks to bats: › Collision mortality, barotrauma and other injuries; (**Operational Phase Impact**) › Loss or damage to commuting and foraging habitat; › Loss of, or damage to, roosts; › and Displacement of individuals or populations. For each of these four risks, the detailed knowledge of bat distribution and activity within the Site has been utilised to predict the potential effects of the Proposed Development on bats (operational phase impacts relating to collision mortality, barotrauma and other injuries are assessed in Section 6.7.4 below). Bat surveys undertaken in 2024, in accordance with NatureScot 2021 guidance, form the core dataset for the assessment of effects on bats. Consideration was also given to the Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED) Guidance, which was produced in August 2021 (amended March 2024). The 2024 manual activity surveys were undertaken in accordance with Bat Surveys for Professional Ecologists – Good Practice Guidelines (Collins, 2023), which supersedes earlier guidance and includes revised standards for survey effort, species identification, and interpretation of bat activity levels. 2024 results are supplemented by data collected during surveys undertaken on the Site in 2020 and 2022.
Characterisation of unmitigated effect	**Loss or damage to commuting and foraging habitat** The assessment of potential impacts to commuting and foraging habitat for bats remain consistent with those presented in Chapter 6: Biodiversity of the EIAR. The Proposed Development continues to be situated predominantly within agricultural land with extensive linear features such as treelines, hedgerows, and areas of conifer forestry. The resulting loss of foraging habitat and linear commuting habitat represents a potential long-term impact on bats at the local level. **Loss of, or Damage to, Roosts** The majority of the information and conclusions in Chapter 6: Biodiversity of the EIAR regarding roost loss or damage remain consistent with those presented in Chapter 6: Biodiversity of the EIAR. The two small common and soprano pipistrelle roosts identified in structures within the Wind Farm Site will be retained and avoided as part of the Proposed Development. No other roosts were identified in any other PRFs surveyed. As such, no loss or damage to roosts is anticipated. Other aspects related to trees and watercourse infrastructure continue to be relevant as presented in Chapter 6: Biodiversity of the EIAR. **Structures**

	All structures will be avoided as part of the Proposed Development, thus no loss or damage to identified or potential roosts is anticipated. **Trees** A potential for indirect effects on bats was identified in the form of loss of roosting habitat resources, as well as direct effects such as temporary disturbance and harm or death as a result of the proposed tree felling. There will be no requirement to fell trees/forestry as part of the Grid Connection underground electrical cabling route. Therefore, there will be no loss of tree roosting habitat or linear landscape connectivity associated with these works. **Watercourse, Culvert and Drain Crossing Infrastructure** Bridges and culvert crossings along the underground electrical cabling route were assessed as having Negligible to Moderate value for roosting bats. The water crossing infrastructure along the underground electrical cabling route will not be altered, in any regard, by the Proposed Development as the options for crossing bridges do not require any works to be carried out on the bridge structure itself, i.e. the bridge culvert. No damage to roosting habitat is expected as a result of the proposed works. Where works related to Options A and C will be in place for culvert crossing CD13 and EPA crossing EPA6, which have been identified as having Low potential to host roosting bats, the proposed works have the potential to cause temporary disturbance to roosting bats. **Displacement of individuals or populations** The assessment of potential impacts to commuting and foraging habitat for bats remain consistent with those presented in Chapter 6: Biodiversity of the EIAR. Factors such as increased noise and artificial lighting during construction have the potential to lead to displacement effects on bats where working hours coincide with periods of bat activity.
Assessment of Significance prior to mitigation	**Loss or Damage to Commuting and Foraging Habitat** The assessment of potential impacts to commuting and foraging habitat for bats remain consistent with those presented in Chapter 6: Biodiversity of the EIAR. In the absence of mitigation this loss of commuting and foraging habitat represents a potentially significant effect on bat populations at the local level. **Loss of, or damage to, roosts** The assessment of significance regarding roost loss or damage remains consistent with that presented in Chapter 6: Biodiversity of the EIAR. The two small common and soprano pipistrelle roosts identified in structures within the Wind Farm Site will be retained and avoided as part of the Proposed Development. No other roosts were identified in any other PRFs surveyed. As such, no loss or damage to roosts is anticipated. Other aspects related to trees and watercourse infrastructure continue to be relevant as presented in Chapter 6: Biodiversity of the EIAR. **Structures** All structures will be avoided as part of the Proposed Development, and thus no significant loss or damage to the identified or potential roosts within buildings/structures is anticipated. **Trees** A potential for indirect effects on bats was identified in the form of loss of roosting habitat resources, as well as direct effects such as temporary disturbance and harm or death as a

	result of the proposed tree felling. Loss of tree roosting habitat therefore represents a potentially significant effect on bat populations at the local level. **Watercourse, Culvert and Drain Crossing Infrastructure** No damage to roosting habitat is expected along the underground electrical cabling route as a result of the proposed works. Where works related to Options A and C will be in place for culvert crossing CD13 and EPA crossing EPA6, which have been identified as having Low potential to host roosting bats, the proposed works have the potential to cause temporary disturbance to roosting bats. These effects would be temporary in nature and are unlikely to represent a significant effect on local populations. **Displacement of individuals or populations** The assessment of potential impacts to commuting and foraging habitat for bats remain consistent with those presented in Chapter 6: Biodiversity of the EIAR. No significant displacement related effects on bats are anticipated at any geographic scale. Potential displacement as a result of an increase in noise and artificial lighting during the construction phase represents a potential short-term non-significant effect on local bat populations.
Mitigation	The mitigation and best practice measures detailed in Chapter 6: Biodiversity of the EIAR remain fully applicable and continue to provide a robust framework for the protection of bats and their habitats throughout the Proposed Development. This EIAR Addendum Report assumes the continued implementation of all previously recommended measures, except for the specific updates outlined below, which respond to new data and findings from the 2024 surveys, as well as recently published guidelines: › Institute of Lighting Professionals Guidance Note 08/23: Bats and Artificial Lighting at Night (ILP, 2023) › Marnell, F., Kelleher, C., & Mullen, E. (2022). Bat Mitigation Guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland. The exceptions and updates provided in this section are intended to refine and enhance mitigation. **Loss of, or damage to, roosts** **Structures** On a precautionary basis, a pre-commencement survey is proposed for any structures requiring removal and any trees with PRFs requiring felling. **Trees** In accordance with Marnell et al. (2022), the following updated best practices will apply to tree works and habitat management: › A pre-commencement survey will be carried out by a suitably qualified ecologist on trees/structures with PRFs proposed for felling/removal. › If, following the pre-commencement survey, a bat roost is identified within any of the trees/structures to be removed/pruned, a bat derogation licence will be obtained from the NPWS, prior to removal and the removal activity will be supervised by a qualified ecologist. › All works affecting potential or confirmed roosts will be undertaken at the appropriate time of year under the necessary derogation licenses and with continuous supervision from a licensed bat ecologist, where required. › Linear features such as hedgerows and treelines, which provide essential bat commuting routes, will be retained and enhanced wherever possible to maintain habitat connectivity.

	› New planting and veteranisation will prioritise native tree and shrub species to improve long-term roosting and foraging habitat quality. **Displacement of individuals or populations** In line with ILP Guidance Note 08/23 (2023), lighting design across the Proposed Development will be optimised to reduce potential impacts on bats: › Lighting spectra will prioritise warm light sources with colour temperatures below 2700K, minimising blue and green wavelengths known to disturb bats. › The use of adaptive lighting controls, including motion sensors, dimmers, timers, and lighting zones, will reduce unnecessary illumination duration and intensity near bat habitats. › All lighting will be designed with full shielding and directionality to prevent light spill onto identified commuting routes and foraging areas. › Post-installation lighting monitoring will be conducted, enabling adaptive management should evidence of bat disturbance or collision risk arise.
Residual Effect following Mitigation	Taking into account the sensitive design of the Proposed Development and the implementation of best practice and adaptive mitigation measures, no significant long-term residual effects on bats are anticipated with regard to: › Collision mortality, barotrauma and other injuries (Operational Phase Impacts), › Loss or damage to roosts, and › Displacement of individuals or populations. However, a temporary residual effect at the local geographic scale is anticipated in relation to the loss of commuting and foraging habitat, due to the removal of hedgerows required to facilitate construction and bat buffers. While this loss will be offset through a comprehensive hedgerow enhancement and replanting programme, it will take approximately 5–10 years for newly planted hedgerows to establish and restore full habitat functionality. As such, a minor temporary reduction in ecological connectivity may occur during this period. There will be no significant effect on the conservation status of any bat species as defined in '*The Status of Protected Habitats and Species in Ireland*' (NPWS, 2019).

6.6.4 Likely Significant Effects During Operational Phase

6.6.4.2 Effects on Fauna during Operation

6.6.4.2.1 *Assessment of Potential Effects on Bats during operation*

Table 6-27 Assessment of Potential Impacts on Bats during operation

Description of Effect	The assessment of potential impacts to commuting and foraging habitat for bats remain consistent with those presented in Chapter 6: Biodiversity of the EIAR. There is no potential for additional loss or fragmentation of foraging or roosting habitat for bat species during the operational phase of the Proposed Development as there will be no additional loss of any habitats following construction. The Addendum Bat Report that is provided in Appendix 6-2a found bat species composition and abundance to be typical of the geographic location and nature of the Site, and that the site is utilised by a regularly occurring bat population of Local Importance (Higher Value) and is consistent with Chapter 6: Biodiversity of the EIAR. . The operational phase of the Proposed Development poses a potential risk to bats in the form of collision mortality, barotrauma and other injuries cause by bats coming into contact

	or close proximity to operational turbines. Any increase in artificial lighting at night associated with the Proposed Development would have the potential to result in displacement effects on bats. No potential effects relating to bats have been identified along the Grid Connection underground electrical cabling route during the Operational Phase of the Proposed Development.
Characterisation of unmitigated effect	The operation of the Proposed Development has the potential to result in a long-term effect on Pipistrelle species (common, soprano and Nathusius) and Leisler's bat species as a result of mortality due to collision. Section 4 of the Addendum Bat Report (provided as Appendix 6-2a) sets out the overall collision risk assessment for these high collision risk species. In 2024, relative bat activity across the Wind Farm Site increased compared to 2022, with Common pipistrelle and Leisler's bat in particular showing widespread and frequent high activity. Multiple detectors (notably D06, D08, D09, and D01) recorded High or Moderate–High activity percentiles, especially in spring and summer. Although activity levels were higher, the bat assemblage remains dominated by widespread, common species, and the Wind Farm Site is not located near any known maternity roost of national importance, swarming site, or major migratory corridor. The **Medium Site Risk** classification remains appropriate despite increased 2024 relative activity, as the development scale is unchanged and no new high-sensitivity habitat features were identified. An updated assessment of collision risk was undertaken using static detector data collected in 2024 and analysed using the EcoBat tool, in accordance with NatureScot (2021) guidance. Tables 4-2 to 4-5 of the Addendum Bat Report (Appendix 6-2a) present the updated collision risk profiles based on the 2024 dataset. The increase in percentile scores relative to 2022 is likely a reflection of shifts within the reference dataset rather than a true rise in local activity or risk. Site-level collision risk for high collision risk bat species was typically ***Medium*** to ***High***. Overall bat activity levels were typical of the nature of the Wind Farm Site, which is predominantly agricultural grasslands with treelines delineating field boundaries and conifer forestry with varying levels of bat activity recorded during the static detector surveys as well as the walked transects undertaken.
Assessment of Significance prior to mitigation	Following the precautionary principle, there is potential for the operation of the Proposed Development to result in Significant effects on the local bat population in the absence of mitigation.
Mitigation	The mitigation and best practice measures detailed in Chapter 6: Biodiversity of the EIAR remain fully applicable and continue to provide a robust framework for the protection of bats and their habitats throughout the Proposed Development. This EIAR Addendum Report assumes the continued implementation of all previously recommended measures, except for the specific updates outlined below, which respond to new data and findings from the 2024 surveys, as well as recently published guidelines: › Institute of Lighting Professionals Guidance Note 08/23: Bats and Artificial Lighting at Night (ILP, 2023) › Marnell, F., Kelleher, C., & Mullen, E. (2022). Bat Mitigation Guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

	The exceptions and updates provided in this section are intended to refine and enhance mitigation. Accordingly, and in line with the precautionary but proportionate approach adopted in the Chapter 6 of the EIAR, no changes to the existing mitigation strategy are required. Post-construction monitoring will continue as planned, with scope to adjust measures if operational evidence indicates an elevated collision risk. In the 2022 Ecobat analysis some detectors recorded high median activity levels across at least one season and therefore to take a precautionary approach given the potential for high collision risk at high median activity levels, an adaptive monitoring and mitigation strategy has already been devised for the Proposed Development. This was devised in line with the case study example provided in Appendix 5 of the NatureScot 2021 Guidance. This still applies to the 2024 Ecobat analysis and risk assessment and therefore no update is required at this stage. **Lighting** In line with ILP Guidance Note 08/23 (2023), lighting design across the Proposed Development will be optimised to reduce potential impacts on bats: › Lighting spectra will prioritise warm light sources with colour temperatures below 2700K, minimising blue and green wavelengths known to disturb bats. › The use of adaptive lighting controls, including motion sensors, dimmers, timers, and lighting zones, will reduce unnecessary illumination duration and intensity near bat habitats. › All lighting will be designed with full shielding and directionality to prevent light spill onto identified commuting routes and foraging areas. › Post-installation lighting monitoring will be conducted, enabling adaptive management should evidence of bat disturbance or collision risk arise. **Monitoring and Adaptive Management** To ensure continued effectiveness of mitigation measures, a comprehensive monitoring programme will be maintained: › Post-construction bat activity and mortality monitoring will continue for a minimum of three years, following the guidelines of Marnell *et al.* (2022). › Adaptive mitigation, including potential turbine curtailment or lighting adjustments, will be implemented as necessary if monitoring indicates elevated collision risk or disturbance.
Residual Effect following Mitigation	Taking into account the sensitive design of the Proposed Development and the implementation of best practice and adaptive mitigation and monitoring measures, no significant long-term residual effects on bats are anticipated with regard to: › Collision mortality, barotrauma and other injuries, › Loss or damage to roosts, and › Displacement of individuals or populations. While any removal of linear habitat features will occur during the construction phase, it will take approximately 5–10 years for newly planted hedgerows to establish and restore full habitat functionality. As such, a minor temporary reduction in ecological connectivity may occur during this period resulting in a temporary residual effect.

7. BIRDS

This Addendum to the Birds Chapter of the EIAR includes the following: an outline of the scope of surveys undertaken since the EIAR was submitted (i.e. October 2022 – March 2025), a summary of the results of these surveys and an updated impact assessment for relevant species. In addition, in response to DAU submission dated 23 May 2023, population estimates have been updated for relevant species where additional information is available in relation to bird density/distributions (please see Section 7.4 below in addition to the Response to Submissions document for further detail).

This Addendum is supported by the following supplementary appendices:

- Appendix 7-2a - Addendum Survey Effort
- Appendix 7-4a – Addendum Survey Data
- Appendix 7-5a – Revised Collision Risk Assessment
- Appendix 7-7a – Addendum Confidential Appendix

7.2 Assessment Approach and Methodology

7.2.4 Field Surveys

Further field surveys were undertaken during the survey period October 2022 – March 2025, consisting of three winter seasons and two breeding seasons. Methodologies for these surveys followed those described in the EIAR as submitted, which included:

- Vantage Point Surveys
- Breeding Walkover Surveys
- Winter Walkover Surveys
- Breeding Raptor Surveys
- Waterbird Distribution and Abundance Surveys

The methodologies of additional surveys, i.e. breeding hen harrier and breeding barn owl surveys, are provided below. Survey locations are shown in Appendix 7-7a.

7.2.4.4 Breeding Raptor Surveys

Breeding Hen Harrier Surveys

Targeted breeding hen harrier surveys were conducted during the 2024 breeding season at two additional survey locations following receipt of information (in the DAU) on breeding hen harrier in the wider area. Locations were chosen based on data provided by the NPWS. The data provided by the NPWS identified the 2km grid squares where hen harrier breeding activity had been recorded. An examination of these 2km grid squares revealed a single identifiable area of suitable habitat for breeding hen harrier, situated approximately 5.5km from the Wind Farm Site. This area was therefore surveyed, in addition to another area of suitable habitat situated approximately 8km from the Wind Farm Site. Surveys were conducted between 06:00–12:00 or 16:00–20:00 to coincide with periods of peak activity. Each location was surveyed once per month during the core breeding season between April and July.

Breeding Barn Owl Surveys

Breeding barn owl surveys were undertaken at the site and within a 2km radius. The survey aimed to identify breeding barn owl territories near or within the site by locating nest sites. Survey methodology followed TII (2021). The surveyor conducted a watch at potential nest sites from 30 minutes before sunset

until 1 hour after sunset. The methods aimed to observe barn owl provisioning flight activity. No barn owl observations were recorded during these surveys.

7.3 Baseline Ornithological Conditions

7.3.8 Field Survey Results

As previously outlined, further field surveys were undertaken during the survey period October 2022 – March 2025, consisting of three winter seasons and two breeding seasons. A summary of the results of these further surveys is provided below for each relevant species[28].

7.3.8.2 Golden Plover

Survey	Total number of records	Average and peak count per observation	Summary
Vantage Point Surveys	10	38 (114)	Majority of observations comprised birds travelling. There were four observations of birds on-ground within 500m of the Wind Farm Site, comprising flock sizes of between 11-80 birds.
Winter Walkover Surveys	1	6	Single observation of birds travelling.
Waterbird Distribution and Abundance Surveys	5	76 (117)	Majority of observations comprised birds travelling. Observations were over 2km from the Wind Farm Site.
Incidental Records	4	60 (81)	All observations comprised birds in flight, predominantly distant from the Wind Farm Site.

7.3.8.3 Peregrine Falcon

Survey	Total number of records	Average and peak count per observation	Summary
Vantage Point Surveys	10	1	Individuals observed hunting, travelling and perched throughout survey period. No evidence of breeding recorded at any stage.
Winter Walkover Surveys	2	1	Individuals observed hunting or commuting in January 2024 and January 2025. One observation was within, or partially within, of the Wind Farm Site, near the sand and gravel quarry.
Breeding Walkover Surveys	1	1	Individual observed travelling in May 2023 within, or partially within, 500m of the Wind Farm Site.

[28] *Results are provided for the Key Ornithological Receptors (KORs) identified in the EIAR as submitted, in addition to hen harrier and barn owl as single observations of these species were recorded in the updated 2.5 years of survey data. These species were not recorded in the two years of survey data presented in the EIAR as submitted and were therefore not included as KORs in the EIAR as submitted.*

Survey	Total number of records	Average and peak count per observation	Summary
Breeding Raptor Surveys	1	1	Individual observed travelling in May 2023.
Incidental Records	7	1	Individuals (male and female) were observed travelling, soaring and flushed between September 2023 and September 2024. Observations were within 500m of the Wind Farm Site and up to 4.1km from the Wind Farm Site.

7.3.8.4 Merlin

Survey	Total number of records	Average and peak count per observation	Summary
Vantage Point Surveys	1	1	Individual observed travelling, landing in October 2022.

7.3.8.5 Lapwing

Survey	Total number of records	Average and peak count per observation	Summary
Vantage Point Surveys	25	8 (50)	Birds observed circling, landing and travelling throughout the survey period. 24 observations were within, or partially within, 500m of the Wind Farm Site. Up to four birds were observed in territorial behaviour in April and May 2023 within the Wind Farm Site – see below for further detail.
Breeding Walkover Surveys	7	4 (8)	Birds were observed travelling, foraging and flushed over two breeding seasons. All observations were within, or partially within, 500m of the Wind Farm Site. There were observations of territorial behaviour indicating probable breeding in 2023 and 2024. <u>Breeding Summary 2023</u> Three birds were observed in territorial defence within the Wind Farm Site in April 2023. There were no further observations of lapwing at this location during follow-up breeding walkover visits in May, June and July 2023. However, there were five observations of lapwing during vantage point surveys (VP1) in this general area in April and May 2023, with up to four birds recorded, including three observations of territorial display and mobbing, indicating probable breeding of an estimated two pairs in 2023.

Survey	Total number of records	Average and peak count per observation	Summary
			Breeding Summary 2024 Lapwing were not recorded in the above 2023 area in 2024. There was an observation of a single bird in territorial behaviour within the Wind Farm Site in April 2024 (a different area of the site to 2023). However, similarly there were no further observations of lapwing within the Wind Farm Site during follow-up breeding walkover visits in May and June 2024. There were observations of single lapwing within the Wind Farm Site in May and June 2024, however no further breeding behaviour was recorded. Lapwing were recorded within the Wind Farm Site in late July 2024, ranging from 2-8 birds, however due to timing of observation and behaviour these were considered to be non-breeding/post-breeding birds. As such, probable breeding was recorded of an estimated one pair in 2024. Breeding locations are shown in the included Appendix 7-7a – Addendum Confidential Appendix.
Winter Walkover Surveys	13	28 (143)	Birds observed travelling or on farm land throughout the survey period. 10 observations were within, or partially within, a 500m radius of the Wind Farm Site, of which six were birds foraging/roosting on farm land.
Waterbird Distribution and Abundance Surveys	24	45 (216)	Birds were observed travelling and foraging in fields throughout the 5km survey radius of the site. Observations were throughout the survey period. Observations were within the 500m radius of the Wind Farm Site and up to 4.1km from the Wind Farm Site.
Incidental Records	1	15	A flock of 15 birds were observed travelling over Lough Sewdy, 3.6km from the Wind Farm Site. Previously recorded on one occasion during assessed survey period with 100 birds observed 1km from the Wind Farm Site.

7.3.8.7 Black-headed Gull

Survey	Total number of records	Average and peak count per observation	Summary
Vantage Point Surveys	9	11 (33)	Birds seen travelling, circling across farmland throughout survey period. Nine observations were within, or partially within, 500m of the Wind Farm Site. No birds observed landing.

Survey	Total number of records	Average and peak count per observation	Summary
Breeding Walkover Surveys	1	4	Birds were observed foraging in a field off site in July 2023.
Winter Walkover Surveys	1	2	Birds were observed travelling in February 2024 within 500m of the Wind Farm Site.
Waterbird Distribution and Abundance Surveys	12	15 (67)	Birds were observed travelling, foraging, loafing and soaring throughout the survey period. Observations ranged from within 500m of the Wind Farm Site and up to 3.7km from the Wind Farm Site.
Incidental Records	4		Birds were observed travelling and foraging in May and June 2024. Flocks ranged from 1-25 birds and observations ranged from within 500m of the Wind Farm Site and up to 3.1km from the Wind Farm Site.

7.3.8.9 Mallard

Survey	Total number of records	Average and peak count per observation	Summary
Vantage Point Surveys	23	6 (30)	Birds observed travelling, loafing and calling throughout survey period. 21 observations were within, or partially within, 500m of the Wind Farm Site.
Breeding Walkover Surveys	7	2 (6)	Birds were observed travelling or loafing over two breeding seasons. Five observations were within, or partially within, 500m of the Wind Farm Site. Confirmed breeding was observed in 2023 and probable breeding in 2024. This is consistent with previous observations where confirmed breeding was recorded in 2019 and 2020. Please see EIAR as submitted Section 7.3.8.9 for further details.
Winter Walkover Surveys	11	5 (18)	Birds were observed travelling, flushed or feeding throughout the survey period. Seven observations were within, or partially within, 500m of the Wind Farm Site.
Waterbird Distribution and Abundance Surveys	69	9 (117)	Birds were observed travelling, foraging and loafing throughout the survey period. Observations ranged from within 500m of the Wind Farm Site and up to 4.2km from the Wind Farm Site.
Incidental Records	4	-	Birds were observed travelling and foraging in May and June 2024 during Breeding Raptor Surveys and Breeding Barn Owl Surveys. Flocks ranged from 1-25 birds and observations ranged

Survey	Total number of records	Average and peak count per observation	Summary
			from within 500m of the Wind Farm Site and up to 3.1km from the Wind Farm Site.

7.3.8.10 Teal

Survey	Total number of records	Average and peak count per observation	Summary
Vantage Point Surveys	2	15 (28)	Birds were observed travelling within, or partially within, 500m of the Wind Farm Site in January and March 2025.
Winter Walkover Surveys	19	8 (42)	Birds were observed flushed or feeding throughout the survey period. 18 observations were within, or partially within, of the Wind Farm Site.
Waterbird Distribution and Abundance Surveys	17	22 (150)	Birds were observed travelling, foraging and loafing throughout the survey period. Observations ranged from within a 500m radius of the Wind Farm Site and up to 4.9km from the Wind Farm Site.
Incidental Records	1	9	A flock of nine birds were observed feeding 2.3km from the Wind Farm Site during Breeding Raptor Survey.

7.3.8.11 Snipe

Survey	Total number of records	Average and peak count per observation	Summary
Vantage Point Surveys	73	2 (6)	Birds were observed travelling, flushed or calling throughout survey period. 38 observations were within, or partially within, a 500m radius of the Wind Farm Site.
Breeding Walkover Surveys	23	2 (13)	Birds were observed travelling or flushed over two breeding seasons. 19 observations were within, or partially within, a 500m radius of the Wind Farm Site. Probable breeding was observed in 2023. Breeding locations are shown in the included Appendix 7-7a.
Winter Walkover Surveys	45	3 (16)	Birds were observed flushed or roosting throughout the survey period. 39 observations were within, or partially within, a 500m radius of the Wind Farm Site.
Waterbird Distribution and Abundance Surveys	89	6 (58)	Birds were observed travelling, flushed and roosting throughout the survey period. Observations were within a 500m radius of the Wind Farm Site and up to 4.1km from the Wind Farm Site.

Survey	Total number of records	Average and peak count per observation	Summary
Incidental Records	101	-	Birds were observed travelling, flushed and drumming throughout the survey period. Flocks ranged from 1-8 birds and observations ranged from within a 500m radius of the Wind Farm Site and up to 10.5km from the Wind Farm Site.

7.3.8.12 Kestrel

Survey	Total number of records	Average and peak count per observation	Summary
Vantage Point Surveys	57	1 (2)	Birds were observed travelling, hunting or perched throughout the survey period. 45 observations were within, or partially within, a 500m radius of the Wind Farm Site.
Breeding Walkover Surveys	7	1 (2)	Birds were observed hunting throughout the two breeding seasons. Five observations were within, or partially within, a 500m radius of the Wind Farm Site. An agitated pair were observed in 2023, indicating probable breeding within the Wind Farm Site. Breeding locations are shown in the included Appendix 7-7a.
Breeding Raptor Surveys	65	1 (2)	The majority of observations were of birds hunting, soaring or perched throughout the survey period. There were two observations of a pair in courtship flights in May and June 2024 indicating probable breeding at this location approximately 1.5km from the Wind Farm Site. Confirmed breeding was recorded in 2024 approximately 2km from the Wind Farm Site. Breeding locations are shown in the included Appendix 7-7a.
Winter Walkover Surveys	11	1 (2)	Birds were observed travelling, hunting or perched throughout the survey period. 10 observations were within, or partially within, a 500m radius of the Wind Farm Site.
Incidental Records	64	1	Individuals were observed travelling and hunting throughout the survey period. Observations ranged from within a 500m radius of the Wind Farm Site and up to 4.4km from the Wind Farm Site.

7.3.8.13 Buzzard

Survey	Total number of records	Average and peak count per observation	Summary
Vantage Point Surveys	151	1 (6)	Birds were observed travelling, hunting, soaring or perched throughout the survey period. 143 observations were within, or partially within, a 500m radius of the Wind Farm Site. Juveniles

Survey	Total number of records	Average and peak count per observation	Summary
			were observed on 16 occasions, confirming breeding within the Wind Farm Site.
Breeding Walkover Surveys	54	1 (5)	Birds were observed travelling, hunting, soaring or perched throughout the two breeding seasons. 50 observations were within, or partially within, a 500m radius of the Wind Farm Site. Breeding activity was observed on 14 occasions with breeding confirmed by the observation of juveniles.
Breeding Raptor Surveys	139	1 (3)	The majority of observations were of birds hunting, soaring or perched throughout the survey period. There were several observations of confirmed breeding during the 2024 breeding season.
Winter Walkover Surveys	30	1 (3)	Birds were observed travelling, hunting, soaring or perched throughout the survey period. 29 observations were within, or partially within, a 500m radius of the Wind Farm Site.
Incidental Records	119	1	Individuals were observed travelling, perched, soaring and hunting throughout the survey period. Observations ranged from within a 500m radius of the Wind Farm Site and up to 4.6km from the Wind Farm Site.

7.3.8.14 Sparrowhawk

Survey	Total number of records	Average and peak count per observation	Summary
Vantage Point Surveys	24	1	Individuals were observed travelling, hunting or soaring throughout the survey period. All observations were within, or partially within, a 500m radius of the Wind Farm Site. No breeding activity was observed during the survey period.
Breeding Walkover Surveys	2	1	Individuals were observed soaring or hunting throughout the two breeding seasons. Both observations were within, or partially within, a 500m radius of the Wind Farm Site.
Breeding Raptor Surveys	8	1	Individuals were observed travelling, hunting, soaring and perched. One observation was in April 2023 and all remaining observations were during the 2024 breeding season. No breeding behaviour was observed.
Winter Walkover Surveys	7	1	Individuals were observed travelling, hunting or flushed throughout the survey period. Six observations were within, or partially within, a 500m radius of the Wind Farm Site.
Incidental Records	32	1 (4)	Up to four birds were observed travelling, hunting, flushed, soaring or displaying throughout the survey period. Observations ranged from within a 500m radius of the Wind

Survey	Total number of records	Average and peak count per observation	Summary
			Farm Site and up to 4.4km from the Wind Farm Site.

7.3.8.15 Hen Harrier

Survey	Total number of records	Average and peak count per observation	Summary
Vantage Point Surveys	1	1	Single bird hunting/travelling immediately east of the Wind Farm Site in October 2022

7.3.8.16 Barn Owl

Survey	Total number of records	Average and peak count per observation	Summary
Incidental Records	1	1	Bird seen travelling over farmland during daylight following a vantage point survey in January 2024.

7.3.8.17 Summary

The results of the updated 2.5 years of survey data are not significantly different from the EIAR as submitted for the majority of species. However, differences in activity were observed for the following species:

- Golden plover (wintering) – not previously recorded utilising habitats within the Wind Farm Site.
- Snipe (breeding) – not previously recorded breeding within the Wind Farm Site.
- Lapwing (breeding) - not previously recorded breeding within the Wind Farm Site.
- Kestrel (all seasons) - not previously recorded breeding within the Wind Farm Site.
- In addition, hen harrier and barn owl were not recorded during the two years of survey data as presented in the EIAR as submitted.

7.4 Receptor Evaluation

The DAU submission dated 23 May 2023 commented that there is the potential for uneven distribution of some species. In response a more detailed analysis of potential population estimates was provided as follows, where additional information is available in relation to bird density/distributions (e.g. from the most recent Bird Atlas), population estimates have been updated to reflect this for relevant species, i.e. peregrine, black-headed gull, snipe, kestrel, buzzard and sparrowhawk (please refer to Response to Submissions document for further discussion). For wintering waterbirds (e.g. lapwing and golden plover) the population estimates reported in the EIAR are to county level and based on I-WeBS data and represent the best available data. The use of I-WeBS data to calculate county populations was not questioned in the submission by the DAU.

7.4.1 Determination of Population Importance

7.4.1.3 Peregrine

There are no published figures for the County Westmeath population of peregrine. The Bird Atlas (2007 – 2011) provides breeding and wintering distribution maps for birds in Ireland. Using these maps, and using the national population estimate for peregrine of 425 pairs, county populations can be inferred by examining distribution points for each county, giving a population of peregrine in Co. Westmeath of 8 pairs[29]. This population figure only relates to breeding birds, however all populations will include non-breeding individuals. For example, given that peregrine have brood sizes of three to four chicks, and a survival rate of 60% in their first year[30], a non-breeding population of juvenile birds can be estimated at 17 birds.

The population of peregrine in Co. Westmeath is therefore estimated to be 33 birds.

7.4.1.5 Lapwing

There are no published figures for the County Westmeath population of breeding lapwing. The Bird Atlas (2007 – 2011) provides breeding and wintering distribution maps for birds in Ireland. Using these maps, and using the national population estimate for breeding lapwing of 620 pairs, county populations can be inferred by examining distribution points for each county, giving a population of breeding lapwing in Co. Westmeath of 24 pairs.

7.4.1.7 Black-headed Gull

As per the Seabirds Count 2015-2021 census (ref) there is an uneven distribution of breeding black-headed gulls in Ireland. As outlined in the Seabirds Count Figure 1 of the black-headed gull account, there is one main cluster of breeding black-headed gull in the midlands of Ireland. The area includes Westmeath, the boundary between Westmeath and Longford and the boundary between Westmeath and Meath. The total population is 682 breeding birds. This population figure only relates to breeding birds, however all populations will include non-breeding individuals. For example, given that black-headed gull have brood sizes of two to three chicks, and a survival rate of c.45% in their first year, a non-breeding population of juvenile birds can be estimated at c.384 birds. The population of breeding black-headed gulls in Co. Westmeath is therefore estimated to be 1,066 birds.

This population estimate is likely conservative as the species opportunistically breeds on flooded sections of cutover bog, of which there are many in the wider surroundings of the Proposed Development. Such sites do not appear to have been included in the Seabirds Count 2015-2021 census.

7.4.1.11 Snipe

There are no population estimates for wintering snipe in Ireland. As reported (2013-2018) under Article 12 of the Birds Directive (Directive 2009/147/EC), the national breeding population estimate of snipe in the Republic of Ireland is 4,275 breeding pairs. Taking a highly precautionary approach, it has been assumed that the number of birds is double the number of pairs. **Note**: as wintering snipe population in Ireland is bolstered by migration of European birds, this represents a considerable underestimate of the wintering population.

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[29] Bird Atlas data from the National Biodiversity Data Centre was used to estimate the county population. Presence/absence hectad data was used to estimate the proportion of the national population that occurs in the county. The national population was then multiplied by this percentage to give a county population estimate. This procedure was followed for all relevant species.
[30] https://www.bto.org/learn/about-birds/birdfacts/peregrine

There are no published figures for the County Westmeath populations of snipe. The Bird Atlas (2007 – 2011) provides breeding and wintering distribution maps for birds in Ireland. Using these maps, and using the national breeding population estimate for snipe of 4,275 pairs (or 8,550 birds, see above), county populations can be inferred by examining distribution points for each county. The wintering population of snipe in Co. Westmeath is therefore estimated to be 175 birds (however in reality it is likely a multiple of this figure).

7.4.1.12 Kestrel

There are no published figures for the County Westmeath population of kestrel. The Bird Atlas (2007 – 2011) provides breeding and wintering distribution maps for birds in Ireland. Using these maps, and using the national population estimate for peregrine of 13,500 birds, county populations can be inferred by examining distribution points for each county. The population of kestrel in Co. Westmeath is therefore estimated to be 363 birds.

7.4.1.13 Buzzard

There are no published figures for the County Westmeath population of buzzard. The Bird Atlas (2007 – 2011) provides breeding and wintering distribution maps for birds in Ireland. Using these maps, and using the national population estimate for buzzard of 1,938 pairs, county populations can be inferred by examining distribution points for each county, giving a population of buzzard in Co. Westmeath of 77 pairs. This population figure only relates to breeding birds, however all populations will include non-breeding individuals. Given that buzzard have brood sizes of two to three chicks, and a survival rate of 63% in their first year[31], a non-breeding population of juvenile birds can be estimated at 121 birds.

The population of peregrine in Co. Westmeath is therefore estimated to be 275 birds.

7.4.1.14 Sparrowhawk

There are no published figures for the County Westmeath population of peregrine. The Bird Atlas (2007 – 2011) provides breeding and wintering distribution maps for birds in Ireland. Using these maps, and using the national population estimate for sparrowhawk of 11,859 birds, county populations can be inferred by examining distribution points for each county, giving a population of sparrowhawk in Co. Westmeath of 237 birds.

[31] *https://www.bto.org/learn/about-birds/birdfacts/buzzard*

7.5 Potential Impacts

An updated collision risk assessment has been carried out incorporating the data presented in the EIAR as submitted, in addition to the updated 2.5 years of survey data (see Appendix 7-5a – Revised Collision Risk Assessment). An updated impact assessment is therefore provided below in relation to collision risk for species where predicted collision rates have changed as a result of the updated assessment, i.e. peregrine, lapwing, black-headed gull, mallard, snipe, kestrel, buzzard and sparrowhawk.

The results of the updated 2.5 years of survey data are not significantly different for the identified KORs in comparison with results from the EIAR as submitted and, as such, broadly corroborate the findings of the EIAR as submitted. The key exceptions to this were observed for golden plover (wintering), lapwing (breeding), snipe (breeding) and kestrel (all seasons) as outlined in Section 7.3.8.17 further above. To account for these changes, an updated impact assessment is provided below.

7.5.7 Effects on Key Ornithological Receptors during Construction and Operation

7.5.7.1 Peregrine Falcon (All seasons)

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
Collision Risk	This species was recorded flying within the potential collision risk height during vantage point surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 7-5a – Revised Collision Risk Assessment.. The collision risk has been calculated at a ratio of 0.152 collisions per year. Annual mortality of adult peregrine has been calculated at 19% per annum (Craig *et al.*, 2004). If 0.152 collisions were to occur per year, it would mean that the losses at the proposed wind farm would increase the annual mortality of the county population (i.e. estimated at *c.*33 birds [please see Section 7.4.1 of the EIAR as submitted for further details]) by 2.42%. The predicted collision risk is therefore of low magnitude as per Percival (2003). No significant effects are anticipated at the county, national or international level.	The magnitude of the effect is assessed as *Low*. The cross tablature of a *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance.	Likely Long-term Constant **Slight** Negative Effect

7.5.7.3 Lapwing (Wintering)

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
Collision Risk	This species was recorded flying within the potential collision risk zone during vantage point surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 7-5a – Revised Collision Risk Assessment.. The collision risk has been calculated at a rate of 19.562 collisions per year. Annual mortality of lapwing has been calculated at 29.5% per annum (Peach *et al*, 1994). If 19.205 collisions were to occur per year, it would mean that the losses at the proposed wind farm would increase the annual mortality of the county population (i.e. *c.*2,872 birds [please see Section 7.4.1 of the EIAR as submitted for further details]) by 2.3%. The predicted collision risk is therefore of low magnitude as per Percival (2003). No significant effects are anticipated at the county, national or international scale.	The magnitude of the effect is assessed as *Low*. The cross tablature of a *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance.	Likely Long-term Constant **Slight** Negative Effect

7.5.7.4 Black-headed Gull (Breeding)

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
Collision Risk	This species was recorded flying within the potential collision risk zone during vantage points surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 7-5a – Revised Collision Risk Assessment.. As outlined in Section 7-4 (of the EIAR as submitted), the county population of breeding black-headed gull was determined based on a highly conservative approach and, as such, the below assessment represents a highly conservative estimate of collision rate.	The magnitude of the effect is assessed as *Medium*. The cross tablature of a *Medium* sensitivity species and *Medium* Impact corresponds to a **Low** effect significance	Likely Long-term Constant **Slight** Negative Effect

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
	The collision risk has been calculated at a rate of 9.205 collisions per year. Annual mortality of adult black-headed gull has been calculated at 10% per annum (Prévot-Julliard *et al.*, 1998). If 9.205 collisions were to occur per year, it would mean that the losses at the proposed wind farm would increase the annual mortality of the county breeding season population (i.e. 1,066 birds [please see Section 7.4.1 of the EIAR as submitted for further details]) by 8.635%. The predicted collision risk is therefore of medium magnitude as per Percival (2003). As previously outlined the black-headed gull population is likely an underestimate (as many cutover bog sites host breeding colonies of black-headed gull that do not appear to have been included in the Seabirds Count census (2015-2021)), and this has inflated the predicted increase in annual mortality beyond what is actually likely. No significant effects are anticipated at the county, national or international scale.		

7.5.7.5 Black-headed Gull (Wintering)

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
Collision Risk	This species was recorded flying within the potential collision risk zone during VP surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 7-5a – Revised Collision Risk Assessment.. As discussed in Section 7.4.1 (of EIAR as submitted), the population numbers for wintering black-headed gull are based on IWeBS data and are highly likely to be a considerable under-estimate of the actual wintering county population.	The magnitude of the effect is assessed as *Medium*. The cross tablature of a *Medium* sensitivity species and	Likely Long-term Constant **Slight** Negative Effect

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
	As such, the below assessment represents a highly conservative approach in respect to collision risk. The collision risk has been calculated at a rate of 4.455 collisions per year. Annual mortality of adult black-headed gull has been calculated at 10% per annum (Prévot-Julliard *et al.*, 1998). If 4.455 collisions were to occur per year, it would mean that the losses at the proposed wind farm would increase the annual mortality of the county wintering population (i.e. *c.*551 birds [please see Section 7.4.1 of EIAR as submitted for further details]) by 8.08%. The predicted collision risk is therefore of medium magnitude as per Percival (2003). As previously outlined (in the EIAR as submitted) the black-headed gull population is likely an underestimate (as per Article 12 reporting), and this has inflated the predicted increase in annual mortality beyond what is actually likely. No significant effects are anticipated at the county, national or international scale.	*Medium* Impact corresponds to a **Low** effect significance	

7.5.7.6 Mallard (All seasons)

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
Collision Risk	This species was recorded flying within the potential collision risk zone during vantage point surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 7-5a – Revised Collision Risk Assessment..	The magnitude of the effect is assessed as *Negligible*. The cross tablature of a *Medium* sensitivity species and *Negligible* Impact corresponds	Likely Long-term Constant **Not Significant** Negative Effect

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
	The collision risk has been calculated at a rate of 0.738 collisions per year. Annual mortality of adult mallard has been calculated at an average 32% per annum (range 54%-10%; Gunnarsson *et al.*, 2008). If 0.738 collisions were to occur per year, it would mean that the losses at the proposed wind farm would increase the annual mortality of the county population (i.e. *c.*367 birds [please see Section 7.4.1 of EIAR as submitted for further details]) by 0.628%. The predicted collision risk is therefore of negligible magnitude as per Percival (2003).	to a **Very Low** effect significance	

7.5.7.8 Snipe (Wintering)

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
Collision Risk	This species was recorded flying within the potential collision risk zone during vantage point surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 7-5a – Revised Collision Risk Assessment.. The collision risk has been calculated at a rate of 0.362 collisions per year. Annual mortality of adult snipe has been calculated at 37.5% (Spence, 1988). If 0.362 collisions were to occur per year, it would mean that the losses at the proposed wind farm would increase the annual mortality of the county population (i.e. *c.*328 birds [please see Section 7.4.1 of the EIAR as submitted for further details]) by 0.29%. The predicted collision risk is therefore of negligible magnitude as per Percival (2003). No significant effects are anticipated at the county, national or international scale.	The magnitude of the effect is assessed as *Negligible*. The cross tablature of a *Medium* sensitivity species and *Negligible* Impact corresponds to a **Very Low** effect significance	Long-term **Not Significant** Negative Effect

7.5.7.9 Kestrel (All seasons)

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
Construction Phase			
Direct Habitat Loss	Kestrel was regularly recorded hunting within the Wind Farm Site over the 4.5 years of survey data, including a probable breeding pair recorded within the Wind Farm Site in 2023. The land lost to the development footprint is small (i.e. 8.2ha/0.9% of EIAR Site Boundary) relative to the total area within the Wind Farm Site. As such, direct loss of hunting habitat relative to its availability onsite will be minimal. Furthermore, this species is unlikely to be dependent on the onsite habitats, given the wide-ranging nature of the species and the availability of similar suitable habitats in the surroundings (e.g. agricultural grassland/coniferous plantation). The results of breeding raptor surveys outside of the Wind Farm Site recorded similar levels of kestrel activity across areas of similar habitat, i.e. agricultural grassland and commercial forestry, which are the abundant habitat types in the surrounding area. The Wind Farm Site is therefore not a unique or scarce resource for kestrel and the potential for construction works to result in ecologically significant habitat loss for kestrel is therefore limited. Significant effects of habitat loss are not predicted at the county, national or international scale.	The magnitude of the effect is assessed as *Low*. The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance	Likely Long-term Constant **Slight** Negative Effect
Disturbance	Kestrel was regularly recorded hunting within the Wind Farm Site over the 4.5 years of survey data, including a probable breeding pair recorded within the Wind Farm Site in 2023. On a precautionary basis, it is assumed that some temporary disturbance may occur in the immediate area of the wind farm. However, the Wind Farm Site does not contain habitats that are unique to the local area. The results of breeding raptor surveys outside of the Wind Farm Site recorded similar levels	The magnitude of the effect is assessed as *Low*. The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance	Likely Short-term Frequent **Slight** Negative Effect

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
	of kestrel activity across areas of similar habitat, i.e. agricultural grassland, and commercial forestry, which are the abundant habitat types in the surrounding area. Therefore, were disturbance to occur it would not result in the loss of a scarce resource for the local kestrel population. Given that extensive areas of suitable foraging/breeding habitat exist and will remain in the wider area and that onsite habitats are not considered unique to the Wind Farm Site, significant displacement effects are not predicted at the county, national or international scale.		
Operational Phase			
Direct Habitat Loss	Direct or indirect effects are not anticipated.	**No Effect**	**No Effect**
Displacement and Barrier Effect	Kestrel was regularly recorded hunting within the Wind Farm Site over the 4.5 years of survey data, including a probable breeding pair recorded within the Wind Farm Site in 2023. Raptor studies have generally found only low levels of turbine avoidance (Hötker *et al.,* 2006; Madders and Whitfield 2006), with some species, such as kestrels, known to continue foraging activity close to turbines (Pearce Higgins *et al.*, 2009). Moreover, extensive areas of suitable foraging habitat exist and will remain in the wider area post-commissioning. Onsite habitats are not unique to the Wind Farm Site. Significant displacement effects are not predicted at the county, national or international scale.	The magnitude of the effect is assessed as *Low.* The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance	Likely Long-term Constant **Slight** Negative Effect
Collision Risk	This species was recorded flying within the potential collision height during vantage point surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 7-5a – Revised Collision Risk Assessment..	The magnitude of the effect is assessed as *Low.*	Likely Long-term Constant **Slight** Negative Effect

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
	The collision risk has been calculated at a ratio of 2.512 collisions per year. Annual mortality of adult kestrel has been calculated at 31% per annum (Village, 1990). If 2.512 collisions were to occur per year, it would mean that the losses at the proposed wind farm would increase the annual mortality of the county population (i.e. estimated at *c.*363 birds [please see Section 7.4.1 of the EIAR as submitted for further details]) by 2.23%. The predicted collision risk is therefore of low magnitude as per Percival (2003). No significant effects are anticipated at the county, national or international scale.	The cross tablature of a *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance	

7.5.7.10 Buzzard (All seasons)

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
Collision Risk	This species was recorded flying within the potential collision risk zone during VP surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 7-5a – Revised Collision Risk Assessment.. The collision risk has been calculated at a rate of 5.342 collisions per year. Annual mortality of adult buzzard has been calculated at 10% per annum (Kenward *et al.*, 2000). If 5.342 collisions were to occur per year, it would mean that the losses at the proposed wind farm would increase the annual mortality of the county population (i.e. estimated at *c.*275 birds [please see Section 7.4.1 of the EIAR as submitted for further details]) by 19.43%. The predicted collision risk is therefore of medium magnitude as per Percival (2003). No significant effects are anticipated at the county, national or international scale.	The magnitude of the effect is assessed as *Medium*. The cross tablature of *Low* sensitivity species and *Medium* Impact corresponds to a **Low** effect significance	Likely Long-term **Slight** Negative Effect

7.5.7.11 Sparrowhawk (All seasons)

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
Collision Risk	This species was recorded flying within the potential collision risk zone during VP surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 7-5a – Revised Collision Risk Assessment.. The collision risk has been calculated at a rate of 0.123 collisions per year. Annual mortality of adult sparrowhawk has been calculated at 31% per annum (Newton, 1986). If 0.123 collisions were to occur per year, it would mean that the losses at the proposed wind farm would increase the annual mortality of the county population (i.e. estimated at 237 birds [please see Section 7.4.1 of the EIAR as submitted for further details] by 0.17%. The predicted collision risk is therefore of negligible magnitude as per Percival (2003). No significant effects are anticipated at the county, national or international scale.	The magnitude of the effect is assessed as *Negligible*. The cross tablature of a *Low* sensitivity species and *Negligible* Impact corresponds to a **Very Low** effect significance	Likely Long-term Constant **No Significant** Negative Effect

7.5.7.12 Golden Plover (Wintering)

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
Construction Phase			
Direct Habitat Loss	Golden plover was recorded a total of 22 times within, or partially within, the Wind Farm Site over the survey period. Golden plover were observed utilising agricultural land within the Wind Farm Site for foraging on four occasions over the 4.5 years of surveying, comprising flocks of between 11-80 birds. This is a low rate of occurrence and demonstrates a lack of dependence of golden plover on the habitats of the Wind Farm Site. The land lost to the development footprint is small (i.e. 8.2ha/0.9% of the EIAR Site Boundary) relative to the total area within the Wind Farm Site. This	The magnitude of the effect is assessed as *Low*. The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance.	Likely Long-term Constant **Slight** Negative Effect

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
	species is unlikely to be dependent on the onsite habitats, given the low number of foraging observations, the wide-ranging nature of the species and the availability of similar suitable habitats in the surroundings (i.e. agricultural grassland). Significant habitat loss effects are not predicted at the county, national or international scale.		
Disturbance	Golden plover were recorded travelling and circling within, or partially within the Wind Farm Site and surrounds during surveys, with four observations of birds utilising habitats within the site. There was no evidence to suggest that golden plover were utilising the Wind Farm Site and immediate surroundings for foraging or roosting with any regularity. The majority of observations were of birds commuting over the Wind Farm Site, and these flights are unlikely to be impacted by construction works. Furthermore the availability of similar suitable habitats in the surroundings (i.e. agricultural grassland) limits the potential for significant disturbance effects. Significant disturbance effects are not anticipated at the county, national and international scale.	The magnitude of the effect is assessed as *Low*. The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance.	Likely Short-term Frequent **Slight** Negative Effect
Operational Phase			
Direct Habitat Loss	Direct or indirect effects are not anticipated.	**No Effect**	**No Effect**
Displacement and Barrier Effect	Golden plover were recorded travelling and circling within, or partially within the Wind Farm Site and surrounds during surveys, with four observations of birds utilising habitats within the site. There was no evidence to suggest that golden plover were utilising the Wind Farm Site and surroundings for foraging or roosting with any regularity. The majority of observations were of birds travelling/circling over the Wind Farm Site, No pattern of direction was observed from these flights and no regular commuting over the site was recorded. Furthermore the availability of alternative suitable habitat in the	The magnitude of the effect is assessed as *Low*. The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance.	Likely Long-term Constant **Slight** Negative Effect

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
	surroundings (i.e. agricultural grassland) limits the potential for significant displacement effects. Significant displacement effects are not predicted at the county, national or international scale.		
Collision Risk	This species was recorded flying within the potential collision risk zone during vantage point surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 7-5a – Revised Collision Risk Assessment.. The collision risk has been calculated at a rate of 10.842 collisions per year. Annual mortality of golden plover has been calculated at 27% per annum (Sandercock, 2003). If 10.842 collisions were to occur per year, it would mean that the losses at the proposed wind farm would increase the annual mortality of the county population (i.e. *c.*2,091 birds [please see Section 7.4.1 of the EIAR as submitted for further details]) by 1.92%. The predicted collision risk is therefore of low magnitude as per Percival (2003). No significant effects are anticipated at the county, national or international scale.	The magnitude of the effect is assessed as *Low.* The cross tablature of a *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance.	Likely Long-term Constant **Slight** Negative Effect

7.5.7.13 Lapwing (Breeding)

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival 2003)	Significance (EPA 2022)
Construction Phase			
Direct Habitat Loss	Probable lapwing breeding was recorded within the Wind Farm Site in 2023 and 2024.	The magnitude of the effect is assessed as *Low.*	Long-term **Slight** Negative Effect

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival 2003)	Significance (EPA 2022)
	Probable breeding by an estimated two pairs was recorded during the 2023 breeding season. Breeding was not recorded at this location in 2024. Observations during 2024 comprised a single bird in territorial display in April 2024, with some further observations of a single bird travelling and landing in May and June 2024, indicating probable breeding of a single pair in 2024. The physical loss of land to the development footprint is small (i.e. 8.2ha/0.9% of EIAR Site Boundary) relative to the total area within the Wind Farm Site. As such, direct loss of breeding/foraging habitat for lapwing relative to its availability onsite will be minimal. Furthermore, substantial areas of undisturbed agricultural grassland habitat will remain in the surrounding area. Results of surveys at the Wind Farm Site show that breeding lapwing have not been predictably associated with a specific area of the Wind Farm Site, with breeding location changing across the two most recent years of survey data. The Proposed Wind Farm will likely give rise to a measurable reduction in the distribution and abundance of breeding lapwing locally within the Proposed Wind Farm, however, significant effects of habitat loss are not predicted at the county, national or international scale.	The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance.	
Disturbance	As outline above, probable lapwing breeding was recorded within the Wind Farm Site, with a single pair estimated in the most recent survey year (2024). Hotker et al. (2006) undertook a meta-analysis of existing literature on disturbance distances. This review reported from the 13 studies examined the mean disturbance distance for breeding lapwing was 108m. Lapwing breeding was not confirmed within the Wind Farm Site. The breeding areas were therefore estimated based on observed activity (e.g. territorial display) and areas of suitable habitat. The estimated breeding areas for 2023 and	The magnitude of the effect is assessed as *Low*. The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance.	Short-term **Slight** Negative Effect

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival 2003)	Significance (EPA 2022)
	2024 partly overlap with a 108m radius of the proposed infrastructure. However, the results of surveys at the Wind Farm Site show that breeding lapwing have not been predictably associated with a specific area of the Wind Farm Site, with breeding location changing across the two most recent years of survey data. The Proposed Wind Farm will likely give rise to a measurable reduction in the distribution and abundance of breeding lapwing locally within the Proposed Wind Farm, however, significant effects of disturbance are not predicted at the county, national or international scale. *Note*: as outlined in Section 7.7.1 of the EIAR as submitted, pre-construction monitoring surveys will be undertaken in advance of any works and if breeding is recorded suitable buffer will be recommended.		
Operational Phase			
Direct Habitat Loss	Direct effects are not anticipated as no additional infrastructure is proposed.	**No Effect**	**No Effect**
Displacement & Barrier Effect	As outline above, probable lapwing breeding was recorded within the Wind Farm Site, with a single pair estimated in the most recent survey year (2024). Several studies of wind energy infrastructure and its impact on bird populations have found no discernible impact on populations of breeding Lapwings, either through collision, disturbance displacement or avoidance (Winkelman 1992; Ketzenberg et al. 2002; Pearce-Higgins et al. 2009). Hotker et al. (2006) undertook a meta-analysis of existing literature on disturbance distances. This review reported from the 13 studies examined the mean disturbance distance for breeding lapwing was 108m. Lapwing breeding was not confirmed within the Wind Farm Site. The breeding areas were therefore estimated based on observed activity (e.g. territorial display) and areas	The magnitude of the effect is assessed as *Low*. The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance.	Long-term **Slight** Negative Effect

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival 2003)	Significance (EPA 2022)
	of suitable habitat. The estimated breeding areas for 2023 and 2024 partly overlap with a 108m radius of proposed infrastructure. Pearce-Higgins et al. (2009) found no significant relationship between distance to wind farms and changes in occurrence. Langston et al. (2003) found that Lapwing nesting occurred slightly closer to turbines possibly as a result of the creation of preferred areas of shorter vegetation. The presence of the wind farm is not expected to deter lapwing from breeding adjacent to the Wind Farm Site during the operational phase of the wind farm development. Results of surveys at the Wind Farm Site show that breeding lapwing have not been predictably associated with a specific area of the Wind Farm Site, with breeding location changing across the two most recent years of survey data. Substantial areas of suitable habitat will remain within the Wind Farm Site distant from the proposed turbines. The Proposed Wind Farm will likely give rise to a measurable reduction in the distribution and abundance of breeding lapwing locally within the Proposed Wind Farm, however, significant effects of displacement are not predicted at the county, national or international scale.		
Collision	The species was recorded flying within the potential collision risk zone during vantage point. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 7-5a – Revised Collision Risk Assessment. The collision risk has been calculated at a rate of 0.207 collisions per year. Annual mortality of lapwing has been calculated at 29.5% per annum (Peach *et al*, 1994). If 0.207 collisions were to occur per year, it would mean that the losses at the proposed wind farm would increase the annual mortality of the county population (i.e. c.48 birds (please see Section 7.4.1 for further details)) by 1.46%.	The magnitude of the effect is assessed as *Low*. The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance.	Long-term **Slight** Negative Effect

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival 2003)	Significance (EPA 2022)
	The predicted collision risk is therefore of low magnitude as per Percival (2003). No significant effects are anticipated at the county, national or international scale.		

7.5.7.14 Snipe (Breeding)

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
Construction Phase			
Direct Habitat Loss	Snipe was regularly recorded within the Wind Farm Site during the breeding season during the additional 2.5 years of surveying. Drumming (i.e. displaying) was recorded within the Wind Farm Site indicating probable breeding. The land lost to the development footprint is small (i.e. 8.2ha/0.9% of EIAR Site Boundary) relative to the total area within the Wind Farm Site. Snipe preferentially utilise wet areas for foraging and roosting. As such, direct loss of foraging habitat relative to its availability onsite will be minimal. Furthermore, substantial areas of undisturbed agricultural grassland habitat will remain in the surrounding area. Significant effects of habitat loss are not predicted at the county, national or international scale.	The magnitude of the effect is assessed as *Low*. The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance	Likely Long-term Constant **Slight** Negative Effect
Disturbance	Snipe was regularly recorded within the Wind Farm Site during the breeding season during the additional 2.5 years of surveying. Drumming (i.e. displaying) was recorded within the Wind Farm Site indicating probable breeding. The availability of alternative suitable habitat in the surroundings limits the potential for significant disturbance effects. Significant disturbance effects are not predicted at the county, national or international scale.	The magnitude of the effect is assessed as *Low*. The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance	Likely Short-term Frequent **Slight** Negative Effect
Operational Phase			

Potential effects during the construction and operational phases of the Proposed Development		Significance (Percival, 2003)	Significance (EPA, 2022)
Direct Habitat Loss	Direct or indirect effects are not anticipated.	**No Effect**	**No Effect**
Displacement and Barrier Effect	Snipe was regularly recorded within the Wind Farm Site during the breeding season during the additional 2.5 years of surveying. Drumming (i.e. displaying) was recorded within the Wind Farm Site indicating probable breeding. The availability of alternative suitable habitat in the surroundings limits the potential for significant displacement effects. Significant displacement effects are not predicted at the county, national or international scale.	The magnitude of the effect is assessed as *Low*. The cross tablature of *Medium* sensitivity species and *Low* Impact corresponds to a **Low** effect significance	Likely Long-term Constant **Slight** Negative Effect
Collision Risk	This species was recorded flying within the potential collision risk zone during vantage point surveys. A "Random" collision risk analysis has been undertaken and full details are provided in Appendix 7-5a – Revised Collision Risk Assessment. The collision risk has been calculated at a rate of 0.471 collisions per year. Annual mortality of adult snipe has been calculated at 37.5% (Spence, 1988). If 0.471 collisions were to occur per year, it would mean that the losses at the proposed wind farm would increase the annual mortality of the county population (i.e. *c.*328 birds [please see Section 7.4.1 of the EIAR as submitted for further details]) by 0.38%. The predicted collision risk is therefore of negligible magnitude as per Percival (2003). No significant effects are anticipated at the county, national or international scale.	The magnitude of the effect is assessed as *Negligible*. The cross tablature of a *Medium* sensitivity species and *Negligible* Impact corresponds to a **Very Low** effect significance	Long-term **Not Significant** Negative Effect

7.9 Cumulative Effects

No significant effects are predicted at the county, national or international level. The Wind Farm site is predominantly characterised by improved agricultural grassland utilised for livestock grazing, and smaller areas of wet grassland and commercial forestry plantation. Improved agricultural grassland and commercial forestry are typically considered to be of low ecological value. Both habitat types are among the most abundant in Ireland, particularly so, in the case of improved agricultural grassland. Neither habitat are rare locally or uniquely occurs within the Wind Farm Site. As outlined in Section 7.2.5.1 of the EIAR as submitted and this EIAR addendum, wind farms have the potential to impact birds. The Wind Farm Site will likely give rise to a measurable reduction in the distribution and abundance of birds locally within the Wind Farm Site. However (as previously stated), no significant effects are predicted at the county, national or international level.

The wider surroundings of the Wind Farm Site include an avian community of the following key ornithological receptors: peregrine, black-headed gull, snipe, mallard, kestrel, buzzard, sparrowhawk, golden plover and lapwing. Based on observations to date, it is likely these species will continue to utilise the wider surroundings of the Wind Farm Site. There is abundant suitable habitat (e.g. agricultural grassland) throughout Westmeath. Within this habitat there is a very low density of turbines. There are no existing wind farms within 25km of the Wind Farm Site, and the one single wind turbine (Kepak), and two proposed[32] wind farms (Lemanaghan & Derryadd) are greater than 16km distant (see Section 2.1.7 of EIAR Addendum for further details). The potential for domestic single turbines at a height lower than 50m in the surrounding area to result in significant cumulative effects on birds is negligible. At such low densities of turbines, the potential for significant cumulative effects is very limited.

For hen harrier and barn owl the evidence of surveys is that the species do not rely on the Wind Farm Site. This limits the potential for ecologically significant effects. No significant cumulative effects are predicted for either species.

No significant cumulative effects are predicted. This finding corroborates the assessment of cumulative effects in the EIAR as submitted.

7.9.3 Conclusion of Cumulative Assessment

Following the detailed assessment provided in the preceding sections, and the EIAR as submitted, it is concluded that, the Proposed Development will not result in any significant effects on birds. There is therefore no potential for the Proposed Development to contribute to any cumulative adverse effects on birds when considered in-combination with other plans and projects.

In the review of the projects that was undertaken, no connection, that could potentially result in additional or cumulative impacts was identified. Neither was any potential for different (new) impacts resulting from the combination of the various projects and plans in association with the Proposed Development.

Taking into consideration the reported residual impacts from other plans and projects in the area and the predicted impacts with the current proposal, no residual cumulative impacts have been identified with regard to birds.

[32] *In addition to the above, the Bellair Wind Farm located north of the proposed Lemanaghan Wind Farm has recently come into the public domain as a project. The project itself is at early project stages, and at the time of writing, no further details of project (turbine layout, no. of turbines or project scale) are in the public domain and as such, the Bellair project has been screened out of relevant assessments.*

8. LAND SOILS AND GEOLOGY

There are no updates to this Section of the EIAR.

9. WATER

9.2 Methodology

9.2.2 Baseline Monitoring and Site Investigations

Hydrological and hydrogeological data used in this assessment includes:

- A Revised WFD Compliance Assessment Report has been completed for the Proposed Development (Wind Farm Site and Grid Connection) and is included as EIAR Addendum Report Appendix 9-2: Revised WFD Assessment Report.

9.3 Receiving Environment

9.3.2 Water Balance

Long term rainfall and evaporation data was sourced from Met Éireann (www.met.ie).

The long-term Average Annual Rainfall (AAR) (1981 - 2010) recorded at Ballymore Garda Station, 2.2km to the northeast of the Wind Farm Site, are presented in Table 9-4. The data from this rainfall station indicates an AAR of 1,154.7mm/yr.

Met Éireann also provide a grid of AAR for the entire country for the period of 1991 to 2020. Based on this more site-specific modelled rainfall values, the 30-year AAR (1991-2020) assigned to location E219000, N246000 (at the centre of the Wind Farm site) is 976mm/yr. This is considered to be the most accurate estimate of AAR from the available sources. The monthly modelled rainfall data for this location within the Wind Farm Site are also included in Table 9-4.

Table 9-4: Local Average long-term Rainfall Data (mm)

Station		X-Coord		Y-Coord		Ht (MAOD)		Opened		Closed		Total
Ballymore G.S.		221200		249100		91		N/A		N/A		
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total
93	68	73	56	70	66	65	92	89	96	89	94	952
Location		X-Coord		Y-Coord		Ht (mAOD)		Opened		Closed		Total
Approx. Centre of WF Site		219000		246000		N/A		N/A		N/A		
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total
96	76	70	62	63	76	80	84	75	99	98	100	976

The closest synoptic station[33] where the average Potential Evapotranspiration (PE) is recorded is at Mullingar, approximately 24km northeast of the Wind Farm Site. The long-term average PE for this station is 445.8mm/year. This value is used as a best estimate of the site PE. Actual Evaporation (AE) at the Proposed Development site is estimated as 423.5mm/year (which is 0.95 × PE).

The Effective Rainfall (ER) represents the water available for runoff and groundwater recharge. The ER for the Site is calculated as follows:

Effective rainfall (ER) = Average Annual Rainfall (AAR) – Actual Evapotranspiration (AE)

= 976mm/year – 423.5mm/year

ER = 552.5mm/year

Based on groundwater recharge coefficient estimates from the GSI (www.gsi.ie) an estimate of 124.3mm/year average annual recharge is given for till at the Wind Farm Site (recharge coefficient of ~22.5%). While till is mapped over much of the Wind Farm Site, areas in the west are underlain by less permeable subsoils including lacustrine clays This means that the hydrology of the Wind Farm Site is characterised by high surface water runoff rates and moderate to low groundwater recharge rates. Therefore, conservative annual recharge and runoff rates for the Wind Farm Site are estimated to be 124.4mm/year and 428.6mm/year (i.e. 552.5mm/year – 124.3mm/year = 428.2mm/year) respectively.

Met Éireann's Translate Project (https://www.met.ie/science/translate) provides projections for a range of future climate change scenarios, as Ireland's future climate will depend on global greenhouse gas emissions reductions. The severity of any future climate change will depend on the degree of future warming. In a 1.5°C world, average winter and summer precipitation rates are projected to be 3.22mm/day and 2.36mm/day respectively in Co. Westmeath. Meanwhile, in a 4°C world, the average winter and summer precipitation rates in Co. Westmeath are projected to be 3.54mm/day and 2.17mm/day respectively.

9.3.3 Surface Water Quality

Q-rating status data for EPA monitoring points on the Dungolman River, the Mullenmeehan stream and the Inny River are shown on Table 9 6 below. The Q-Rating is a water quality rating system based on both the habitat and the invertebrate community assessment and is divided into status categories ranging from 0-1 (Poor) to 4-5 (Good/High).

Most recent data available (2023 to 2024) shows that the Q-rating for the Dungolman River upstream of the Wind Farm Site, at the bridge west of Umma House (EPA Station Code: RS26D060200), is of Poor Q-status (Q3). Meanwhile, upstream of the Wind Farm Site at a bridge near Mullenineehan (EPA Station Code: RS26M120080), the Mullenmeehan stream achieved also achieved a Q3 rating in 2023. Downstream of the Wind Farm Site, the Dungolman River achieved a Q3 rating at a bride southeast of Lecade (EPA Station Code: RS26D060400) in 2024. No recent EPA monitoring has been completed on the Tang or Inny rivers downstream of the Wind Farm Site.

The Q-rating data of watercourses in the vicinity and downstream of the Grid Connection are also summarised in Table 9 6 below. The northern section of the Grid Connection in the vicinity of the Wind Farm Site is drained by the Dungolman River. Recent EPA monitoring on the Dungolman River is described above. The Ballynagrenia stream achieved a Q3 rating ('Poor' Q-status) at a bridge south of Rosemount (EPA Station Code: RS25B160400) along the underground electrical cabling route in 2023. Further downstream the Ballynagrenia stream achieved a Q4 rating ('Good' Q-status) at a bridge near Newtown (EPA Station Code: RS25B160600) in 2021. The Gageborough River achieved a Q4 rating ('Moderate' Q-status) downstream of the underground electrical cabling route at Gageborough Bridge (EPA Station Code: RS25G010300) in 2023. The Brosna River also achieved 'Good' Q-status in

[33] *A station at which meteorological observations are made for the purposes of synoptic (large spatial scale) analysis*

2021 at a bridge near Lismoyny (EPA Station Code: RS25B090450) downstream of the underground electrical cabling route. A tributary of the Silver River, referred to by the EPA as the Durrow Abbey Stream, achieved a Q3 rating ('Poor' Q-status) downstream of the underground electrical cabling route in 2023 (EPA Station Code: RS25D120200). Meanwhile, the Silvery River achieved a Q4 rating at Gormagh Bridge (EPA Station Code: RS25S030100) along the underground electrical cabling route in 2023.

Table 9-6 EPA Water Quality Monitoring Q-Rating Values

Waterbody	EPA Location Description	Year	Easting	Northing	EPA Q-Rating Status
Downstream of Wind Farm Site					
Dungolman River	Bridge West of Umma House	2023	218,660	245,466	Poor
Mullenmeehan Stream	Bridge near Mullenineehan	2023	221,427	246,572	Moderate
Dungolman River	Bridge SE of Lecade	2024	217,655	252,059	Poor
Downstream of Grid Connection					
Ballynagrenia Stream	Bridge S of Rosemount	2023	223309	242067	Poor
Ballynagrenia Stream	Bridge near Newtown	2021	224687	238735	Good
Gageborough River	Gageborough Bridge	2023	226085	237776	Moderate
Brosna River	Bridge near Lismoyny	2021	229559	233197	Good
Durrow Abbey Stream	Bridge upstream of Silver River	2023	230189	228890	Poor
Silver River	Gormagh Bridge	2023	233826	228490	Good

9.3.4 Hydrogeology

9.3.4.1 Wind Farm Site

Karst features are mapped by the GSI and available through the GSI online viewer (www.gsi.ie). There are no GSI mapped karst features within the Wind Farm Site. The closest GSI mapped karst features is a spring (GSI Karst Feature ID: 2023NEK003) located ~1.5km to the southwest of T4. Another spring, referred to as Tober Enain (GSI Karst Feature ID: 2023NEK002), is mapped ~2km to the northwest of T1. Furthermore, no karst features were recorded during the site investigations at the Wind Farm Site or during the site walkover surveys.

The groundwater vulnerability rating at the Wind Farm Site is mapped by the GSI (www.gsi.ie) to range from 'High' to 'Extreme'. All proposed turbine locations and the onsite substation are mapped in

areas of 'High' groundwater vulnerability. Only a small areas in the northwest of the Wind Farm Site is mapped as having 'Extreme' groundwater vulnerability. Site investigations at the Wind Farm Site comprising of trial pits did not encounter any bedrock. The depth of the trial pits ranged from 1.5 to 2.7mbgl. The trial pits excavations typically encountered granular deposits comprising of sandy GRAVEL or silty SAND, however, cohesive CLAY deposits were also encountered. However, despite the presence of granular sands and gravels at the Wind Farm Site, the underlying bedrock will reject a significant proportion of potential recharge due to its low permeability. There will only be short groundwater flowpaths, with groundwater discharging into the surface water features which drain the site.

9.3.4.2 Grid Connection

Approximately 9km of the underground electrical cabling route is mapped to be underlain by a Regionally Important Aquifer – Karstified (diffuse).

Several karst features are also mapped in the vicinity of the underground electrical cabling route as detailed below:

- A spring is mapped ~1.3km to the east in the townland of Coolatoor (GSI Karst Feature ID: 2023NEK005);
- A spring is mapped ~800m to the west in the townland of Ballagh (GSI Karst Feature ID: 2023NEK004);
- A spring is mapped ~900m to the southwest of Newtown Cross Roads in the townland of Faheeran (GSI Karst Feature ID: 2023SEK001);
- 3 no. springs are mapped along the N52 and the underground electricity cabling route, in the townland of Durrow Demense. These springs discharge into the Durrow Abbey Stream.

In terms of groundwater vulnerability, the proposed onsite substation is mapped by the GSI to be located in an area of High groundwater vulnerability. Groundwater vulnerability along the underground electricity cabling route ranges from 'Moderate' to 'Extreme'. The vast majority of the underground electricity cabling route is mapped in areas of 'High' groundwater vulnerability. Approximately 450m is mapped in an area of 'Extreme' groundwater vulnerability in the townland of Kilmurragh.

9.3.10 Surface Waterbody Status

9.3.10.1 Wind Farm Site

A summary of the WFD status and risk result of Surface Water Bodies (SWBs) in the vicinity and downstream of the Wind Farm Site are shown in Table 9-13 below.

The Dungolman River (Dungolman_020 and _030 SWBs) in the vicinity of the Wind Farm Site achieved 'Poor' status in the latest WFD cycle (2016-2021). Note that the Dungolman_030 SWB includes the Mullenmeehan stream in the area of the Wind Farm Site. In the vicinity of the Wind Farm Site the Dungolman River (IE_SH_26D060400) has been deemed to be 'At risk' and under significant pressure from agriculture (Dungolman_020 SWB) and urban wastewater (Dungolman_030 SWB). Further downstream the Inny_010 SWB is assigned 'Moderate' status. The risk status of this SWB is 'under review' and no significant pressures have been identified. Note that the Inny_010 SWB includes the lower reaches of the Dungolman River, the Tang River and the Inny River as far as Lough Ree. Meanwhile, Lough Ree (IE_SH_26_750a) achieved 'Good' status and is deemed to be "Not at risk".

Table 9-13 Summary WFD Information for Surface Waterbodies (Wind Farm Site)

SWB Code	Water Body	Overall Status	Risk Status	Pressures
IE_SH_26D060200	Dungolman_020	Poor	At risk	Agriculture
IE_SH_26D060400	Dungolman_030	Poor	At Risk	Urban Wastewater
IE_SH_26I011400	Inny_110	Moderate	Under review	None
IE_SH_26_750a	Lough Ree	Good	Not at risk	None

9.3.10.2 Grid Connection

A summary of the WFD status and risk result of SWBs along the Grid Connection are shown in Table 9-14 below.

The surface water quality status (2016-2021) for the Ballynagrenia_010 and 020 waterbodies are 'Poor' and 'Good' respectively. Ballynagrenia_010 SWB is identified as being 'At Risk' from agricultural and hydromorphological pressures. Meanwhile, the Ballynagrenia_020 SWB is 'Not at Risk' and no pressures have been identified.

Further south along the underground electrical cabling route, the Gageborogh_020 and Gageborogh_030 SWBs both achieved "Good" status during the WFD 2016-2021 cycle. The Gageborough_030 SWB is deemed to be 'not at risk' of failing to meet its WFD objectives. The risk status of the Gageborough_020 SWB is currently 'under review'. No significant pressures have been identified to be impacting upon these SWBs.

The Brosna_070 SWB achieved 'Good' status and is "Not at Risk". The Tonaphort_010 SWB is assigned a 'Moderate' status, but its risk rating is 'under review'. The Durrow Abbey Stream_010 SWB achieved 'Poor' status and is considered to be 'At Risk', with forestry and agriculture being the significant pressures.

Finally, the Silver (Tullamore)_020 SWB achieved 'Good' status and is considered to be 'Not at risk' whilst the Tullamore_030 SWB is of 'Poor' status and is under significant pressure from urban runoff.

Table 9-14 Summary WFD Information for Surface Waterbodies (Grid Connection)

SWB Code	Water Body	Overall Status	Risk Status	Pressures
IE_SH_25B160400	Ballynagrenia Stream_010	Poor	At Risk	Hydromorphology and agriculture
IE_SH_25B160600	Ballynagrenia Stream_020	Good	Not at risk	None
IE_SH_25G010500	Gageborogh_030	Good	Not at Risk	None
IE_SH_25G010300	Gageborogh_020	Good	Under Review	None

SWB Code	Water Body	Overall Status	Risk Status	Pressures
IE_SH_25B090450	Brosna_070	Good	Not At Risk	None
IE_SH_25T450930	Tonaphort_010	Moderate	Under review	None
IE_SH_25D120200	Durrow Abbey Stream_010	Poor	At Risk	Forestry and agriculture
IE_SH_25S030100	Silver(Tullamore)_020	Good	Not at risk	None
IE_SH_25S030300	Silver(Tullamore)_030	Good	Not at risk	None
IE_SH_25T030300	Tullamore_030	Poor	At risk	Urban runoff

9.3.12 Water Resources

Wind Farm Site

An information request was submitted to Uisce Éireann for the location of all groundwater abstraction locations within 5km of the Wind Farm Site. No groundwater abstractions were identified.

Grid Connection

Additional groundwater supplies identified in the areas surrounding the Grid Connection include the Tubber GWS and the Ballybroder GWS. According to GSI mapping the Source Protection Area associated with the Ballybroder Ballycallan GWS is located ~1.7km east of the Grid Connection along the N52. Meanwhile, the Source Protection Area associated with the Tubber GWS is located ~1.7km southwest of the Grid Connection as it passes to the southwest of Rosemount.

An information request submitted to Uisce Éireann identified several groundwater abstractions in the vicinity of the Grid Connection. Uisce Éireann also identified the presence of the abstractions associated with the Ballybroder GWS and the Tullamore Ardan GWS. Uisce Éireann also identify Sillogue Well ~1.17km to the west of the N52 and the Grid Connection in the townland of Coniker. Note that the potential effects on these supplies are assessed in Section 9.5.2.10.

9.3.12.2 Surface Water Resources

In terms of surface waters, several SWBs downstream of the Proposed Development are listed in Article 7 Abstraction for Drinking Water. However, these Drinking Water Protected Areas (DWPAs) are generally distant from the Wind Farm Site and the Grid Connection.

The closest surface water DWPA downstream of the Wind Farm Site is located on the Shannon (Upper)_120 SWB. This DWPA is associated with Uisce Éireann's abstraction for the Athlone Water Supply. This abstraction is located downstream of Lough Ree. This DWPA has been screened out of the impact assessment due to its distant location from the Wind Farm Site and the large volumes of water in Lough Ree. Note that the Proposed Development does not in any way rely upon the dilution or assimilation capacity of any downstream waterbody. The mitigation measures prescribed in Sections9.5.2, 9.5.3 and 9.5.4 for the construction, operation and decommissioning phases of the

Proposed Development will ensure the protection of all watercourses in the immediate vicinity of the works. By protecting the watercourses in close proximity to the Proposed Development works, all downstream waterbodies, and associated DWPAs, will also be protected.

The Brosna_080 DWPA is located downstream of the Grid Connection on the Brosna River. This DWPA is associated with the Clara/Ferbane PWS which has a maximum daily abstraction of 4,359m^3/day from the Brosna River. The length of the hydrological flowpath between the Grid Connection and this DWPA is ~3.8km.

The Shannon (Lower)_010 DWPA is located downstream of the Grid Connection via the Brosna River. This DWPA is associated with the Banagher PWS which has a daily abstraction volume of 2,688m^3/day. The length of the hydrological flowpath between the Grid Connection and this DWPA is in excess of 35km. This DWPA has been screened out of the impact assessment due to the length of the flowpath between the Grid Connection and this DWPA, and the large volume of water within the Brosna River and the River Shannon.

With regards to the screening out of the Shannon (Lower)_010 and Shannon (Upper)_120 SWBs, note that the Proposed Development does not in any way rely upon the dilution or assimilation capacity of any downstream watercourse. The mitigation measures prescribed in Sections 9.5.2, 9.5.3 and 9.5.4 of the EIAR and further detailed in Section 9.5 below for the construction, operation and decommissioning phases of the Proposed Development will ensure the protection of all watercourses in the immediate vicinity of the works. By protecting the watercourses in close proximity to the works, all downstream waterbodies, and associated DWPAs, will also be protected.

9.5 Likely Significant Effects and Associated Mitigation Measures

9.5.2 Construction Phase

9.5.2.10 Potential Effects on Local Groundwater Wells (Wind Farm Site and Grid Connection)

The Source Protection Area associated with the Ballybroder Ballycallan GWS is located ~1.7km east of the Grid Connection along the N52. Meanwhile, the Source Protection Area associated with the Tubber GWS is located ~1.7km southwest of the Grid Connection as it passes to the southwest of Rosemount. Sillogue Well is located ~1.2km west of the Grid Connection.

Pathway: Groundwater flow paths.

Receptor: Down-gradient groundwater well supplies including the Ballybroder Ballycallan GWS and the Tubber GWS and Sillogue Well.

Pre-Mitigation Potential Impact: Indirect, negative, imperceptible, temporary, unlikely effect on the Ballybroder Ballycallan GWS and the Tubber GWS and Sillogue Well.

Proposed Mitigation Measures / Impact Assessment

There is no potential for significant effects on the Ballybroder Ballycallan GWS and the Tubber GWS and Sillogue Well for the following reasons:

- The minor and transient nature of the works along the Grid Connection. The works along the underground electrical cabling route will be within the carriageway of the existing road

network. These works will be similar to roadworks completed across the country and will have limited potential for effects,
- The Grid Connection is distant from the delineated source protection areas associated with these GWSs and is distant from Sillogue Well.;
- The Ballynagrenia Stream acts as a hydrological barrier between the Grid Connection and the Tubber GWS;
- The Durrow Stream acts as s hydrological barrier between the Grid Connection and Sillogue Well;
- The Grid Connection is located downstream/downgradient of the Ballybroder Ballycallan GWS;

Nevertheless, detailed, tried and tested, best practice mitigation measures with respect to suspended solids, hydrocarbons, cement-based products and watercourse crossings will be implemented.

Post-Mitigation Residual Effect: The Proposed Development does not overlap with the delineated source protection areas of the Tubber GWS or the Ballybroder Ballycallan GWS. The topographical and hydrological setting of the Grid Connection with respect to these GWSs ensures that there is no potential for effects. There is also no potential for effects on the Sillogue Well due to the nature of the works along the Grid Connection and the distance between the well and the works. Proven and effective mitigation measures have been prescribed which will ensure the protection of surface and groundwater quality. There will be no residual effect.

Significance of Effects: For the reasons outlined above, no significant effects on the Tubber GWS or the Ballybroder Ballycallan GWS or Sillogue Well will occur.

9.5.2.13 Potential Effects on Karst Features

There are no karst features mapped by the GSI within the Wind Farm Site and no karst features were recorded during the site walkover surveys or site investigations.

However, some karst features are mapped by the GSI along the Grid Connection underground cabling route. In total ~9km of the underground electrical cabling route is mapped to be underlain by a Regionally Important Aquifer – Karstified (diffuse).

Several karst features are also mapped in the vicinity of the underground electrical cabling route as detailed in Section 9.3.7.2, including 3 no. springs mapped in the vicinity of the N52 in the townland of Durrow Demesne.

Any potential alteration in local groundwater quality or surface water quality has the potential to impact the Karstic Bedrock Aquifer underlying ~9km of the Proposed Grid Connection underground cabling route and any local karst features.

Pathway: Groundwater recharge and surface water drainage.

Receptor: Local karst features and the Regionally Important Karst Aquifer.

Pre-Mitigation Potential Effect: Indirect, negative, slight, temporary, unlikely effect on karst features and karst aquifer.

Mitigation Measures / Impact Assessment:

The potential for effects on the underling karst aquifer are limited due to the minor and transient nature of the works along the Grid Connection. The works along the underground electrical cabling route, including those in the townland of Durrow Demesne, will be within the carriageway of the existing road network. These works will be similar to roadworks completed across the country and will have limited potential for effects,

Nevertheless, the following mitigation measures will be implemented:

- Mitigation measures relating to suspended solids (Section 9.5.2.1) hydrocarbons, cementitious materials and wastewater disposal as prescribed in Section 9.5.2.4 (hydrocarbons), Section 9.5.2.6 (cement-based products) and Section 9.5.2.5 (wastewater) will provide adequate protection to groundwater and surface water quality and will ensure that groundwater quality will not be impacted.

Residual Effect: Due to the minor and transient nature of the works along the Grid Connection there is limited potential for effects on nearby karst features. Furthermore, the mitigation measures associated with drainage management and the protection of water quality will ensure that the residual effects is an indirect, negative, imperceptible, temporary, unlikely effect.

Significance of Effects: No significant effects on karst features will occur.

9.5.2.14 Potential Effects on Downstream Surface Water Abstractions

The closest downstream surface water DWPA is the Brosna_080 DWPA. This DPWA is downstream of the Grid Connection. The length of the hydrological flowpath between the Grid Connection and the Brosna_080 SWB is ~3.8kmkm. Any potential deterioration in surface water quality could result in a temporary effect on this DWPA. However, given the minor and transient nature of the proposed works along the Grid Connection any impacts, even in a worst case scenario, will be imperceptible.

Pathways: Surface water flowpaths, and groundwater levels.

Receptors: Down-gradient water quality in the Shannon(Lower)_010 DWPA.

Potential Pre-Mitigation Effect: Negative, imperceptible, indirect, temporary, likely effect on the Brosna_080 DWPA.

Proposed Mitigation Measures:

- Mitigation measures for sediment control are detailed in Section 9.5.2.1.
- Mitigation measures for the control of hydrocarbons during construction works are detailed in Section 9.5.2.4.
- Mitigation measures for the control of cement-based products during construction works are detailed in Section 9.5.2.6.
- Mitigation measures to be implemented at watercourse crossings are prescribed in Section 9.5.2.7.

Implementation of these mitigation measures will ensure the protection of water quality in receiving waters.

Post-Mitigation Residual Effects: Construction activities pose a threat to surface water DWPAs linked with the Proposed Development. Proven and effective measures to mitigate the risk of surface and groundwater contamination have been proposed which will break the pathway between the potential source and the downstream receptor. These mitigation measures will ensure that surface water runoff will be equivalent to baseline conditions and will therefore have no effect on downstream water quality. It is considered that there will be no residual effect on downstream water quality within the Brosna_080 DWPA.

Significance of Effects: For the reasons given above, and with the implementation of the listed mitigation measures, no significant effects on downstream surface water abstractions will occur.

9.5.2.15 Potential Effects Associated with Piled Foundations

Piled foundations may be required as part of the Proposed Development.

The following potential scenarios arise in respect of potential piling works:

- Creation of preferential pathways, through lower permeability subsurface layers (if an aquitard such as silts and clays i.e. glacial till is present), to allow downward flow into the underlying bedrock aquifer;
- Creation of preferential pathways, through a low permeability subsurface layer (an aquitard such as silts and clays i.e. glacial till – if present), to allow upward migration of groundwater to the surface, thus potentially altering local hydrochemistry and therefore vegetation at the surface; and,
- Creation of a blockage to regional groundwater flow within the underlying aquifer due to placement of pile clusters.

These pathways are analogous to pathways described for piling works associated with contaminated land sites, as detailed in Environment Agency (2001). However, with respect to these pathways required for inclusion in the assessment, no upward or downward pathways were observed during the site investigations. Regional groundwater flow is the dominant groundwater flow pathway at this site and no upward or downward groundwater flowpaths exist as would occur in a bog setting.

Pathway: Groundwater flowpaths (upward and/or downward pathways, and regional groundwater flows).

Receptor: Groundwater quality in the underlying GWB and groundwater hydrochemistry.

Pre-Mitigation Potential Effect: Negative, moderate, direct, short term, likely effect on groundwater quality/hydrochemistry.

Proposed Mitigation Measures:

The proposed mitigation measures designed for the protection of downstream surface water quality and groundwater quality will be implemented at all construction work areas.

- Mitigation measures for sediment control are detailed in Section 9.5.2.1, 9.5.2.2 and 9.5.2.3.
- Mitigation measures for the control of hydrocarbons during construction works are detailed in Section 9.5.2.4.
- Mitigation measures for the control of cement-based products during construction works are detailed in Section 9.5.2.6.

Proposed mitigation measures relative to piling works will comprise:

- Strict QA/QC procedures for piling works will be followed;
- Piles will be kept vertical during piling works;
- Good workmanship will be employed during all piling works; and,
- Where required use bentonite seal to prevent upward/downward movement of surface water/groundwater.

Impact Assessment:

Impact Assessment Associated with Potential Piling:

For bored piles, as the temporary steel casing is removed, a steel reinforcement cage is added to the pile column and then concrete is added to the toe of the pile using a tremie pipe. Vermiculite is used to create a plug between the concrete and the displaced water, therefore the concrete seals the entire pile

column and pushes the vermiculite plug to the surface as concrete is added. The temporary steel casing is removed carefully as the concreting works are being completed. This concreting process is similar to that used when grouting a water supply production well (IGI (2007), and EPA (2013)). This means that a direct long term pathway between the surface and the lower bedrock aquifer will not be sustained.

Scenario 1: Creating a Pathway for Downward Flow

To ensure downward flow of water and/or pollutants from the piling works does not occur, the concrete added to the bored pile will seal the pile annulus. As a result, the potential for the piling works to create pathways for downward flow of water or pollutants that could affect groundwater quality in the underlying aquifer is imperceptible.

Scenario 2: Creating a Pathway for Upward Flow

To ensure upward flow of underlying groundwater via potential pathways created by piling works does not occur, the concrete added to the bored pile will seal the pile annulus. As a result, the potential for piling works to create pathways for upward flow of groundwater to the surface is imperceptible.

Scenario 3: Blocking Regional Groundwater Flow

The piles have a very small footprint and if required would account for a very small percentage of the overall footprint associated with the Proposed Development. The proposed piles would not penetrate any great distance into the underlying bedrock aquifer, as they will likely find sufficient resistance upon reaching the top of bedrock. The ability of a single cluster of piles, to alter or affect local or regional groundwater flow in the bedrock aquifer is imperceptible.

Impact Assessment Associated with Potential Piling:

If piling is required at other turbine locations the potential for effects are further reduced in comparison to potential piling at T7 for the following reasons:

- Other turbines are located away from sensitive receptors including the Dungolman River and its tributaries;
- The glacial tills present at these turbine locations will likely self-seal around a bored pile preventing the creating of pathways between the surface and the bedrock aquifer; and,
- All turbines are mapped on a Poor Bedrock Aquifer and groundwater flowpaths will be short and groundwater discharges rapidly to surface water streams. Therefore, the ability to block groundwater flowpaths will be very low.

Residual Effects: Piling works potentially pose a threat to groundwater quality in the underlying regional groundwater system, and also could potentially create a pathway for upward migration of groundwater to the surface. These potential effects will not arise at the Wind Farm site due to a combination of the prevailing ground conditions, groundwater conditions, and proposed mitigation measures that will ensure the potential pathways for interaction of shallow water and deeper groundwater are prevented from occurring. In additional, due to the small footprint of any pile clusters, and the significant spacing between turbine foundations, the potential for such pile clusters to block regional groundwater flow is imperceptible at that scale. Any required piled foundations will therefore have no potential to change the WFD status or impact the WFD objectives of the underlying GWB. The residual effect is considered to be Negative, imperceptible, indirect, short term, unlikely effect on groundwater flow, and ground quality/peat water hydrochemistry.

Significance of Effects: For the reasons given above, no significant effects on regional groundwater and the GWB will occur, and no significant effects on water hydrochemistry will occur from any potential piling works.

9.5.3 Assessment of Potential Health Effects

Potential health effects arise mainly through the potential for surface and groundwater contamination which may have negative effects on public and private water supplies. There are mapped public and group water scheme groundwater protection zones in the area of the Proposed Development. However, the Proposed Development design and mitigation measures ensure that the potential for effects on the hydrogeological environment will not be significant.

Flooding of property can cause inundation with contaminated flood water. Flood waters can carry waterborne disease and contamination/effluent. Exposure to such flood waters can cause temporary health issues. A detailed Flood Risk Assessment has also shown that the risk of the Proposed Development contributing to downstream flooding is also very low, as the long-term plan for the Site is to retain and slow down drainage water within the Site. On-site drainage control measures will ensure no downstream increase in flood risk.

9.5.4 Risk of Major Accidents and Disasters

Flooding can also result in downstream Major Accidents and Disasters. However, due to the small scale of the Proposed Development footprint and with the implementation of the proposed mitigation measures, the increased flood risk associated with the Proposed Development is low.

10. AIR AND CLIMATE

10.1.2 Relevant Guidance

The air quality section is carried out in accordance with the EIA Directive 2011/92/EU as amended by Directive 2014/52/EU and having regard, where relevant, to guidance listed below:

- Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Document PE-ENV-01106 (Transport Infrastructure Ireland, December 2022).
- Air Quality Assessment of Proposed National Roads – Standard PE-ENV-01107' (Transport Infrastructure Ireland, December 2022).
- Guidelines on the Information to be contained in Environmental Impact Assessment Reports – June 2022 (EPA, 2022).
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (EC, 2017).
- Air Quality in Ireland Report 2023 (EPA, 2024).
- European Environment Agency (2024) Europe's Air Quality Status 2024.
- Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects (EPA, 2021).
- Guidance of the Assessment of Dust from Demolition and Construction (IAQM, 2024).
- Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (TII, 2011).
- Guidelines for Assessment of Ecological Impacts of National Roads Schemes (TII, 2009).
- Clean Air Strategy for Ireland (Government of Ireland, 2023).
- UK Department of Environment Food and Rural Affairs (DEFRA) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM.TG (16) (DEFRA 2018).
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) – LA 105 Air Quality (UKHA, 2019).
- World Health Organization (WHO) Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulphur Dioxide Global Update 2021 (WHO 2021).

The climate section is carried out in accordance with the 'EIA Directive' as amended by Directive 2014/52/EU and has been prepared in accordance with guidance listed in Section 1.7.2 of Chapter 1: Introduction. Due to the nature of the Proposed Development, a wind farm project, the following methodology and guidance was utilised for the climate section:

- '*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment'* (2013) European Commission.
- *'Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation'* (Institute of Environment Management and Assessment (IEMA), 2020).
- *'Calculating Carbon Savings from Wind Farms on Scottish Peat Lands*' (University of Aberdeen and the Macauley Institute 2008).
- '*Wind Farms and Carbon Savings*' (Scottish Natural Heritage, 2003).
- Macauley Institute Carbon Calculator for Wind Farms on Scottish Peatlands (Version 2.14.1) (2023).
- Transport Infrastructure Ireland (TII) Carbon Assessment Tool (Version 0.7.10) (TII, 2020).

Consideration has also been given to the 'Air Quality Assessment of Proposed National Roads – Standard PE-ENV-01107' (Transport Infrastructure Ireland, December 2022 (2022a)), Climate Assessment of Proposed National Roads – Standard and Overarching Technical Documentation

(Transport Infrastructure Ireland December 2022b/c) and Transport Infrastructure Ireland Carbon Tool for Road and Light Rail Projects: User Guidance Document, GE-ENV-01106 (TII 2022d).

10.2 Air Quality

Relevant Legislation

In 1996, the Air Quality Framework Directive (on ambient air quality assessment and management) (96/62/EC) was published. This Directive was transposed into Irish law by the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999 (S.I. No. 33 of 1999). The Directive was followed by four Daughter Directives, which set out limit values for specific pollutants:

- The first Daughter Directive (1999/30/EC) addresses sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene. The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).
- The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).
- The third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004).
- The fourth Daughter Directive (2004/107/EC), published in 2004, relates to polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air and was transposed into Irish law by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2009 (S.I. No. 58 of 2009) (amended by SI 659/2016 - Air Quality Standards (Amendment) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air (Amendment) Regulations 2016.)

The Air Quality Framework Directive and the first three Daughter Directives were replaced by the Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC on ambient air quality and cleaner air for Europe) (as amended by Directive EU 2015/1480) which encompasses the following elements:

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for PM2.5 (fine particles) including the limit value and exposure concentration reduction target.
- The possibility to discount natural sources of pollution when assessing compliance against limit values.
- The possibility for time extensions of three years (for particulate matter PM10) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

Table 10-1 below sets out the limit values of the CAFE Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre ($\mu g/m^3$) and parts per billion (ppb). The notation PM_{10} is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. $PM_{2.5}$ represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016 (S.I. 659 2016). The 2011 Regulations superseded the Air Quality Standards Regulations 2002 (S.I. No.

271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the Ambient Air Quality Assessment and Management Regulations 1999 (S.I. No. 33 of 1999). The Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) was revoked on 31 December 2022 and has been replaced by the Ambient Air Quality Standards Regulations 2022 (S.I. No. 739/2022).

On the 26th of October 2022 the EU Commission announced a proposed review of Air Quality Standards.[34] The proposed revision will set interim 2030 EU air quality standards, seeking to align more closely with WHO recommendations, while putting the EU on a trajectory to achieve zero pollution for air at the latest by 2050, in synergy with climate-neutrality efforts. The first review is proposed to take place by the end of 2028, with the objective of ensuring full alignment with WHO recommendations.

On 10 December 2024, Directive (EU) 2024/2881 on ambient air quality and cleaner air for Europe came into force. This directive recasts Directive 2008/50/EC (the CAFE Directive) and the fourth Daughter Directive (Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air) and incorporates them into a single directive. This recast directive sets out limit values, target values, average exposure reduction obligations, average exposure concentration objectives, critical levels, alert thresholds, information thresholds and long-term objectives. It sets out air quality provisions with the aim of achieving the objectives of the European Commission's Zero Pollution Action Plan, so that air pollution within the EU is progressively reduced to levels no longer considered harmful to health and natural ecosystems at the latest by 2050. At the time of writing Directive (EU) 2024/2881 has not yet been transposed into Irish law.

10.2.1 Air Quality Standards

The Ambient Air Quality Standards Regulations 2022 (S.I. No. 739/2022) remains aligned to the CAFÉ Directive and diverts to the CAFÉ Directive for the Limit values outlined in Table 10-1, the Assessment Thresholds in Table 10-2, the Ozone limits and Assessment Thresholds in Table 10-3 and Table 10-4 respectively.

Table 10-1 Limit Values of the CAFÉ Directive 2008/50/EC (Source: https://airquality.ie/information/air-quality-standards)

Pollutant	Limit Value Objective	Averaging Period	Limit Value (ug/m3)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Protection of human health	1 hour	350	Not to be exceeded more than 24 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of human health	24 hours	125	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of vegetation	Calendar year	20	Annual mean	19th Jul 2001
Sulphur dioxide (SO_2)	Protection of vegetation	1st Oct to 31st Mar	20	Winter mean	19th Jul 2001
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	Annual mean	1st Jan 2010

[34] *European Commission, Revision of the Ambient Air Quality Directives.* <https://environment.ec.europa.eu/topics/air/air-quality/revision-ambient-air-quality-directives_en>

Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2)	Protection of ecosystems	Calendar year	30	Annual mean	19th Jul 2001
Particulate matter 10 (PM_{10})	Protection of human health	24 hours	50	Not to be exceeded more than 35 times in a calendar year	1st Jan 2005
Particulate matter 10 (PM_{10})	Protection of human health	Calendar year	40	Annual mean	1st Jan 2005
Particulate matter 2.5 ($PM_{2.5}$) Stage 1	Protection of human health	Calendar year	25	Annual mean	1st Jan 2015
Particulate matter 2.5 ($PM_{2.5}$) Stage 2	Protection of human health	Calendar year	20	Annual mean	1st Jan 2020
Lead	Protection of human health	calendar year	0.5	Annual mean	1st Jan 2005
Carbon Monoxide	Protection of human health	8 hours	10,000	Not to be exceeded	1st Jan 2005
Benzene	Protection of human health	calendar year	5	Annual mean	1st Jan 2010

Table 10-2 Assessment Thresholds from CAFE Directive 2008/50/EC

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m³)	Basis of Application of Limit Value
Sulphur dioxide (SO_2)	Upper assessment threshold for the protection of Human Health	24 hours	75	Not to be exceeded more than 3 times in a calendar year
Sulphur dioxide (SO_2)	Lower assessment threshold for the protection of human health	24 hours	50	Not to be exceeded more than 3 times in a calendar year
Nitrogen dioxide (NO_2)	Upper assessment threshold for the	1 hour	140	Not to be exceeded more

Pollutant	Limit Value Objective	Averaging Period	Limit Value ($\mu g/m^3$)	Basis of Application of Limit Value
	protection of human health			than 18 times in a calendar year
Nitrogen dioxide (NO_2)	Lower assessment threshold for the protection of human health	1 hour	100	Not to be exceeded more than 18 times in a calendar year
Particulate matter 10 (PM_{10})	Upper assessment threshold	24 hours	35	Not to be exceeded more than 35 times in a calendar year
Particulate matter 10 (PM_{10})	Lower assessment threshold	24 hours	25	Not to be exceeded more than 35 times in a calendar year
Lead (Pb)	Upper assessment threshold	Calendar Year	0.35	-
Lead (Pb)	Lower assessment threshold	Calendar Year	0.25	-
Carbon Monoxide (CO)	Upper assessment threshold	8 hours	7000	-
Carbon Monoxide (CO)	Lower assessment threshold	8 hours	5000	-
Benzene (C_6H_6)	Upper assessment threshold	Calendar Year	3.5	-
Benzene (C_6H_6)	Lower assessment threshold	Calendar Year	2	-

Ozone is set out differently in the CAFE Directive in that it sets target values and long-term objectives for ozone rather than limit values. Table 10-3 presents the target values and long-term target value for ozone and Table 10-4 details the threshold values for Ozone.

Table 10-3 Target values for Ozone defined in Directive 2008/50/EC

Objective	Parameter	Target Value for 2010	Long- term Objective
Protection of human health	Maximum daily 8-hour mean	120 $\mu g/m^3$ not to be exceeded more than 25 days per calendar year averaged over 3 years	120 $\mu g/m^3$

Objective	Parameter	Target Value for 2010	Long- term Objective
Protection of vegetation	AOT40* calculated from 1-hour values from May to July	18,000 µg/m^3.h averaged over 5 years	6,000 µg/m^3.h

* AOT40 is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 µg/m3 and is expressed as µg/m3 hours.

Table 10-4 Threshold for Ozone Defined in Directive 2008/50/EC (source: https://airquality.ie/information/air-quality-standards and Directive 2008/50/EC)

Pollutant	Averaging Period	Threshold
Information Threshold	1-hour average	180 µg/m^3
Alert Threshold	1-hour average	240 µg/m^3

10.2.1.1 Air Quality and Health

In September 2024, the EPA published 'Air Quality in Ireland 2023'[35] which reports that although Ireland met the current EU legal air quality limits in 2023, monitoring results were higher than the more stringent health-based WHO air quality guidelines for a number of pollutants including: particulate matter (PM), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and ozone (O_3). The main sources of these pollutants are the burning of solid fuel in towns and villages and traffic in cities. People's health and the health of the environment is impacted by these pollutants. Ireland's ambition in the 'Clean Air Strategy for Ireland' (discussed below) is to move towards alignment with the WHO Air Quality guidelines, this will be challenging but will have a significant positive impact on health. Despite comparing favourably with many other European countries, Ireland's 2023 monitoring results, if similar trends continue, would exceed the soon-approaching 2026 targets.

The European Environmental Agency (EEA) Report, 'Europe's Air Quality Status 2024[36] report highlights the negative effects of air pollution on human health. The report assessed that poor air quality in Europe accounted for premature deaths of approximately 238,000 people in the 27 EU Member States in 2020[37]. In 2020 in the European Union, 96% of the urban population was exposed to levels of fine particulate matter above the health-based guideline level set by the World Health organisation. Furthermore, in 2020 damaging levels of nitrogen deposition to ecosystems were exceeding in 75% of the total ecosystems that are in the EU-27. This represents a fall of 12% since 2005. The estimated effects on the population in Europe of exposure to NO_2 and O_3 concentrations in 2020 were around 49,000 and 24,000 premature deaths, respectively. From this, 490 Irish deaths were attributable to fine particulate matter ($PM_{2.5}$), 50 Irish deaths were attributable to nitrogen oxides (NO_2) and 70 Irish deaths were attributable to Ozone (O_3) (Source: *'Air Quality in Europe – 2022 Report'*, EEA, 2022).

The EEA published a briefing[38] on Europe's air quality status in April 2023. This briefing presented the status of concentrations of pollution in ambient air in 2021 and 2022 for regulated pollutants in relation to both EU air quality standards and the 2021 WHO guideline levels. The assessment shows that, in spite of constant improvements, exceedances of air quality standards are common across the EU, with

[35] *Environmental Protection Agency: Air Quality in Ireland 2023. Available at:* https://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2023.php#:~:text=Summary%3A%20Air%20quality%20in%20Ireland,based%20WHO%20guidelines%20in%202023.

[36] *European Environmental Agency, Europe's Air Quality Status 2024. Available at:* https://www.eea.europa.eu/publications/europes-air-quality-status-2024

[37] https://www.eea.europa.eu/publications/air-quality-in-europe-2022/

[38] *Europe's air quality status 2023 briefing.* <https://www.eea.europa.eu/publications/europes-air-quality-status-2023>

concentrations well above the latest WHO recommendations. PM_{10}, NO_2 and O_3 emissions, along with others including sulphur oxides, carbon monoxide, benzene and lead are produced during fossil fuel-based electricity generation and traffic in various amounts, depending on the fuel and technology used. Whilst there is the potential of such emissions to be generated from the construction, operational and decommissioning phases of the Proposed Development, mitigation measures will be implemented at the Site to reduce the impact from dust and vehicle emissions, which are discussed in Section 10.2.3 below.

The Office of Energy Efficiency and Renewable Energy in the United States published an article on August 24, 2023 entitles '*How Wind Can help Us Breathe Easier*.'[39] This article details the CO_2 emissions from different energy sources over the entire lifespan of the technology. It was found that wind energy produces around 11 grams of CO2 per kilowatt-hour (g CO_2/kWh) of electricity generated, compared with about 980 g CO_2/kWh for coal and roughly 465 g CO_2/kWh for natural gas. That makes coal's carbon footprint almost 90 times larger than that of wind energy, and the footprint of natural gas more than 40 times larger. During combustion of high-emitting energy sources, other air pollutants, i.e., nitrogen oxides (NOx) and sulphur dioxide (SO_2), are also released into the atmosphere. This results in the emission of pollutants that can cause adverse health effects, including asthma, bronchitis, lower and upper respiratory symptoms, and heart attacks. Air pollution is responsible for a large number of premature deaths relating to these illnesses.

The EEA published a briefing on Europe's air quality status in April 2024[40]. This briefing presented the status of concentrations of pollution in ambient air in 2022 and 2023 for regulated pollutants in relation to both EU air quality standards and the 2021 WHO guideline levels. The assessment shows that, in spite of constant improvements, exceedances of air quality standards are common across the EU, with concentrations well above the latest WHO recommendations. These emissions, along with others including sulphur oxides (SO_x) are produced during fossil fuel-based electricity generation in various amounts, depending on the fuel and technology used, emissions from industry and power plants, vehicles emissions and transport fuels.

More recently a few key messages are outlined in the 'Air Quality Status Report 2025' published on the 09/04/2025 on the European Environment Agency web site [41] These are:

- EU air quality standards are still not fully met across Europe, despite ongoing overall improvements.
- Since 2011, all countries have reduced exposure of their urban population to fine $PM_{2.5}$ particles, the most harmful pollutant from a health perspective. Nevertheless, the vast majority (94%) of the EU urban population remains exposed to $PM_{2.5}$ concentrations above the World Health Organization guideline level, highlighting the need for additional measures to reduce the associated health risks.
- Many locations already have air quality concentrations below the new EU 2030 standards. But in order to meet these new standards everywhere, and based on current progress, additional measures to improve air quality, especially in cities, are likely to be needed.

A 2024 EPA report *'Ireland's State of the Environment Report'* [42] states that the pollutants of most concern are Fine Particulate matter ($PM_{2.5}$.), Nitrogen Dioxide (NO_2) and Ammonia (NH_3). The EPA 2024 report goes on to state that:

[39] *Office of Energy Efficiency and Renewable Energy (2023) How Wind Can Help Us Breathe Easier*
[40] *Europe's air quality status 2024 briefing. https://www.eea.europa.eu//publications/europes-air-quality-status-2024*
[41] *https://www.eea.europa.eu/en/analysis/publications/air-quality-status-report-2025*
[42] *Environmental Protection Agency (2024). Irelands State of the Environment Report 2024)* <https://www.epa.ie/our-services/monitoring–assessment/assessment/irelands-environment/state-of-environment-report-/>

"The planned transition to more renewable energy sources, and away from combustion-sourced heating systems to electrification, is a shift that could see greenhouse gas emissions from industry significantly decrease.

As a consequence of meeting these growing demands primarily with oil, natural gas, coal and peat, our energy system is highly dependent on fossil fuels. Ireland has made some progress in transforming the electricity system through the deployment of wind farms, with renewable energy currently providing more than 40% of electricity used. However, electricity represents only one-fifth of Ireland's energy use, and our transport and heating systems remain heavily reliant on fossil fuel systems, with lock-ins that need to be addressed.

While Ireland's renewable energy share has increased from 10.7% in 2018 (reported in the last State of the Environment Report) to 13.1% in 2022, this is the lowest level in the EU (well below the EU average of 23.0%), and Ireland is not on track to meet the EU-wide binding target of 42.5% renewable energy share by 2030. Reaching the target of 80% renewable electricity by 2030, while ensuring a stable energy supply, will require new capacity, a more flexible grid and increased interconnectivity (EC, 2024).

Established technologies, such as wind energy, solar photovoltaics and bioenergy, will be key in meeting short-term emission reduction targets (i.e. 2030), whereas significant growth in offshore wind infrastructure is expected to be the key essential element of future energy systems."

The EPA also published a report in May 2025 providing details of emissions of air pollutants in Ireland in the period 1990 to 2023 and projected emissions of these pollutants for 2030[43]. The Key findings of the report with respect to assessment of targets are:

- Ireland is compliant with current and future emission reduction commitments for ammonia (NH3), non-methane volatile organic compounds (NMVOC), sulphur dioxide (SO2), nitrogen.
- oxides (NOx) and fine particulate matter (PM2.5).
- Ammonia emissions are projected to be in compliance out to 2030.
- An adjustment to NMVOC emissions is required in order to meet the required emission reduction commitment made in 2023.

The Proposed Development therefore represents an opportunity to further harness Ireland's significant renewable energy resources, with valuable benefits to air quality and in turn to human health. The consumption of fossil fuels for energy results in the release of particulates, sulphur dioxide and nitrogen dioxide to our air. The use of wind energy, by providing an alternative to electricity derived from coal, oil or gas-fired power stations, results in emission savings of carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide SO_2, thereby resulting in cleaner air and associated positive health effects.

Whilst there is the potential of such emissions to be generated from the construction, operational and decommissioning phases of the Proposed Development, mitigation measures will be implemented at this Site to reduce the impact from dust and vehicle emissions, which are discussed in Section 10.2.3 below.

Ireland's Clean Air Strategy 2023[44] sets out the detail of seven strategic frameworks that will be used to ensure that air quality continues to improve (Figure 10-1). The aims of these key strategic frameworks are:

[43] *Environmental Protection Agency (EPA). (2025). Ireland's Air Pollutant Emissions 1990–2030.* <https://www.epa.ie/publications/monitoring–assessment/climate-change/air-emissions/EPA-Air-Pollutant-Final-Report.pdf>
[44] *Rialtas na hÉireann Clean Air Strategy April 2023. Available at:* https://www.gov.ie/en/publication/927e0-clean-air-strategy/#:~:text=The%20Clean%20Air%20Strategy%20provides,delivering%20on%20wider%20national%20objectives

- To set the appropriate targets and limits to ensure continuous improvements in air quality across the country and to deliver health benefits for all.
- To ensure the integration of clean air considerations into policy development across Government.
- To increase the evidence base that will help Ireland to continue to evolve it's understanding of the sources of pollution and their impacts on health, in order to address them more effectively.
- To enhance regulation required to deliver improvements across all pollutants.
- To improve the effectiveness of our enforcement systems.
- To promote and increase awareness of the importance of clean air, and the links between cleaner air and better health.
- To develop the additional targeted/specific policy measures as required to deal with national or local air quality issues.

Since the publication of the Clean Air Strategy 2023, the Clean Air strategy for Ireland *First Progress Report* 2024 was released. This report detailed the significant progress that has been made on the actions in the strategy since its publication in April 2023. The key takeaways that have been implemented since the publication of the strategy include, the operational use of the Air Pollution Act 1987 (Solid Fuels) which has seen significant air quality improvements made in areas prone to burning solid fuels, however it is too premature to quantify the exact impacts. The strategy saw a push for the submission of Ireland's second National Air Pollution Control Programme completed in May 2024 and the development of new public awareness campaigns. The strategy has furthermore increased the frequency and financial supports given to local authorities to conduct sulphur testing[45].

Figure 20-1 Seven Strategic Frameworks for Air Quality, with associated chapters in brackets. Reproduced as Figure 1 from Clean Air Strategy 2023

Chapter 11 of the Clean Air Strategy discusses Air Quality Policy Development. The chapter discusses energy policy and acknowledges how the State's accelerated transition to renewable electricity will be critical to successfully meeting the ambitious renewable energy and greenhouse gas emission reduction targets outlined in the European Green Deal and Ireland's Climate Action Plan 2025, as well as to protecting against security of supply risks and removal of fossil fuels from power generation. Wind (offshore and onshore) and solar energy will be the leading cost-effective technologies to achieve our

[45] *Clean Air Strategy For Ireland First Progress Report 2024*

energy and emissions targets, as well as displacing emissions in other sectors, including household heating and vehicle transport. In the Clean Air Strategy the Climate Action Plan 2023 is referenced, while Climate Action Plan 2025 is currently the latest revision. The targets of the Climate Action Plan 2025 and the Green Deal are to deliver net-zero GHG emissions by 2050 and reduce GHG emissions to at least 55% by 2030, compared to 1990 levels.

Air Quality Data Review

The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. The most recent report on air quality in Ireland, 'Air Quality in Ireland 2023' was published by the EPA in 2024[46]. The EPA reports provide SO_2, PM_{10}, NO_2 and O_3 concentrations for areas in Zone D. These are detailed in the Baseline Air Quality section.

10.2.1.2 Dust

The Institute of Air Quality Management in the UK (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*' (2024) (hereafter referred to as 'IAQM 2024 Guidance') was considered in the dust impact assessment. The guidance document outlines an assessment method for predicting the impact of dust emissions from construction activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. This methodology has been used to predict the likely risk of dust as a result of the construction phase works, operational phase activities and decommissioning phase. The use of UK guidance is considered best practice in the absence of applicable Irish guidance. The major dust generating activities are divided into four types within the IAQM 2024 Guidance to reflect their different potential impacts. These are:

- Demolition (There are no demolition works required for any phase of the Proposed Development);
- Earthworks;
- Construction;
- Trackout - The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when Heavy Goods Vehicles (HGVs) leave the construction / demolition site with dusty materials, which may then spill onto the road, and/or when HGVs transfer dust and dirt onto the road having travelled over muddy ground on site.

The magnitude of dust generating activities is divided into 'Large', 'Medium' or 'Small' scale depending on the nature of the activities involved. The IAQM 2024 Guidance provides example definitions for the scale of the activities, and these are applied for this development as outlined in Table 10-5

Table 10-5 Description of magnitude for nature of activities

	Large	Medium	Small
Demolition	Total building volume >75,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12 m above ground level	Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material, demolition activities 6-12m above ground level	Total building volume <12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6 m above ground, demolition during wetter months

[46] *Environmental Protection Agency: Air Quality in Ireland 2022. Available at: https://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2023.php#:~:text=Ireland%20met%20the%20current%20EU,and%20ozone%20(O3)*

	Large	Medium	Small
Earthworks	Large: Total site area >110,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6m in height	Total site area 18,000 m^2 – 110,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 3m - 6m in height	Total site area <18,000 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <3 m in height
Construction	Total building volume >75,000 m^3, on site concrete batching, sandblasting	Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material (e.g. concrete), on site concrete batching	Total building volume <12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m	20-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m	<20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m
	Note: A vehicle movement is a one way journey. i.e. from A to B and excludes the return journey. HDV movements during a construction project vary over its lifetime, and the number of movements is the maximum not the average		

The earthwork requirements as outlined in Chapter 4 of the EIAR results in the classification of the Wind Farm Site as 'Large' for Earthworks and Construction activities. The Grid Connection falls under the classification of 'Medium' for Earthworks and Construction due to the lower volumes of construction material required. The number of heavy-duty vehicle movements per day, as outlined in Section 14.1 in Chapter 14 Material Assets of the EIAR, results in the classification of the Wind Farm Site as 'Large' and Grid Connection as 'Medium' for Trackout activities.

The magnitude of each activity is combined with the overall sensitivity of the area to determine the risk of dust impacts from site activities.

Defining the Sensitivity of the Area

For the purposes of this assessment, high sensitivity receptors are residential properties and dust sensitive ecological habitats. Commercial properties and places of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity.

The IAQM 2024 Guidance has outlined three types of effects to be considered:

- Sensitivities of People to Dust Soiling Effects

- Sensitivities of People to the Health Effects of PM_{10}
- Sensitivities of Receptors to Ecological Effects

Sensitivities of People to Dust Soiling Effects

Dust soiling effects can occur for a distance of 250m from Proposed Development works areas, but the majority of deposition occurs within the first 50m (IAQM 2024 Guidance). Table 10-6 below identifies the sensitivity of an area to dust soiling effects on people and their properties, relative to different receptor sensitivities.

Table 10-6 Sensitivity of the Area to Dust Soiling Effects on People and Property. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Sensitivities of People to the Health Effects of PM_{10}

When assessing sensitivity of people to the health effects of PM_{10}, the IAQM 2024 Guidance recommends the use of sensitivities bands based on whether or not the receptor is likely to be exposed to elevated concentrations of PM_{10} over a 24-hour period. Table 10-7 below identifies the sensitivity of an area to human health effects of PM_{10}, relative to different receptor sensitivities.

Table 10-7 Sensitivity of the Area to Human Health Impacts. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Annual Mean PM_{10} concentration	Number Of Receptors	Distance from source (m)			
			<20	<50	<100	<250
High	>32 µg/m^3	>100	High	High	High	Medium
		10-100	High	High	Medium	Low
		1-10	High	Medium	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low
		10-100	High	Medium	Low	Low
		1-10	High	Medium	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low

Receptor Sensitivity	Annual Mean PM_{10} concentration	Number Of Receptors	Distance from source (m)			
			<20	<50	<100	<250
	<24 µg/m^3	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	>32 µg/m^3	>10	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	28-32 µg/m^3	>10	Medium	Low	Low	Low
		1-10	Low	Low	Low	Low
	24-28 µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
	<24 µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low

Sensitivities of Receptors to Ecological Effects

Dust deposition due to demolition, earthworks, construction and trackout has the potential to physically and chemically affect sensitive habitats and plant communities. Table 10-8 below identifies the sensitivity of an area to ecological impacts.

Table 10-8 Sensitivity of the Area to Ecological Impacts. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Distance from source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

There are no sensitive habitats, as described by the IAQM 2024 Guidance within 50m of the Wind Farm Site. Therefore, dust impacts on ecological receptors in relation to the Wind Farm Site have been scoped out from this assessment.

Defining the Risk of Impacts

The dust emission magnitude is combined with the sensitivity of the area to determine the risk of impacts with no mitigation applied. The matrices in Table 10-9, Table 10-10 and Table 10-11 provide a method of assigning the level of risk for each activity.

Table 10-9 Risk of Dust Impacts - Earthworks (IAQM, 2024)

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 10-10 Risk of Dust Impacts - Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 10-11 Risk of Dust Impacts - Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

The risk of dust impacts for the Earthworks, Construction and Trackout activities from the Proposed Development is set out in Section 10.3 below.

EPA classification terminology as presented in Table 1-2 of Chapter 1 of the EIAR have been correlated with the equivalent risk rating from Table 10-12 below.

Table 10-12 Correlation of Impact Classification Terminology (EPA, 2022) to Risk Rating

EPA Term	EPA Description	Risk Rating
Imperceptible	An effect capable of measurement but without significant consequences	Negligible
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities	Low
Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends	Medium
Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment	High

10.2.2 Air Quality Zones

The air quality zone for the Site was selected, followed by a review of EPA collated baseline air quality data namely Sulphur Dioxide (SO_2), Particulate Matter (PM_{10}), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO) and Ozone (O_3) for the selected air quality zone to determine the representative levels of such emissions for the Proposed Development.

The EPA has designated four Air Quality Zones for Ireland:

- Zone A: Dublin City and Environs
- Zone B: Cork City and Environs
- Zone C: 16 urban areas within population greater than 15,000
- Zone D: Remainder of the country

These zones were defined to meet the criteria for air quality monitoring, assessment and management as described in the CAFE Directive. The Site lies within Zone D, which represents rural areas located away from large population centres.

10.2.2.1 Sulphur Dioxide

The Sulphur dioxide data from Cork Harbour, Kilkitt, Askeaton, Edenderry and Letterkenny in 2023 is presented in Table 10-13.

Table 10-13 Sulphur Dioxide Data for Zone D Sites in 2023

Parameter	Measurement (ug/m³)
Annual Mean	4.3 µg/m^3
Hourly values > 350	0
Hourly max (Average)	80.9 µg/m^3

Daily values > 125	0
Daily max (Average)	23.2

During the monitoring period there were no exceedances of the daily limit values for the protection of human health. As can be observed from Table 10-13 the average maximum hourly value recorded during the assessment period was 80.9 µg/m^3. In addition, there were no exceedances of the annual mean limit for the protection of ecosystems. It is expected, based on professional judgement that SO_2 values at the Site are similar or lower than those recorded for the Zone D sites above.

10.2.2.2 Particulate Matter (PM_{10})

Sources of particulate matter include vehicle exhaust emissions, dust from soil and road surfaces, construction works and industrial emissions. The Air Quality in Ireland 2023 report[47] provides annual mean PM_{10} concentration for sixteen Zone D towns: Tipperary Town, Carrick-on-Shannon, Askeaton, Enniscorthy, Birr, Macroom, Castlebar, Cobh Carrignafoy, Claremorris, Kilkitt, Cavan, Roscommon Town, Edenderry, Mallow, Longford, Cobh Cork Harbour and Killarney Particulate matter (PM_{10}) data for 2023 is presented in Table 10-14.

Table 10-14 Average Particulate Matter (PM_{10}) Data for Zone D Sites in 2023

Parameter	Measurement (ug/m3)
Annual Mean	10.9 µg/m^3
% Data Capture (Average)	91.3%
Values > 50 ug/m^3	Max 6 (Edenderry)
Daily Max (Average)	44.2 µg/m^3

The daily limit of 50 µg/m^3 for the protection of human health was exceeded on 40 days, which is greater than the PM_{10} daily limit for the protection of human health of a max 35 days >50 µg/m^3 applicable from 2005. The greatest number of exceedances occurred at Edenderry where the PM_{10} daily limit was exceeded on 10 no. occasions. In the Air Quality in Ireland 2023 report, it notes that there were breaches in the levels of particulate matter (PM), which in Ireland, mainly comes from the burning of solid fuel, such as coal, peat, and wood to heat our homes. It is expected, based on professional judgement, that PM_{10} values at the Site is similar or lower than those recorded for the Zone D sites above.

10.2.2.3 Nitrogen Dioxide (NO_2)

Nitrogen dioxide data for Birr, Castlebar, Carrick-on-Shannon, Edenderry, Emo Court and Kilkitt in 2023 is presented in Table 10-15.

Table 10-15 Average Nitrogen Dioxide Data for Zone D Sites in 2023

Parameter	Measurement
Annual Mean (Average)	8.1 µg/m^3

[47] *EPA (2024). Air Quality in Ireland 2023.*

Parameter	Measurement
NO_2 Values >200	0
Values > 140 (UAT)	1
Values >100 (LAT)	4
Hourly Max. (Average)	67.6 µg/m^3

The annual NO_2 value was below the annual mean limit value for the protection of human health of 40 µg/m^3. The lower assessment threshold of 100 µg/m3 was exceeded 4 no. times during the monitoring period in Emo Court, Co. Laois and the upper assessment threshold of 140 µg/m^3 was exceeded once during the monitoring period, also in Emo Court, Co. Laois. Both did not exceed the 18 days limit during the monitoring period. In 2022, no other monitoring locations in Zone D had exceedances in the lower and upper assessment thresholds of 100 and 140 µg/m^3/ The average hourly max. NO_2 value of 67.6 µg/m^3 measured during the monitoring period was below the hourly max threshold of 200 µg/m^3. It is expected based on professional judgement that NO_2 values at the Site is similar or lower than those recorded for the Zone D sites above.

10.2.2.4 Carbon Monoxide (CO)

The EPA Report provides rolling 8-hour carbon monoxide concentrations for Birr, a Zone D site. Carbon Monoxide data for 2023 is presented in Table 10-16.

Table 10-16 Carbon Monoxide Data for Birr – Zone D Site in 2023.

Parameter	Measurement
Annual Mean	0.6 mg/m^3
Median	0.6 mg/m^3
% Data Capture	99.8%
Values > 10	0
Max	2.2 mg/m^3

The average concentration of carbon monoxide was 0.6 mg/m^3. The carbon monoxide limit value for the protection of human health is 10,000 µg/m^3 (or 10 mg/m^3). On no occasions were values in excess of the 10 mg limit value set out in Directive 2008/50/EC. It is expected based on professional judgement that the CO value at the Site is similar or lower than those recorded for the Zone D site above.

10.2.2.5 Ozone (O_3)

The EPA report provides rolling 8-hour ozone concentrations for seven Zone D sites, Emo Court, Kilkitt, Carnsore Point, Mace Head, Castlebar, Valentia and Malin Head. Ozone (O_3) data for 2023 is presented in Table 10-17. As can be observed from Table 10-17 there were 10 no. exceedances of the maximum daily eight-hour mean limit of 120 µg/m^3. The CAFE Directive stipulates that this limit should not be exceeded on more than 25 days per calendar year averaged over 3 years. It would be expected on professional judgement that O_3 values at the Site would be similar or lower than those recorded for the Zone D sites below.

Table 10-17 Average Ozone Data for Zone D Sites in 2022.

Parameter	Measurement
Annual Mean	61.5µg/m^3
Median	72.8 µg/m3
% Data Capture	95.5%
No. of days > 120 µg/m^3	10 days

10.2.2.6 Dust

There are no statutory limits for dust deposition in Ireland. However, EPA guidance suggests that a deposition of 10 mg/m^2/hour can generally be considered as posing a soiling nuisance. This equates to 240 mg/m^2/day. The EPA recommends a maximum daily deposition level of 350 mg/m^2/day when measured according to the TA Luft Standard 2002. This limit value can also be implemented with regard to dust impacts from construction activities associated with the Proposed Development.

The extent of dust generation at any site depends on the type of activity undertaken, the location, the nature of the dust, i.e., soil, sand, etc., and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Construction dust has the potential to be generated from on-site activities such as excavation and backfilling. Construction traffic movements also have the potential to generate dust as they travel along the haul route.

The potential dust-related effects on local air quality and the relevant associated mitigation measures during the construction, operational and decommissioning phases of the Proposed Development are presented in Sections 10.2.3 below.

10.2.3 Likely Significant Effects and Associated Mitigation Measures

10.2.3.2 Construction Phase

10.2.3.2.1 *Exhaust Emissions*

1. Wind Farm Site (Turbines and associated foundations and hard-standing areas, Meteorological Mast, Junction Accommodation Works, Access Roads, Temporary Construction Compound, Underground Cabling, Spoil Management, Site Drainage, Tree Felling, and all ancillary works and apparatus)

The construction of turbines, site roads and other onsite infrastructure (as outlined in Chapter 4 of the EIAR) will require the operation of construction vehicles and plant on the Wind Farm Site. Exhaust emissions associated with vehicles and plant will arise as a result of construction activities. This potential effect will not be significant and will be restricted to the duration of the construction phase and localised to works locations. Therefore, this is considered a short-term slight negative effect. Mitigation measures to reduce this impact are presented below.

2. Grid Connection (Onsite Substation, Temporary Construction Compound and Underground Electrical Cabling Route)

The construction of the onsite substation and temporary construction compound (as outlined in Chapter 4 of the EIAR) will require the operation of construction vehicles and plant on the Wind Farm

Site. Exhaust emissions associated with vehicles and plant will arise as a result of construction activities. This potential effect will not be significant and will be restricted to the duration of the construction phase and localised to works locations. Therefore, this is considered a short-term slight negative effect. Mitigation measures to reduce this impact are presented below.

The construction of the underground electrical cabling route will require the use of construction machinery, thereby giving rise to exhaust emissions. This is a short-term slight negative effect, which will be reduced through use of the best practice mitigation measures as presented below.

3. Transport to Site

The transport of turbines and construction materials to the Site, which will occur on specified routes only (see Section 4.4 in Chapter 4 of the EIAR), will also give rise to exhaust emissions associated with the transport vehicles. This constitutes a slight negative effect in terms of air quality. Mitigation measures in relation to exhaust emissions are presented below.

4. Waste Disposal

Construction waste will arise from the Proposed Development mainly from excavation and unavoidable construction waste including material surpluses and damaged materials and packaging waste. Waste management will be carried out in accordance with *Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects* (2021) produced by the EPA.

Mitigation:

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Turbines and construction materials will be transported to the Site on specified routes only, unless otherwise agreed with the Planning Authority.
- When stationary, delivery and on-site vehicles will be required to turn off engines.
- Users of the Site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum.
- The expected waste volumes generated onsite are unlikely to be large enough to warrant source segregation at the Proposed Development site. Therefore, all wastes streams generated onsite will be deposited into a single waste skip which will be covered. This waste material will be transferred to a licensed /permitted Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal.
- The MRF facility will be local to the Proposed Development site to reduce the amount of emissions associated with vehicle movements. The nearest licensed waste facility to the Wind Farm Site is Barna Waste, Athlone which is located approximately 13km to the south-west of the Wind Farm Site.
- Waste associated with the construction of the Grid Connection underground electrical cabling route will be disposed of at the closest MRF to where waste is generated along the underground electrical cabling route. There are two licensed waste facilities in the vicinity of the underground electrical cabling route, and these are Barna Waste, Athlone as outlined above and the Derryclure Landfill which is located approximately 6.5km to the south of the Thornsberry 110kV substation at Tullamore.

Residual Effect

Following implementation of the mitigation measures above, residual impacts of exhaust emissions for the construction phase of the Proposed Development will have a short-term imperceptible negative effect.

Significance of Effects

Based on the assessment above there will be no significant effects.

10.2.3.2.2 *Dust Emissions*

Wind Farm Site

The IAQM 2024 Guidance methodology for *the Assessment of Dust from Demolition and Construction* as discussed in Section 10.2.1.2 above is used to assess the potential risk to high sensitivity receptors from dust deposition. Dust deposition impacts can occur for a distance of 250m from Proposed Development works areas, but the majority of deposition occurs within the first 50m (IAQM 2024 Guidance). The high sensitivity receptors were identified using a constraints mapping process, and detailed and updated planning searches which informed the project sensitive receptor dataset.

- There are no high sensitivity receptor located within 20m of the Wind Farm Site footprint;
- There are 2 no. high sensitivity receptors within 50m of the Wind Farm Site footprint;
- There are 6 no. high sensitivity receptors within 100m of the Wind Farm Site footprint;
- There are 11 no. high sensitivity receptors within 250m of the Wind Farm Site footprint.

Table 10-18 below identifies the sensitivity of the area surrounding the Proposed Development footprint of the Wind Farm Site to dust soiling effects, as described in Section 10.2.1.2 above.

As per the criteria in Table 10-18 below the overall sensitivity of the area to dust soiling impacts is considered to be **'Low'.**

Table 10-18 Sensitivity of the Area to Dust Soiling Effects on People and Property. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 10-19 below identifies the high sensitivity receptors in the area surrounding the Proposed Development footprint of the Wind Farm Site to the health effects of PM_{10}, as described in Section

10.2.1.2 above. The annual mean PM_{10} concentration of Zone D in Ireland is 11 µg/m^3. The overall sensitivity of the area to human health effects of PM_{10} is considered to be Low.

Table 10-19 Sensitivity of the Area to Human Health Impacts from the Wind Farm Site construction works. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number Of Receptors	Distance from source (m)			
			<20	<50	<100	<250
High	<24 µg/m^3 (<14 µg/m^3 in Scotland)	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	<24 µg/m^3 (<14 µg/m^3 in Scotland)	>10	Low	Low	Low	Low
		1-10				
Low	-	≥1	Low	Low	Low	Low

As identified in Section 10.2.1.2 above, the Wind Farm Site is classified as 'Large' for Earthworks, Construction and Trackout activities. Therefore, when combined with the sensitivity of the area, using Tables 10-6 to 10-8 above as guidance, the pre-mitigation risk of impacts from the Wind Farm Site is summarised in Table 10-20 below.

Table 10-20 Summary Dust Risk Table for Wind Farm Site Activities

Potential Impact	Dust Emission Magnitude			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Low Risk	Low Risk	Low Risk
Human Health	N/A	Low Risk	Low Risk	Low Risk
Ecological	N/A	N/A	N/A	N/A

The overall risk of dust emissions impacts with no mitigation applied for the major dust generating activities during the construction phase of the Wind Farm Site is '**Low**'. Therefore, the potential effects of dust from the construction phase of the Wind Farm Site are considered to be equivalent to short-term, slight, negative effects.

Grid Connection

The construction of the Grid Connection (permanent 110kV substation, temporary construction compound, underground grid connection cabling) will give rise to dust emissions. Aggregate materials for the construction of the proposed onsite substation and temporary construction compound will be sourced from local licenced quarries.

The number of high sensitive receptors within 250m from Grid Connection works areas and their likely risk of dust impacts during the construction works, as highlighted in the IAQM 2024 Guidance methodology discussed above are as follows:

- There are 59 no. high sensitivity receptors located within 20m from the proposed Grid Connection footprint;
- There are 232 no. high sensitivity receptors located within 50m of the proposed Grid Connection footprint;
- There are 293 no. high sensitivity receptors located within 100m of the proposed Grid Connection footprint;
- There are 438 no. high sensitivity receptors located within 250m of the proposed Grid Connection footprint;

Table 10-21 below identifies the sensitivity of the area surrounding the development footprint of the Grid Connection to dust soiling effects, as described in Section 10.2.1.2 above. The overall sensitivity of the area to dust soiling effects is '**High**' due to the number of high sensitivity receptors within 20m and within 50m of the Grid Connection.

Table 10-21 Sensitivity of the Area to Dust Soiling Effects from Grid Connection construction works on People and Property. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 10-22 below identifies the high sensitivity receptors in the area surrounding the development footprint of the Grid Connection to the health effects of PM_{10}, as described in Section 10.2.1.2 above. The overall sensitivity of the area to human health effects of PM_{10} is '**Medium**' due to the number of high sensitivity receptors within 20m of the Grid Connection.

Table 10-22 Sensitivity of the Area to Human Health Impacts from Grid Connection construction works. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024).

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number Of Receptors	Distance from source (m)			
			<20	<50	<100	<250
High	<24 µg/m^3 (<14 µg/m^3 in Scotland)	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	<24 µg/m^3	>10	Low	Low	Low	Low

	(<14 µg/m^3 in Scotland)	1-10				
Low	-	≥1	Low	Low	Low	Low

Table 10-23 below identifies the sensitivity of the receptors to ecological effects in the area surrounding the development footprint of the Grid Connection. The Proposed Grid Connection crosses 34 water crossings, 11 of which are EPA/OSI mapped watercourses, while the remaining are classified as culverts/drains. However, it does not cross any Protected European Sites. The overall sensitivity of the areas surrounding the development footprint of the Proposed Grid Connection is considered to be **'Low.'**

Table 10-23 Sensitivity of the Area to Ecological Impacts. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Distance from source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

As identified in Section 10.2.1.2 above, the Grid Connection is classified as 'Medium' for Earthworks, 'Medium' for Construction, and 'Medium' for Trackout activities. Therefore, when combined with the sensitivity of the area, using Tables 10-9 to 10-11 above as guidance, the pre-mitigation risk of impacts from the Grid Connection is summarised in Table 10-24.

Table 10-24 Summary Dust Risk Table for Proposed Grid Connection Activities

Potential Impact	Dust Emission Magnitude			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Medium Risk	Medium Risk	Medium Risk
Human Health	N/A	Low Risk	Medium Risk	Negligible
Ecological	N/A	Medium Risk	Medium Risk	Medium Risk

The overall risk of dust emissions impacts with no mitigation applied for the major dust generating activities during the construction phase of the Grid Connection is **'Medium'**. Therefore, the potential effects of dust from the construction phase of the Grid Connection are considered to be equivalent to short-term, moderate negative effects.

Please note that the assessment of the potential impact of dust on the ecological receptors included in this assessment (i.e. rivers and streams along the grid connection) follows the methodology set out in the IAQM 2024 Guidance. However, a more detailed ecological impact assessment assessing impacts on these receptors during the construction phase (including effects from dust) is contained in Chapter 6 of the EIAR.

Transport to and from the Wind Farm Site

The transport of turbine components, supporting infrastructure materials, construction and staff vehicles, small volume of aggregate material and waste removal vehicles to/from the Site, the departure of empty vehicles and/or minor waste volumes (please see CEMP Appendix 4-2 of the EIAR) from the Site and daily staff movements will also give rise to some localised dust emissions during periods of dry weather. The transport of construction vehicles, aggregate material, waste removal vehicles and construction staff to/from the Site for the construction of the Grid Connection will also give rise to some localised dust emissions during periods of dry weather.

The IAQM 2024 Guidance states that the likely routes the construction traffic will use should also be included in an assessment of dust arising from trackout, and that related construction dust impact increases with respect to the number of movements of HGVs per day, length of unpaved road, distance to receptors and the sensitivity of local receptors.

For the purposes of this assessment of the dust emissions arising from trackout related to the construction of the Proposed Development, the L5363 local road, along which the main construction site entrance is located was scoped in for assessment. Beyond either end of this road, construction traffic will disperse in different directions along different routes to a degree that there will be no potential for significant effects from trackout related dust emissions. The L5363, scoped in for assessment, is a 3.3km stretch of local road that runs in a north-south orientation to the west of the Wind Farm Site.

The IAQM 2024 Guidance methodology for *the Assessment of Dust from Demolition and Construction* as discussed in Section 10.2.1.2 above is used to assess the potential risk to high sensitivity receptors from dust deposition. Dust deposition impacts can occur for a distance of 250m from source (in this instance the L5363), but the majority of deposition occurs within the first 50m. The high sensitivity receptors were identified using a constraints mapping process, and detailed and updated planning searches which informed the project sensitive receptor dataset.

- There are 4 no. high sensitivity receptors located within 20m of the L5363;
- There are 18 no. high sensitivity receptors within 50m of the L5363;
- There are 24 no. high sensitivity receptors within 100m of the L5363;
- There are 32 no. high sensitivity receptors within 250m of L5363.

Table 10-25 below identifies the sensitivity of the area surrounding the L5363 to dust soiling effects from trackout, as described in Section 10.2.1.2 above.

As per the criteria in Table 10-25 below, there are 4 no. high sensitivity receptors within 20m of the L5024, and 18 no. high sensitivity receptors within 50m of the L5024. The overall sensitivity of the area to dust soiling impacts is considered to be Medium.

Table 10-25 Sensitivity of the Area to Dust Soiling Effects on People and Property. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 10-26 below identifies the high sensitivity receptors in the area surrounding the L5363 to the health effects of PM_{10}, as described in Section 10.2.1.2 above. The overall sensitivity of the area to human health effects of PM_{10} is considered to be Low.

Table 10-26 Sensitivity of the Area to Human Health Impacts from the Wind Farm Site construction works. Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number Of Receptors	Distance from source (m)			
			<20	<50	<100	<250
High	<24 µg/m^3 (<14 µg/m^3 in Scotland)	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	<24 µg/m^3 (<14 µg/m^3 in Scotland)	>10	Low	Low	Low	Low
		1-10				
Low	-	≥1	Low	Low	Low	Low

As identified in Section 10.2.1.2 above, the Wind Farm Site is classified as 'Large' for Trackout activities, and the Grid Connection is classified as 'Medium' for Trackout activities. Therefore, when combined with the sensitivity of the area, using Table 10-11 above as guidance, the pre-mitigation risk of impacts from the Wind Farm Site and Grid Connection is summarised in Table 10-27 below.

Table 10-27 Summary Dust Risk Table for Wind Farm Site Activities

Potential Impact	Dust Emission Magnitude	
	Trackout (Wind Farm Site)	Trackout (Grid Connection)
Dust Soiling	Medium Risk	Low Risk
Human Health	Low Risk	Low Risk
Ecological	N/A	N/A

The overall risk of dust emissions impacts on the identified 3.3km stretch of the L5363, with no mitigation applied for the major dust generating activities, during the construction phase of the Wind Farm Site is '**Medium**' and for the Grid Connection is **'Low'**. Therefore, the potential effects of dust from the construction phase of the Proposed Development are considered to be equivalent to short-term, moderate, negative effects.

Mitigation

- In periods of extended dry weather, dust suppression may be necessary along haul roads, site roads, and other infrastructure to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling ponds in the Wind Farm Site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads, and site compounds to prevent the generation of dust where required. Water

bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff.
- All plant and materials vehicles shall be stored in dedicated areas (on Site).
- Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and compaction.
- Turbines and construction materials will be transported to the Site on specified haul routes only.
- The agreed haul route roads adjacent to the Site will be regularly inspected for cleanliness and cleaned as necessary.
- The Site access roads will be checked weekly for damage/potholes and repaired as necessary.
- The transport of construction materials to the Site that have significant potential to cause dust, will be undertaken in tarpaulin or similar covered vehicles where necessary.
- The transportation of dry excavated material from the Site to the designated on-site spoil management areas, which may have potential to generate dust will be minimised. If necessary, excavated material will be dampened prior to transport to the spoil management areas.
- A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Appendix 4-2). The CEMP includes dust suppression measures.

Residual Effect

With the implementation of the above, the Wind Farm Site is considered to have a short-term imperceptible negative effect on air quality brought about by dust emissions generated during the construction activities.

The Grid Connection is considered to have a temporary slight negative effect on air quality brought about by dust emissions generated during the construction activities.

Following implementation of mitigation measures as outlined above, residual effects on air quality from dust emissions from traffic movements to and from the Site during the construction phase will have a short-term, slight negative effect.

Significance of Effects

Based on the assessment above there will be no significant effects.

10.2.3.3 Operational Phase

10.2.3.3.4 *Overall Effect on Air Quality*

Operational Phase: Carbon Offsetting

Although a Long-term, Imperceptible, Negative effect on air quality is expected during the operational phase due to exhaust and dust emissions from maintenance vehicles, there will be no net carbon dioxide (CO_2) emissions from operation of the Proposed Development. By providing an alternative to electricity derived from coal, oil or gas-fired power stations, the Proposed Development will result in emission savings of carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulphur dioxide (SO_2). The production of renewable energy from the Proposed Development will have a Long-Term Moderate Positive effect on air quality due to the offsetting of approximately 41,580 tonnes of Carbon Dioxide (CO_2) per annum. Please see Section 10.3 Climate below for further details on carbon displacement calculations.

Mitigation and Monitoring Measures

No mitigation required.

Residual Effect

The overall effect will be a Long-term Moderate Positive effect on air quality due to the offsetting of approximately 41,580 tonnes of Carbon Dioxide (CO2) per annum (see Section 10.3 Climate below for details), due to the provision of renewable energy in the range of approximately 40,191 Irish households with electricity per year.

Significance of Effects

Based on the assessment above there will be Long-term Moderate Positive effect on air quality.

10.3 Climate

10.3.7 Climate Change and Greenhouse Gases

10.3.7.9 Climate Change Advisory Council 2023 and 2024

The Climate Change Advisory Council (CCAC) was established on 18th January 2016 under the Climate Action and Low Carbon Development Act 2015. The CCAC aims to provide independent evidence-based advice and recommendations on policy to support Ireland's Just Transition to a biodiversity-rich, environmentally sustainable, climate-neutral, and resilient society.

In July 2023, the CCAC published the 2023 Annual Review[48], this is the seventh annual review carried out by CCAC and details the CCAC concerns that the necessary national actions are not taking place or being enabled at the required speed, going on to state that 'at the current rate of policy implementation, Ireland will not meet the targets set in the first and second carbon budget periods unless urgent action is taken immediately, and emissions begin to fall much more rapidly.'

In 2024 the CCAC has changed it approach to produce sector specific annual reviews in order to emphasise the requirement for greater effort across all sectors to remain within their sectoral emission ceiling. In a statement released on 9th July 2024 the CCAC state that while '*the provisional greenhouse gas emissions data published today by the EPA shows some positive results across the sectors but overall, it is increasingly unlikely that the first carbon budget will be achieved. Much more urgent action is required from Government if Ireland is to achieve its climate change objectives.*'[49]

The Annual Review 2024: Electricity report[50] has been released by the CCAC and focuses specifically on key findings and recommendations for the Electricity sector. In 2023, emissions from the sector reduced by approximately 21% from 2022 to the lowest level since records began in 1990. This was driven by a considerable decline in the use of coal for electricity generation, coupled with a notable rise in imported electricity.

Renewables accounted for 41% of electricity demand in 2023, up from 39% in 2022 and approaching the 2025 target of a 50% renewable energy share in electricity generation. By the end of 2023, the total renewable grid capacity in Ireland was 5.7 GW, with the majority (4.7 GW) from onshore wind turbine

[48] *Climate Change Advisory Council 2023 Review* <https://www.climatecouncil.ie/councilpublications/annualreviewandreport/CCAC-AR-2023-FINAL%20Compressed%20web.pdf>
[49] https://www.climatecouncil.ie/news/chairs-statement-irelands-provisional-greenhouse-gas-emissions-1990-2023.html
[50] *Climate Change Advisory Council (2024) Annual Report 2024: Electricity* <https://www.climatecouncil.ie/councilpublications/annualreviewandreport/AR2024-Electricity-final.pdf>

installations. However, there is still a significant lack of progress towards onshore wind targets in 2023, with just 0.2GW of new onshore wind being connected to the grid in 2023.

10.3.7.12 Climate Action Plan 2025

The National Climate Action Plan (CAP) 2025 was launched in April 2025. CAP 2025 sets out the roadmap to deliver on Ireland's climate ambition. It aligns with the legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by Government in July 2022 following the Climate Action and Low Carbon Development (Amendment) Act 2021, which commits Ireland to a legally binding target of net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030.

CAP 2025 highlights the firm commitment that has been made by Ireland in relation to the clean energy transition and provides an outline of precise goals for renewable energy, focusing on solar, onshore wind, and offshore wind.

10.3.7.12.14 *Local Greenhouse Gas Emission and Climate Targets*

Westmeath County Council Local Authority Climate Action Plan 2024-2029

The Westmeath County Council Climate Action Plan 2024-2029 (Westmeath CAP) was adopted on March 13th 2024.

The Westmeath CAP highlights the current state of climate action in Ireland, and how Westmeath County Council will be responsible for enhancing climate resilience, increasing energy efficiency, and reducing greenhouse gas emissions, across its own assets and services. The Westmeath CAP provides a mechanism for bringing together both adaptation and mitigation actions to help drive positive climate action and outcomes across the local authority and its administrative area. The framework of climate actions set within the plan, configures the arrangement of climate actions within a defined structure that ensures alignment between on the ground actions and the high-level vision that the Westmeath CAP aspires to deliver. The Westmeath CAP will help address the mitigation of greenhouse gases, the implementation of climate change adaption measures, and will strengthen the alignment between national climate policy and the delivery of effective local climate action.

Overall, the greenhouse gas emissions generated from County Westmeath equated to 1,639,108 ktCO2-eq in the baseline year 2018[51]. The top three emitting sectors within County Westmeath in terms of total greenhouse gas emissions in the baseline year were Agriculture, Transport, and Residential, producing 40%, 21%, and 16% respectively of total emissions in County Westmeath. Westmeath County Council, along with all public sector entities must reduce greenhouse gas emissions by 51% by 2030 as compared to 2018 in line with the national Climate Action Plan 2025.

During the operational phase, the Proposed Development will assist in reducing emission by enabling renewable energy to be fed into the grid and the subsequent decarbonisation of other sectors, in particular the main emitting sectors in County Westmeath as identified above. Please see Section 10.3.3 below for further information on carbon savings associated with the Proposed Development.

The Westmeath LACAP assesses climate risk relevant to Ireland and to County Westmeath, this, plus the evidence baseline, inform the climate objectives and actions that will be undertaken by Westmeath County Council to assist in the achievement of national and international climate targets.

[51] *Baseline Emissions Inventory Report for County Westmeath*
https://consult.westmeathcoco.ie/en/system/files/materials/1075/03%20Westmeath%20County%20Council%20BEI%20Report.pdf

The Westmeath County Development Plan 2022-2028[52] (WCDP) sets out the overall strategy for the proper planning and sustainable development of the County over a 6-year period. The WCDP includes numerous objectives on sustainability and climate within, as well as a Renewable Energy Strategy. Please see Chapter 2 of the EIAR for more details on the WCDP.

10.3.3 Calculating Carbon Losses and Savings from the Proposed Development

10.3.3.2 Methodology for Calculating Losses

In addition to the Macauley Institute methodology described in Chapter 10 of the EIAR, where possible, carbon emissions or losses associated with embodied carbon of materials used in the construction, operational and decommissioning phase of the Proposed Development have been identified. Embodied carbon refers to the emissions associated with procuring, mining, and harvesting raw materials, the transformation of those materials into construction products, transporting them to site, installation of these materials during a construction phase, and the subsequent replacement, removal, and disposal of these materials upon decommissioning.[53]

The full life cycle and embodied carbon of the Proposed Development turbines have been taken account of in the Macauley Institute model. The emissions associated with the embodied carbon, along with the construction phase transport movements, of the remaining features of the site are considered using the Transport Infrastructure Ireland (TII) Carbon Tool (TII 2022)[54]. The TII Carbon Tool is customised for road and light rail projects in Ireland, using emission factors from recognised sources during the construction, maintenance and operation of TII projects in Ireland.

Section 14.1 in Chapter 14 of the EIAR outlines traffic generation numbers relative to quantum of materials required for the construction of the Proposed Development, the details of which have been utilised to determine the emissions associated with these activities and are included in EIAR Addendum Appendix 10-1Revised Carbon Calculations attached.

10.3.3.3 Calculating Carbon Losses and Savings

10.3.3.3.1 *Carbon Losses*

The Scottish Government online carbon calculator was used to assess the impacts of the Proposed Development in terms of potential carbon losses taking into account drainage, habitat improvement, forestry felling and site restoration. The online calculator is pre-loaded with information specific to the CO_2 emissions from the United Kingdom's electricity generation plant, which is used to calculate emissions savings from proposed wind farm projects in the UK. However, due to the availability of Irish specific carbon intensity emission factors for the Irish electricity generation plant, the CO_2 emissions savings from the Proposed Development have been calculated separately from the online carbon calculator as set out below.

In relation to embodied carbon and associated transport movements of all other ancillary elements of the Proposed Development, the TII Carbon Tool has been utilised to assess the impacts of the Proposed Development in terms of potential carbon losses in regards to construction phase transport emissions and embodied carbon.

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[52] *The Galway County Development Plan 2022-2028,* https://consult.galway.ie/en/consultation/adopted-galway-county-development-plan-2022-2028

[53] *Irish green Building Council – What is embodied carbon?* <https://www.igbc.ie/what-is-embodied-carbon/>

[54] *Transport Infrastructure Ireland Carbon Tool for Road and Light Rail Projects: User Guidance Document* https://www.tiipublications.ie/library/GE-ENV-01106-01.pdf

A copy of the outputs is provided as Appendix 10-1 of this EIAR Addendum Report, *'Carbon Calculations'*. Where available and relevant, site-specific information was inserted into the online carbon calculators. Otherwise, default values were used.

The main CO_2 losses due to the Proposed Development are summarised in Table 10-28.

Table 10-28 CO2 Losses from the Proposed Development

Origin of Losses	CO_2 Losses (tonnes CO_2 equivalent)	
	Expected	Maximum
Losses due to turbine life (e.g., manufacture, construction, decommissioning)	49,066	49,193
Losses due to backup	31,675	31,675
Losses from reduced carbon fixing potential	1,187	2,096
Losses associated to forestry felling	2,534	2,646
Losses associated with embodied carbon in construction materials	3,437	3,437
Losses associated with traffic and transport movements	250	250
Total	88,148	89,296

The worksheet models and online tools calculate that the Proposed Development will give rise to 88,149 tonnes of CO_2 equivalent losses over its 30-year life. Of this total figure, the proposed turbines directly account for 49,066 tonnes, or 56%. Losses due to backup account for 31,675 tonnes, or 36%. Losses from reduced carbon fixing potential accounts for 1.3% or 1,187 tonnes. Losses due to forestry felling account for 2,534 tonnes or 3%. Losses due to embodied carbon accounts for 3,437 tonnes or 4% and losses due to construction phase transport emissions accounts for 0.3% or 250 tonnes.

The values discussed above are based on the assumption that no habitat enhancement or afforestation activities will take place as part of the Proposed Development. As detailed in Section 4.3.1.6.2 of the EIAR, the estimated 6.4 ha of forestry that will be permanently felled for the footprint of the Proposed Development infrastructure will be replaced or replanted on a hectare for hectare basis as a condition of any felling licence that will be issued in respect of the Proposed Development. Similarly, as detailed in Appendix 6-4, a Biodiversity Management and Enhancement Plan (BMEP) for the Proposed Development has identified enhancement activities such as planting of hedgerow and treelines. Taking into account the afforestation and habitat enhancement that will take place, the actual CO_2 losses for forestry felling and reduced carbon fixing potential are expected to be lower than the values detailed in Table 10-28, over the life-time of the Proposed Development.

The figure of 3,437 tonnes of CO_2 arising from the embodied carbon of construction materials associated with the Proposed Development is calculated based the types of materials available in the TII Carbon tool such as, concrete, steel, cement and granular fill, and assumes that each HGV or LGV will be carrying material at its full capacity. The figure of 250 tonnes of CO_2 arising from transport movements associated with construction activities of the Proposed Development is calculated based on the assumption that material will be imported locally or from a port/city location where applicable. Details on the assumptions made for the modelling of embodied carbon and construction phase transport emissions are included in Appendix 10-1.

The values discussed above are based on the assumption that the hydrology of the Proposed Development and habitats within the site are not restored on decommissioning of the Wind Farm Site after its expected 30-year proposed operational life. As detailed in the Decommissioning Plan, Appendix 4-6, the wind turbines and met mast will be dismantled and removed offsite. It is not intended to remove the concrete foundations from the ground as it is considered that its removal will be the least preferred options in terms of having potential effects on the environment. The associated foundations will be backfilled and covered with soil material. The soil material will be spread and graded over the foundation using a tracked excavator and revegetation enhanced by spreading of an appropriate seed mix to assist in revegetation and accelerate the resumption of the natural drainage management that will have existed prior to any construction. The underground electrical cabling connecting the turbines to the on-site substation will be removed from the cable ducts. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance. The cable materials will be transferred to a suitable recycling or recovery facility. Taking into account the proposals incorporated in the Decommissioning Plan, the actual CO_2 losses are expected to be lower than the values detailed in Table 10-28.

10.3.3.3.2 Carbon Savings

According to the model described above, the Proposed Development will give rise to total losses of 88,148 tonnes of carbon dioxide.

A simple formula can be used to calculate carbon dioxide emissions reductions resulting from the generation of electricity from wind power rather than from carbon-based fuels such as peat, coal, gas and oil. The formula is:

$$CO_2 \text{ (in tonnes)} = \frac{(A \times B \times C \times D)}{1000}$$

where: A = ... The rated capacity of the wind energy development in MW

B = ... The capacity or load factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc.

C = ... The number of hours in a year

D = ... Carbon load in grams per kWh (kilowatt hour) of electricity generated and distributed via the national grid.

For the purposes of this calculation, the rated capacity of the Wind Farm Site is assumed to be 55.8 MW (based on 9 No. 6.2 MW turbines).

A capacity factor of 0.37 (or 37%) has been used for the Proposed Development.[55]

The number of hours in a year is 8,760.

A conservative figure for the carbon load of electricity generated by natural gas in Ireland was sourced from Sustainable Energy Authority Ireland's (SEAI) Conversion and Emissions Factors for Publication worksheet.[56] The emission factor for electricity generated in Ireland in 2023 was 229.9 gCO_2/kWh.[57]

[55] *Eirgrid, 2022 Enduring Connection Policy 2.3 Constraints Report for Solar and Wind <* https://cms.eirgrid.ie/sites/default/files/publications/ECP-2.4-Solar-and-Wind-Constraints-Report-Assumptions-and-Methodology-v1.0.pdf
The Proposed Development is located within the C wind region for Ireland with an associated capacity factor of 37%.
[56] *Conversion and Emission Factors for Publication (2023)* https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/SEAI-conversion-and-emission-factors.xlsx
[57] *SEAI have published the provisional 2023 emission factor for electricity generation in Ireland as 229.9 gCO2/kWh. Please note that this is a provisional value that may change.*

The calculation for carbon savings is therefore as follows:

$$CO_2 \text{ (in tonnes)} = \frac{(55.8 \times 0.37 \times 8{,}760 \times 229.9)}{1000}$$

$$= 41{,}580 \text{ tonnes per annum}$$

Based on this calculation, **41,580** tonnes of carbon dioxide will be displaced per annum from the largely carbon-based traditional energy mix by the Wind Farm Site. Over the proposed 30-year lifetime of the development, therefore **1,247,384** tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation.

Based on the carbon calculations as presented above in Section 10.3.3.3.1 and in Appendix 10-1, approximately 88,148 tonnes of CO_2 will be lost to the atmosphere due to changes in the soil and ground conditions and due to the construction and operation of the Proposed Development. This represents **7%** of the total amount of carbon dioxide emissions that will be offset by the Wind Farm Site. The 88,148 tonnes of CO_2 that will be lost to the atmosphere due to changes in soil and ground conditions and due to the construction and operation of the Proposed Development will be offset by the Wind Farm Site in approximately 25 months (2.2 years) of operation.

As detailed in Section 10.3.3.3.1 above, habitat enhancement and afforestation activities will take place as part of the Proposed Development. As detailed in Section 4.3.1.6 of the EIAR, the estimated 6.4ha of forestry that will be permanently felled for the footprint of the Proposed Development infrastructure will be replaced or replanted on a hectare for hectare basis as a condition of any felling licence that will be issued in respect of the Proposed Development. Similarly, as detailed in Appendix 6-4, a BMEP for the Proposed Development has identified enhancement activities such as planting of hedgerows and treelines. These activities, over the lifetime of the Wind Farm Site has the potential to give rise to carbon savings.

10.3.4 Likely Significant Effects and Associated Mitigation Measures

10.3.4.1 Construction Phase

10.3.4.1.1 *Greenhouse Gas Emissions*

The construction of turbines, site roads and other onsite infrastructure (as outlined in Chapter 4 of the EIAR) will require construction materials (such as cement), and the operation of construction vehicles and plant on the Proposed Development site. Greenhouse gas emissions, e.g. carbon dioxide (CO_2), carbon monoxide and nitrogen oxides associated with production of construction materials, and operation of vehicles and plant will arise as a result of the construction activities. The transport of turbines and construction materials to the site, which will occur on specified routes only (see Section 4.4 in Chapter 4 of the EIAR), will also give rise to greenhouse gas emissions associated with the transport vehicles and exhaust emissions. This potential impact will be short-term and slight only, given the insignificant quantity of greenhouse gases that will be emitted to the atmosphere, and will be restricted to the duration of the construction phase. Mitigation measures to reduce this impact are presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- Turbines and construction materials will be transported to the Site on specified routes only unless otherwise agreed with the Planning Authority.

- The majority of aggregate materials for the construction of the Proposed Development will be obtained from the local quarries. This will significantly reduce the number of delivery vehicles accessing the site and the length of such journeys, thereby reducing the amount of emissions associated with vehicle movements.
- Where applicable, low carbon intensive construction materials will be sourced and utilised onsite.

Residual Effects

Following implementation of the mitigation measures above, residual impacts of greenhouse gas emissions arising from the construction phase of the Proposed Development will have a short-term imperceptible negative effect.

However, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible negative effect on Climate.

When considering these greenhouse gas emissions within the context of the national Electricity Sector Emissions Ceilings detailed in Section 10.3.1.1.11, Carbon Budget 1 (2021-2025) has an Electricity Sector budget of 40 MtCO2eq. and Carbon Budget 2 (2026-2030) has an Electricity Sector budget of 20 MtCO2eq for large-scale deployment of renewables. As detailed in Section 10.3.3.3.2, the Proposed Development will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 30-year lifespan of the Wind Farm Site. Therefore, while there will be greenhouse gas emissions associated with the construction of the Proposed Development, this will take place under the Electricity sector emissions ceiling and will be offset by the operation of the Wind Farm Site within its operational life.

Significance of Effects

Based on the assessment above there will be no significant effects.

10.3.4.2 Operational Phase

10.3.4.2.1 *Greenhouse Gas Emissions*

Wind Farm Site

The Proposed Development will generate energy from a renewable source. This energy generated will offset energy and the associated emission of greenhouse gases from electricity-generating stations dependent on fossil fuels, thereby having a positive effect on climate. As detailed in Section 10.3.3.3.2 above, the Proposed Development will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 30-year lifespan of the Wind Farm Site. The Proposed Development will assist in reducing carbon dioxide (CO_2) emissions that would otherwise arise if the same energy that the Proposed Development will generate were otherwise to be generated by conventional fossil fuel plants. This is a long-term significant positive effect on climate.

Some potential long-term slight negative impacts that may occur during the operational phase of the Proposed Development are the release of small amounts of carbon dioxide to the atmosphere due to exhaust emissions arising from routine maintenance, the potential alteration to the drainage of the site and the removal of carbon fixing vegetation. Waste is not proposed to be generated on the site during the operational phase, any waste that does arise will be minimal and any impact will be short-term and imperceptible. Waste management will be carried out in accordance with '*Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects*' (2021) produced by the EPA. These impacts will be slight and will be nullified by the quantity of carbon dioxide that will be displaced by the Proposed Development and by the design and layout of the Proposed Development which has ensured the utilisation of as much of the existing roads within the

Wind Farm Site as possible to gain access to the proposed turbine locations and minimise the construction of additional roads.

Grid Connection

While there will be approximately 1 to 2 trips made to the Wind Farm Site by car or light goods vehicle per day from maintenance and monitoring crews on site for maintenance activities, this will be less than those needed at the Grid Connection during the operational phase. Therefore, impacts relating to emissions from maintenance and monitoring along the Grid Connection infrastructure throughout the operational phase will be less than that of the Wind Farm Site and less than those impacts described in Section 10.3.4.1.1 above.

Mitigation

- Ensure that all maintenance and monitoring vehicles will be maintained in good operational order while onsite, and, when stationary, be required to turn off engines thereby minimising any emissions that arise.
- As detailed in Appendix 6-4, a BMEP, for the Wind Farm Site has identified biodiversity enhancement and management activities such as planting of hedgerow and treelines.
- The identified 6.4ha of commercial forestry that will be permanently felled for the Wind Farm Site will be replaced or replanted on a hectare for hectare basis as a condition of any felling licence that will be issued in respect of the Wind Farm Site felling (Chapter 4 of the EIAR).

Residual Effect

Following implementation of the BMEP outlined above, the loss of carbon fixing vegetation over the lifetime of the Proposed Development will be partially offset by the BMEP and afforestation of 6.4ha of forestry and using the precautionary principle, will have a potential long-term imperceptible negative effect on Climate, which is not significant. However, the Proposed Development will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 30-year lifespan of the Proposed Development. Therefore, while there will be greenhouse gas emissions associated with the operation of the Proposed Development, this will be offset by the operation of the Proposed Development within the 30-year operational life.

Long-term Moderate Positive Effect on Climate as a result of reduced greenhouse gas emissions.

Significance of Effects

Based on the assessment above there will be no significant effects.

11. NOISE & VIBRATION

11.1.7 Summary of Sensitive Receptors

11.1.7.1 Scoped In Receptors

As detailed in Section 5.2.1 above, 3 no. new properties have been identified within 2.5km of proposed turbines. The new properties identified are included as property no. 342, no. 343 and no. 344 on the updated dwellings list, and are all located outside the 740-metre buffer (4 x tip height setback) from proposed turbines. All three properties have been identified as Noise Sensitive Receptors (NSRs) for the operational noise assessment.

As detailed in Section 11.5.2.2 in Chapter 11 of the EIAR, of the identified NSRs, a total of 16 were chosen as Noise Assessment Locations (NALs) for the operational noise assessment and 20 CNALs where selected for the Wind Farm Site construction noise assessment. The CNALs/ NALs were chosen to represent the noise sensitive receptors located closest to the Wind Farm Site and also some additional receptors were included to consider larger groups of NSRs. The modelling results for the CNALs/ NALs has been presented within the main body of Chapter 11 and Appendices 11-1 and 11-2, whilst an assessment for all NSRs has been included within Annex 3 of Appendix 11-1 and Annex 5 of Appendix 11-2.

As identified in Section 5.2.1 above, a number of properties and planning applications beyond the 2.5km buffer from turbines were identified and reviewed against the comparable distance to the NSRs modelling results in Annex 3 of Appendix 11-1, it is considered that these properties are comprehensively assessed as part of the NALs and CNALs which are representative of all NALs in the noise assessment. Therefore, properties outside of the 2.5km buffer from the proposed turbines have been screened out for further detailed assessment. Similarly, the modelling results for the 3 no. new NSRs confirm that the chosen NALs for the assessment of the Proposed Development are still representative of all NALs for the Proposed Development.

For ease of reference the operational noise modelling results of the 3 no. new NSRs (H342, H343 & H344) are detailed below in Section 11.2.1.1.1.

11.2 Assessment of Likely Effects

11.2.7 Potential Operational Noise Effects

11.2.7.1 Wind Farm Site

11.2.7.1.1 *Predictions*

The Guidelines Noise Limits were compared to the predictions of the Proposed Development operating on its own and the results for the 3 no. new NSRs are summarised below in Table 11-12a for the daytime and Table 11-13a for the night time. The tables also show the difference between the predicted noise level and the Guidelines Noise Limit at a given wind speed, illustrated in the tables as the 'Exceedance Level'. A negative Exceedance Level indicates satisfaction of the noise limit. The Guidelines Noise Limits and predictions are also shown on Figures A1.3a – 3p in Appendix 11-2: Operational Noise Report and can be read in conjunction with the below table.

The assessment shows that the predicted wind turbine noise immission levels meet the Guidelines Noise Limits under all conditions for both daytime and night time periods at all receptors and as such there will be **no significant effects** at those receptors

Table 11-12a Compliance Table –Comparison of predicted noise levels from the Proposed Development against the Guidelines Noise Limit at 3 no. new NSRs Daytime

NSR		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
H342	Guidelines Noise Limit, L_{A90}	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.2	49.7	49.7	49.7
	Predicted Wind Turbine Noise L_{A90}	-	-	27.0	28.5	32.6	36.3	37.6	37.6	37.6	37.6	37.6	37.6
	Exceedance Level	-	-	-13	-11.5	-7.4	-8.7	-7.4	-7.4	-7.6	-12.1	-12.1	-12.1
H343	Guidelines Noise Limit, L_{A90}	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	49.2	55.1	55.1
	Predicted Wind Turbine Noise L_{A90}	-	-	28.1	29.7	33.7	37.4	38.7	38.7	38.7	38.7	38.7	38.7
	Exceedance Level	-	-	-11.9	-10.3	-6.3	-7.6	-6.3	-6.3	-6.3	-9.5	-13.9	-18.6
H344	Guidelines Noise Limit, L_{A90}	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	47.4	51.9	56.8
	Predicted Wind Turbine Noise L_{A90}	-	-	22.4	24.0	28.1	31.8	33.1	33.1	33.1	33.1	33.1	33.1
	Exceedance Level	-	-	-17.6	-16	-11.9	-13.2	-11.9	-11.9	-12.1	-16.6	-16.6	-16.6

Table 11-13a Compliance Table –Comparison of predicted noise levels from the Proposed Development against the Guidelines Noise Limit at 3 no. new NSRs Nighttime

NSR		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
H342	Guidelines Noise Limit, L_{A90}	43	43	43	43	43	43	43	43	43	46.3	50.9	55
	Predicted Wind Turbine Noise L_{A90}	-		27.0	28.5	32.6	36.3	37.6	37.6	37.6	37.6	37.6	37.6
	Exceedance Level	-		-16	-14.5	-10.4	-6.7	-5.4	-5.4	-5.4	-8.7	-13.3	-17.4
H343	Guidelines Noise Limit, L_{A90}	43	43	43	43	43	43	43	43	43	46.4	51.4	56.4
	Predicted Wind Turbine Noise L_{A90}	-		28.1	29.7	33.7	37.4	38.7	38.7	38.7	38.7	38.7	38.7
	Exceedance Level	-		-14.9	-13.3	-9.3	-5.6	-4.3	-4.3	-4.3	-7.7	-12.7	-17.7
H344	Guidelines Noise Limit, L_{A90}	43	43	43	43	43	43	43	43	43	46.3	50.9	55
	Predicted Wind Turbine Noise L_{A90}	-		22.4	24.0	28.1	31.8	33.1	33.1	33.1	33.1	33.1	33.1
	Exceedance Level	-		-20.6	-19	-14.9	-11.2	-9.9	-9.9	-9.9	-13.2	-17.8	-21.9

11.1 Assessment of Residual Effects

11.1.1 Residual Construction Effects

Predicted construction noise levels are below the assessment criteria at all receptors, for all phases of construction of the Proposed Development. Good practice mitigation measures are outlined in Chapter 11, however, with or without the good practice construction mitigation measures there will be **no significant residual effects**.

Although noise levels from the laying of the underground electrical cabling route has the potential to exceed the BS 5228 threshold levels during the daytime, due to the transient nature of the underground electrical cabling works, this will only occur for a short period of time at any one location. There will be short periods where threshold levels may be exceeded for the closest noise sensitive receptors. For trenching and backfill activities this will likely occur for less than one day at any given receptor. If directional drilling activities at watercourse, drain and culvert crossing locations are required close to noise sensitive receptors, the mitigation measures detailed above will be put into place and there will be **no significant residual effects**.

11.1.2 Residual Operational Effects

Predicted Proposed Development turbine operational noise levels at all the NALs and NSRs lie below the Guidelines daytime and night time Noise Limits, there will be **no significant residual effects**.

12. LANDSCAPE AND VISUAL

The Response to Submissions Document, to which this EIAR Addendum Report is Appended, provides a response to the submissions pertaining to the Hill of Uisneach. The response on the Hill of Uisneach is supported by Appendix 3 to the Response to Submissions Document: Hill of Uisneach Technical Report and Appendix 4 to the Response to Submissions Document: Photomontage Booklet.

In the preparation of the Hill of Uisneach Technical Report, the EIAR Landscape & Visual Impact Assessment (LVIA) specialist and EIAR Archaeological and Cultural Heritage Impact Assessment specialist, alongside other heritage specialists, have considered the extent to which the impact assessment carried out on the Hill of Uisneach is required to be updated. The impact assessments carried out in the Hill of Uisneach Technical Report comprise a detailed analysis of additional mapping, modelling, drone imagery and photomontage visualisations which provide greater clarity on the likely impact of the Proposed Development on the sensitive landscape, visual and cultural heritage characteristics and attributes encompassed by the Hill of Uisneach and its assemblage of monuments. The assessments in the Hill of Uisneach Technical Report are supported by photomontage visualisations from 3 No. Viewpoints presented in Appendix 4: Photomontage Booklet.

The Hill of Uisneach Technical Report and the Photomontage Booklet should be read in conjunction with Chapter 12: Landscape and Visual and Chapter 13: Archaeology and Cultural Heritage of the submitted EIAR. It is not intended to replicate the supplementary baseline information and assessment provided in the Hill of Uisneach Technical Report in this EIAR Addendum Report, however, it is important to note, with respect to Chapter 12 of the EIAR, Section 5.3 of the Hill of Uisneach Technical Report presents an update to the Likely Significant Effects section presented in Chapter 12 of the submitted EIAR. This update is reflected below in the corresponding section of Chapter 12 – *Section 12.7 Likely or Significant Landscape and Visual Effects.*

There are no other relevant updates to this Section of the EIAR.

12.7 Likely or Significant Landscape and Visual Effects

12.7.3 Operational Phase Effects

12.7.3.1 Landscape Effects (Operational Phase)

12.7.3.1.2 *Effects on Landscape Receptors of High Sensitivity*

Hill of Uisneach

The following text is an extract from Section 5.3.1 of the Hill of Uisneach Technical Report (Appendix 3 to the Response to Submissions Document).

> *The Hill of Uisneach, its monuments, its LCA and landscape setting are considered to be landscapes of 'Very High' landscape sensitivity. Whilst the landscape is a working farm and the site of the annual Bealtaine Fire Festival (which hosts approximately 5,000 attendees on that day each year), the 'Very High' sensitivity is afforded the Hill of Uisneach on account of its cultural significance, protections in local planning policy and its status on Irelands tentative list for UNESCO world heritage status.*
>
> *As the nearest proposed turbine is located approx. 8.8km west-south-west of the summit of the Hill of Uisneach, the Proposed Development will not materially alter the landscape of the Hill*

of Uisneach itself or its LCA, therefore only perceptual effects on landscape character have the potential to occur.

The proposed turbines are visible from vantage points on the Hill of Uisneach, therefore a degree of visual connectivity is evident and effects on landscape character will occur. There is clear physical and landscape separation between the proposed turbines and the Hill of Uisneach. The separation is both evident in terms of distance as well as the landscape context where the proposed turbines are located within a different landscape type and landscape area to the Hill.

The assessments and analysis included in this report could not identify any specific heritage sites, monuments or landscape features in close proximity to the proposed turbines, or within their line of sight from the Hill, which indicate a cultural connection between the landscape of Uisneach and the landscape of the Wind Farm Site. The assessment determined that the proposed turbines would have very limited potential to impact views towards the Hill of Uisneach, only in a very small area immediately west of the proposed turbines (See Section 5.2.7). Therefore, the proposed turbines have a 'Negligible' change to the overall appearance and character of the Hill as a landmark and feature as perceived from within the surrounding landscape. Considering all of the factors mentioned above the magnitude of change is 'Slight' (See Definition in Appendix 12-1 of the EIAR).

'Very High' sensitivity balanced with a 'Slight' Magnitude of change and considering all of the relevant factors, the overall residual landscape effect is ***'Moderate'****, 'Negative' and 'Long Term'.*

12.7.3.2 Visual Effects

12.7.3.2.1 *Selection of Photomontage Viewpoints*

Analysis of mapping and new visualisations included as part of the Technical Report have provided greater clarity on the reality of the visual impact likely to occur from receptors visiting the Hill of Uisneach. Whilst there are some limitations that remain in relation to access the private landholdings at the Hill itself, all of the supplementary information and materials in this report and photomontages (Appendix 4 Photomontage Booklet), and information from the EIAR are sufficient to inform an effective and robust visual impact assessment. The proposed turbines will be visible from vantage points on the western aspect of the Hill of Uisneach and therefore visual effects will occur.

Firstly, all visual receptors visiting the Hill of Uisneach are given a 'Very High' sensitivity on account of the importance and significance of the Hill and the likelihood that most receptors are visiting in a recreational capacity to experience the monuments on the Hill and its landscape setting, as well as take in the panoramic views available from elevated vantage points.

The greatest visual impact will occur from the skyline ridge, beyond the field boundary to the west of St Patrick's Bed where there will be clear and uninterrupted views of the proposed turbines. From these vantage points on the western aspect of the Hill, the proposed turbines will be seen as a linear array beyond the foothills of the Central Hills (See Discussion and analysis of Viewpoint 19 in Section 5.2.6. Considering the scale of the proposed turbines at the distance from receptors and their acceptable arrangement and form as a collective group of turbines, they are effectively absorbed and accommodated within the expansive, wide and long-ranging landscape views and the magnitude of change is considered 'Slight'.

'Very High' sensitivity balanced with a 'Slight' Magnitude of change and considering all of the relevant factors, the overall residual landscape effects is ***'Moderate'****, 'Negative' and 'Long Term'.*

13. ARCHAEOLOGY AND CULTURAL HERITAGE

As identified in Section 12 above, the Hill of Uisneach Technical Report (Appendix 3 to the Response to Submissions Document) should be read in conjunction with Chapter 12: Landscape and Visual and Chapter 13: Archaeology and Cultural Heritage of the submitted EIAR. It is not intended to replicate the supplementary baseline information and assessment provided in the Hill of Uisneach Technical Report, however, it is important to note, with respect to Chapter 13 of the EIAR, Section 6.5 of the Hill of Uisneach Technical Report presents an update to the Likely Significant Effects section presented in Chapter 13 of the submitted EIAR. This update is reflected below in the corresponding section of Chapter 13 – *Section 13.4 Likely Effects and Associated Mitigation Measures.*

There are no other relevant updates to this Section of the EIAR.

13.4 Likely Effects and Associated Mitigation Measures

13.4.3 Operational Phase Potential Impacts (Indirect)

13.4.3.1 UNESCO World Heritage sites

13.4.3.1.1 *The Hill of Uisneach*

The following text is an extract from Section 6.5.1 of the Hill of Uisneach Technical Report (Appendix 3 to the Response to Submissions Document).

> *From an archaeological and cultural heritage perspective and as determined in Chapter 13 of the EIAR no potential visual effects to the immediate setting of the Hill of Uisneach or the monuments therein will occur as a result of the Proposed Development. A change to the wider setting in which the Hill of Uisneach and relevant monuments (as discussed above) are located is acknowledged but will not result in any significant visual effects. The assessment carried out as part of this report has identified that the Proposed Development will result in a slight intrusion and therefore an alteration to the existing panoramic view in one direction, which forms of an important and integral aspect of the receiving archaeological environment of the Hill. A change in view from the western slopes of the Hill of Uisneach is acknowledged, which, though noticeable, does not lead to a significant loss of character, integrity and data about this cultural heritage asset. Given the very high significance of the Hill of Uisneach, which is considered of international importance, and the low magnitude of impact as a result of the Proposed Development, the overall significance of effects is considered to be Moderate.*
>
> *In the context of the findings of the original EIAR and in light of the additional assessments undertaken as part of this report it is considered that potential visual effects to the wider setting of the Hill of Uisneach and any relevant monuments will be **Moderate**, Negative and Long Term (EPA, 2022). At a distance of over 8km significant visual effects to the Hill of Uisneach, its wider landscape setting, and to any relevant monuments as discussed above will not occur as a result of the Proposed Development. It is also noteworthy that the potential effect of the Proposed Development as stated above is reversible and will only last for the duration of the operational lifetime of the proposed turbines. It is considered that the potential effect to the Hill of Uisneach, the monuments located thereon, and its wider setting will be reversed once the proposed turbines are removed after their lifetime of operation.*

14. MATERIAL ASSETS

There are no updates to this Section of the EIAR.

15. MAJOR ACCIDENTS AND NATURAL DISASTERS

There are no updates to this Section of the EIAR.

16. INTERACTION OF THE FOREGOING

There are no updates to this Section of the EIAR.

17. SCHEDULE OF MITIGATION

All updates to mitigation measures identified in the preceding sections are included in the below table which is to be read in conjunction with the Chapter 17.

17.1 EIAR Mitigation Measures

Table 17-1 Schedule of Mitigation

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
Chapter 5: Human Beings					
Construction Phase					
MM50	Human Health	EIAR Section 5	The Proposed Development will be constructed, operated and decommissioned in accordance with all relevant Health and Safety Legislation, including: › Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005); › Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2016 (S.I. No. 36 of 2016); › S.I. No. 528/2021 - Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021 and › Safety, Health and Welfare at Work (Work at Height) Regulations 2006 (S.I. No. 318 of 2006). A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. › A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. This will be prepared on a preliminary basis at the procurement stage and developed further at construction stage. › All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project. Safepass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required. The developer is required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety and Health Plan. Public safety will be addressed by restricting Site access during construction. Fencing will be erected in areas of the Site where uncontrolled access is not permitted. › Goal posts will be established, where necessary, under overhead electricity lines for the entirety of the construction phase of the Wind Farm Site. › The suitability of machinery and equipment for use near power lines will be risk assessed. › All staff will be trained on operating voltages of overhead electricity lines running the Site. All staff will be trained to be aware of the risks associated with overhead lines. All contractors that may visit the Sites are made aware of the location of lines before they come on to Site. › Barriers will run parallel to the overhead line at a minimum horizontal distance of 6 metres on plan from the nearest overhead line conductor wire. › When activities must be carried out beneath overhead lines, e.g., component delivery or substation construction, a Site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			prior to any works. Overhead line proximity detection equipment will be fitted to machinery when such works are required. › Information on safe clearances will be provided to all staff and visitors. › Signage indicating locations and health and safety measures regarding overhead lines will be erected in canteens and on Site. › All staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the Site Health and Safety Plan. The scale and scope of the project necessitates that a Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) are required to be appointed in accordance with the provisions of the Health & Safety Authority's *'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013'*. The PSDP appointed for the construction stage shall be required to perform his/her duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to): › Identify hazards arising from the design or from the technical, organisational, planning or time related aspects of the project; › Where possible, eliminate the hazards or reduce the risks; › Communicate necessary control measures, design assumptions or remaining risks to the PSCS so they can be dealt with in the Safety and Health Plan; › Ensure that the work of designers is coordinated to ensure safety; › Organise co-operation between designers; › Prepare a written Safety and Health Plan;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› Prepare a safety file for the completed structure and give it to the client; and › Notify the Authority and the client of non-compliance with any written directions issued. The PSCS appointed for the construction stage shall be required to perform his/her duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to): › Development of the Safety and Health Plan for the construction stage with updating where required as work progresses; › Compile and develop safety file information. › Reporting of accidents / incidents; › Weekly Site meeting with PSCS; › Coordinate arrangements for checking the implementation of safe working procedures. Ensure that the following are being carried out: › Induction of all Site staff including any new staff enlisted for the project from time to time; › Toolbox talks as necessary; › Maintenance of a file which lists personnel on Site, their name, nationality, current Safe Pass number, current Construction Skills Certification Scheme (CSCS) card (where relevant) and induction date; › Report on Site activities to include but not limited to information on accidents and incidents, disciplinary action taken and PPE compliance; › Monitor the compliance of contractors and others and take corrective action where necessary; and › Notify the Authority and the client of non-compliance with any written directions issued.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			The Proposed Development will connect to the existing Thornsberry 110kV substation. Grid Connection via Thornsberry will comprise an on-site 110kV substation and underground electrical cabling, measuring approximately 31km in total, predominantly located within the public road corridors. Health and safety guidelines for working within and around electrical substations and overhead lines will be adhered to on site.		
MM54	Human Health	EIAR Section 5, 10	› In periods of extended dry weather, dust suppression may be necessary along haul roads, site roads, and other infrastructure to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling ponds in the Wind Farm Site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads, and site compounds to prevent the generation of dust where required. Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff. › All plant and materials vehicles shall be stored in dedicated areas (on Site). › Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and compaction. › Turbines and construction materials will be transported to the Site on specified haul routes only. › The agreed haul route roads adjacent to the Site will be regularly inspected for cleanliness and cleaned as necessary. › The Site access roads will be checked weekly for damage/potholes and repaired as necessary. › The transport of construction materials to the Site that have significant potential to cause dust, will be undertaken in tarpaulin or similar covered vehicles where necessary.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› The transportation of dry excavated material from the Site to the designated on-site spoil management areas, which may have potential to generate dust will be minimised. If necessary, excavated material will be dampened prior to transport to the spoil management areas. › A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Appendix 4-2). The CEMP includes dust suppression measures.		
Chapter 6: Biodiversity					
Pre-Commencement Phase					
MM59	Bats	EIAR Section 6 Addendum Bat Report Appendix 6-2a	On a precautionary basis, a pre-commencement survey is proposed for any structures requiring removal and any trees with PRFs requiring felling. In accordance with Marnell et al. (2022), the following updated best practices will apply to tree works and habitat management: › A pre-commencement survey will be carried out by a suitably qualified ecologist on trees/structures with PRFs proposed for felling/removal. › If, following the pre-commencement survey, a bat roost is identified within any of the trees/structures to be removed/pruned, a bat derogation licence will be obtained from the NPWS, prior to removal and the removal activity will be supervised by a qualified ecologist.		
Construction Phase					
MM60	Bats	EIAR Section 6	In line with ILP Guidance Note 08/23 (2023), lighting design across the Proposed Development will be optimised to reduce potential impacts on bats:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
		Addendum Bat Report Appendix 6-2a	› Lighting spectra will prioritise warm light sources with colour temperatures below 2700K, minimising blue and green wavelengths known to disturb bats. › The use of adaptive lighting controls, including motion sensors, dimmers, timers, and lighting zones, will reduce unnecessary illumination duration and intensity near bat habitats. › All lighting will be designed with full shielding and directionality to prevent light spill onto identified commuting routes and foraging areas. › Post-installation lighting monitoring will be conducted, enabling adaptive management should evidence of bat disturbance or collision risk arise. In accordance with Marnell et al. (2022), the following updated best practices will apply to tree works and habitat management: › All works affecting potential or confirmed roosts will be undertaken at the appropriate time of year under the necessary derogation licenses and with continuous supervision from a licensed bat ecologist, where required. › Linear features such as hedgerows and treelines, which provide essential bat commuting routes, will be retained and enhanced wherever possible to maintain habitat connectivity. › New planting and veteranisation will prioritise native tree and shrub species to improve long-term roosting and foraging habitat quality.		
Operational Phase					
MM65	Bats	EIAR Section 6 Appendix 6-2	**Monitoring and Adaptive Management** To ensure continued effectiveness of mitigation measures, a comprehensive monitoring programme will be maintained:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› Post-construction bat activity and mortality monitoring will continue for a minimum of three years, following the guidelines of Marnell *et al.* (2022). › Adaptive mitigation, including potential turbine curtailment or lighting adjustments, will be implemented as necessary if monitoring indicates elevated collision risk or disturbance.		
EIAR Chapter 9 Water					
Construction Phase					
MM80	Excavation Dewatering, Surface Water Quality and Piling	EIAR Section 9	Proposed mitigation measures relative to piling works will comprise: › Strict QA/QC procedures for piling works will be followed; › Piles will be kept vertical during piling works; › Good workmanship will be employed during all piling works; and, › Where required use bentonite seal to prevent upward/downward movement of surface water/groundwater.		
Chapter 10 Air & Climate					
Construction Phase					
MM90	Exhaust Emissions	EIAR Section 10	› The MRF facility will be local to the Proposed Development site to reduce the amount of emissions associated with vehicle movements. The nearest licensed waste facility to the Wind Farm Site is Barna Waste, Athlone which is located approximately 13km to the south-west of the Wind Farm Site. › Waste associated with the construction of the Grid Connection underground electrical cabling route will be disposed of at the closest MRF to where waste is generated along the underground		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			electrical cabling route. There are two licensed waste facilities in the vicinity of the underground electrical cabling route, and these are Barna Waste, Athlone as outlined above and the Derryclure Landfill which is located approximately 6.5km to the south of the Thornsberry 110kV substation at Tullamore.		

17.2 EIAR Monitoring Measures

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
MX17	Bats	EIAR Section 6	**Monitoring and Adaptive Management** To ensure continued effectiveness of mitigation measures, a comprehensive monitoring programme will be maintained: › Post-construction bat activity and mortality monitoring will continue for a minimum of three years, following the guidelines of Marnell *et al.* (2022). › Adaptive mitigation, including potential turbine curtailment or lighting adjustments, will be implemented as necessary if monitoring indicates elevated collision risk or disturbance.	Years 1, 2, 3	Annually	Project Ecologist