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DESIGNING AND DELIVERING A SUSTAINABLE FUTURE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED LITTLETON WIND FARM, CO. TIPPERARY

Volume 2 - Main EIAR

Chapter 10 - Air Quality and Climate

Prepared for:

Littleton Wind Farm DAC

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10. AIR QUALITY AND CLIMATE

10.1 Introduction

This chapter identifies, describes and assesses the likely significant direct and indirect effects on air quality and climate arising from the construction, operation and decommissioning of the Proposed Development, as well as the effects of climate change on the Proposed Development and the ability of the Proposed Development to adapt to possible climate changes over the course of its lifetime.

The Proposed Development assessed in this EIAR comprises the following elements:

- The 'Proposed Wind Farm' (also referred to in this EIAR as the '**Site'**);
- The 'Proposed Grid Connection' (also referred to in this EIAR as the **'GC'**);
- The 'Turbine Delivery Route' (also referred to in this EIAR as the **'TDR'**);
- The 'Biodiversity Enhancement and Management Plan Lands' (also referred to in this EIAR as the **'BEMP Lands'**);

The Proposed Development consists of an 11 no. turbine wind farm and associated infrastructure including internal access tracks, hard standings, amenity trails, an onsite borrow pit, peat deposition areas, a permanent meteorological mast, an onsite 110kV substation and associated grid connection infrastructure, internal electrical and communications cabling, temporary construction compounds, drainage infrastructure, biodiversity management and enhancement measures, temporary accommodation works along the Proposed Turbine Delivery Route and all associated works related to the construction of the Proposed Development.

The Wind Farm Site is located within the jurisdiction of Tipperary County Council. The closest settlements to the Site are Urlingford (ca. 5 km to the north-east), Gortnahoe (ca. 2.5 km to the east), Twomileborris (ca. 2 km to the west), Littleton (ca. 2.5 km to the west) and New Birmingham (ca. 2 km to the east). The town of Thurles is located approximately 9km to the west of the Site. The Wind Farm Site is located within a bog group and includes lands in the townlands of Longfordpass North, Longfordpass South, Leigh, Bawnreagh, Clonoura, Noard, Derryhogan, Derryvella, Ballybeg, Lanespark, Newhill and Killeen, County Tipperary.

The location of the Proposed Development is shown in Figure 4.1, contained within Volume 4 of the EIAR. The general layouts of the Proposed Wind Farm, Grid Connection (GC) route and Turbine Delivery Route (TDR) are presented in Figures 4.2 to 4.4, Volume 4 of the EIAR.

A detailed description of the Proposed Development assessed in the EIAR is contained in Chapter 4, Volume 2 of the EIAR.

The proposed GC route, whilst assessed as part of this EIAR, will not form part of this planning application. If the Proposed Development is permitted, the GC route will be subject to a separate planning application.

10.1.1 Statement of Authority

This chapter has been prepared by Aoife Hurd, and reviewed by Conor Auld, of Fehily Timoney and Company.

Aoife Hurd is a Senior Project Engineer at Fehily Timoney and Company working in the Energy and Planning Department. She holds a First-Class Honours Bachelor's Degree and Master's Degree in Civil, Structural and Environmental Engineering from Trinity College Dublin. She is a member of Engineers Ireland (EI) and has ca. 3.5 years' experience working on residential, infrastructure and renewable energy projects at all stages from concept to construction. Aoife provides technical and engineering support to the EIAR teams for a variety of commercial scale renewable energy projects.

Aoife has experience in the preparation of Traffic and Transportation assessments, Air and Climate assessments, as well as other technical chapters associated with EIARs and environmental reports for renewable energy projects ranging from wind farms, solar farms, grid connections, battery energy storage systems and ancillary grid infrastructure projects. She also has experience in the design of renewable energy developments.

Conor Auld is a Principal Planner with a MSc in Urban and Rural Design and BSc in Environmental Planning from Queen's University Belfast. Conor also holds an advanced Diploma in Planning and Environmental Law from The Honourable Society of King's Inns. Conor has 10 years' experience and has prepared several EIAR Chapters and assisted in EIAR management for wind farm developments throughout Ireland.

10.1.2 Air Quality

According to the EPA, the number of deaths directly linked to air pollution is estimated at 1,600 premature deaths in Ireland annually due to poor air quality (predominantly due to $PM_{2.5}$), with a figure of 6.7 million premature deaths worldwide (UNEP, 2024).

Ireland's most recent air quality monitoring indicates that we meet current EU standards (EPA, 2024). However, in the short term, when compared with WHO guideline values and EEA reference level values; ozone, particulate matter and PHAs are of concern and NO_2 is expected to increase as traffic on our roads increases.

The use of fossil fuel-based electricity generation leads to NOx and SOx emissions; however, wind generation does not produce any NOx or SOx emissions. An operational substation will not produce these emissions either.

To protect our health, vegetation and ecosystems, EU Directives have set out air quality standards for Ireland and the other member states for a wide variety of pollutants. These Directives include how we should monitor, assess and manage ambient air quality. The assessment presented in this EIAR has been carried out in accordance with the relevant EU and national legislation. In addition, regard has been had to the relevant local authority Development Plans for County Tipperary, as the decision-maker is required to consider these plans in determining the application. Chapter 2, Volume 2 sets out the specific air quality and climate objectives of these Development Plans and confirms that the Proposed Development is consistent with those objectives.

Table 10.1 below details the limit values for pollutants as per the CAFE Directive.

Table 10-1: Limit Values of Directive 2004/107/EC and 2008/50/EC

Pollutant	Limit Value Objective	Averaging Period	Limit Value (ug/m3)	Limit Value (ppb)	Basis of Application of the Limit Value
SO_2	Protection of human health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year
SO_2	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year
SO_2	Protection of vegetation	calendar year	20	7.5	Annual mean
SO_2	Protection of vegetation	1 Oct to 31 Mar	20	7.5	Winter mean
NO_2	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year
NO_2	Protection of human health	calendar year	40	21	Annual mean
NO + NO_2	Protection of ecosystems	calendar year	30	16	Annual mean
PM_{10}	Protection of human health	24 hours	50		Not to be exceeded more than 35 times in a calendar year
$PM_{2.5}$	Protection of human health	calendar year	40		Annual mean
$PM_{2.5}$ - stage 1	Protection of human health	calendar year	25		Annual mean
$PM_{2.5}$ - stage 2	Protection of human health	calendar year	20		Annual mean
Lead	Protection of human health	calendar year	0.5		Annual mean
Carbon Monoxide	Protection of human health	8 hours	10,000	8620	Not to be exceeded
Benzene	Protection of human health	calendar year	5	1.5	Annual mean

There are no statutory limits for dust deposition, however, the TA Luft (German Government 'Technical Instructions on Air Quality') (TA Luft 2002) state a guideline value of maximum 350 mg/m2/day.

There are also no limit values in relation to ozone.

10.1.3 Climate - Overview

Carbon dioxide (CO_2) is a greenhouse gas which, if released in excessive amounts, can lead to increases in global temperatures known as 'global warming' which can influence climate change. Once the Proposed Development is constructed it will have a long-term positive impact by providing a sustainable energy source. Should the Proposed Development not be developed, fossil fuel power stations will be the primary alternative to provide the required quantities of electricity. This will further contribute to greenhouse gas and other emissions, and hinder Ireland in its commitment to meet its target to increase electricity production from renewable sources and to reduce greenhouse gas emissions.

The revised Energy Efficiency Directive and the revised Renewable Energy Directive (RED III) entered into force in October and November 2023 respectively. These recast directives include a binding renewable energy target for the EU for 2030 of at least 42.5% (and aiming for 45%), up from the 32% target put forward in the 2018 version of the legislation. This legislation will help the EU meet the Paris Agreement goals. In addition, the European Union (Planning and Development) (Renewable Energy) Regulations 2025 have recently been published, providing the national legislative framework to support the implementation of these EU objectives within Ireland's planning system.

The Government published an updated Climate Action Plan 2024 (CAP24) in December 2023. This third updated action plan follows on from the inaugural plan of 2019 which was a result of the Irish Government declaring a climate and biodiversity emergency on 9th May 2019.

The CAP24 provides a framework for delivering the Government's target of a 51% reduction (relative to 2018) in greenhouse gas (GHG) emissions by 2030. CAP24 follows The Climate Action and Low Carbon Development Act 2015 as amended by 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. The Act provides a governance framework for annual revisions of the Climate Action Plan and the development of a National Long-Term Climate Action Strategy at least once every ten years. As part of this plan, the Government is also committed to reducing emissions by an average 7% per annum by 2030. The Action Plan is underpinned by a series of sectoral emissions reduction ambitions and enabling actions, with a selection of relevant actions that are relevant to the Proposed Development outlined below.

CAP24 sets out an objective to more than double Ireland's onshore wind energy capacity to 9 GW by 2030 in order to meet new renewable energy targets and reduce emissions.

The policies and objectives of CAP24 are reflected in the National Energy & Climate Plan (NECP) 2021-2030, which was published in July 2024.

The NECP was prepared to incorporate all planned policies and measures that were identified up to the end of 2019 and will collectively deliver a 42% reduction by 2030 in greenhouse gas emissions (from 2005 levels).

Climate Action Plan 2025 (CAP25), approved in July 2025, builds upon the trajectory established by CAP24, maintaining the central targets while placing greater emphasis on delivery and accountability mechanisms. CAP25 refines existing actions, updates timelines, and places particular focus on:

- Enhancing planning and grid connection processes to expedite renewable energy deployment;
- Strengthening local authority roles through updated guidelines and supports for local energy strategies;
- Increasing transparency in sectoral progress through more granular reporting;
- Integrating climate resilience and adaptation measures more directly into development planning and infrastructure delivery.

CAP25 represents a continued evolution of Ireland's climate governance framework and reaffirms the Government's commitment to achieving legally binding emissions reduction targets.

Tipperary County Council has set targets for reducing carbon emissions as part of its Climate Action Plan (CAP) 2024-2029. The Council aims to achieve a 51% reduction in its own greenhouse gas emissions and a 50% improvement in energy efficiency by 2030. This plan is part of a broader effort to support the National Climate Objective at local, sectoral, and community levels.

10.1.4 Carbon Emissions

The carbon balance of proposed wind farm developments in peatland habitats has attracted significant attention in recent years. When developments such as wind farms are proposed for peatland areas, there will be direct impacts and loss of peat around the development footprint. There may also be indirect impacts where it is necessary to install drainage in certain areas to facilitate construction. The works can either directly or indirectly allow the peat to dry out, locally, which permits the full decomposition of the stored organic material with the associated release of the stored carbon as CO_2. It is essential therefore that any wind farm development in a peatland area displaces more CO_2 produced from fossil fuel sources than it releases during the construction, operation and decommissioning of the wind farm site.

Peat depths across the Site range from approximately 0.1 m to 6.0 m with an average peat depth of 1.5 m. The thickness of peat ranged from 0.65 m to 3.0 m at the turbine locations and up to 3.1 m at the substation location. The Corine Land Cover database for Ireland (based on interpretation of satellite imagery and national vector mapping data) identifies the following land cover types within and surrounding the Site: peat bogs, moors and heath, coniferous forestry, mixed forestry, land principally occupied by agriculture, non-irrigate land, pastures and transitional woodland scrub. Land use at the Site is dominated by peat bog with smaller pockets of forestry and land used for agricultural purposes. Littleton is generally surrounded by farmland but there are extensive conifer plantations outside the eastern and western boundaries.

For more information, please refer to Chapter 8, Volume 2 and the Peat and Spoil Management Plan, located in Appendix 8.1, Volume 3 of the EIAR.

The Scottish Carbon Calculator Tool[1] was used to calculate whole life carbon emissions and carbon savings as a result of the Proposed Development. Input data used in the calculations is presented in Appendix 10.1, Volume 3 of this EIAR.

10.2 Methodology

10.2.1 Context

The primary land-uses within and in the vicinity of the Site comprises peat bog and land for agricultural practices.

Due to the non-industrial nature of the project and the general character of the surrounding environment, air quality sampling was deemed to be unnecessary for this EIAR. It is expected that air quality in the existing environment is good, since there are no major sources of air pollution (e.g. heavy industry) in the vicinity of the site.

[1] https://informatics.sepa.org.uk/CarbonCalculator/index.jsp

The production of energy from wind turbines has no direct emissions as is the case for fossil fuel-based power stations. Harnessing more energy by means of renewable sources will reduce dependency on fossil fuels, thereby resulting in a reduction in harmful emissions that can be damaging to human health and the environment. Some minor short term or temporary indirect emissions associated with the construction of the Proposed Development include vehicular and dust emissions.

As the operation of wind turbines does not give rise to emissions (except for back-up generators which would not be in use regularly), in respect of air and climate, this chapter focuses on the potential emissions which may arise during the construction and decommissioning phases of the Proposed Development, in accordance with best practice. The Scottish Windfarm Carbon Assessment Tool was used to predict the carbon savings for the wind farm for an operational period of 35 years, in accordance with best practice.

In line with best practice, the significance of likely effects has been assessed in accordance with the Environmental Protection Agency's 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' (EPA, 2022)[2] through comparison of the character of the predicted effect to the sensitivity of the receiving environment.

The scale of effect is determined in relation to the sensitivity of the receptor and the potential magnitude of change from baseline conditions. Figure 10-1 below presents how comparison of the magnitude of the predicted impact to the sensitivity of the receiving environment can determine the significance of the impact. Sensitivity of the receiving environment can be 'high', 'medium', 'low' or 'negligible'. Description of impact is defined by its character, magnitude, duration, probability and consequences (pre-mitigation). The magnitude of impact can be 'high', 'medium', 'low' or 'negligible'.

Receptors are classified as either human or ecological. A human receptor refers to any location where a person or property may experience the adverse effects of airborne dust or dust soiling, or exposure to PM_{10}. An ecological receptor refers to any sensitive habitat that may be affected by dust soiling.

The sensitivity of each receptor is assessed based on its characteristics and distance from the source. This approach ensures robust assessment of potential air quality impacts throughout the Proposed Development.

[2] Guidelines on the information to be contained in Environmental Impact Assessment Reports, EPA, 2022, *Available at:* Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)

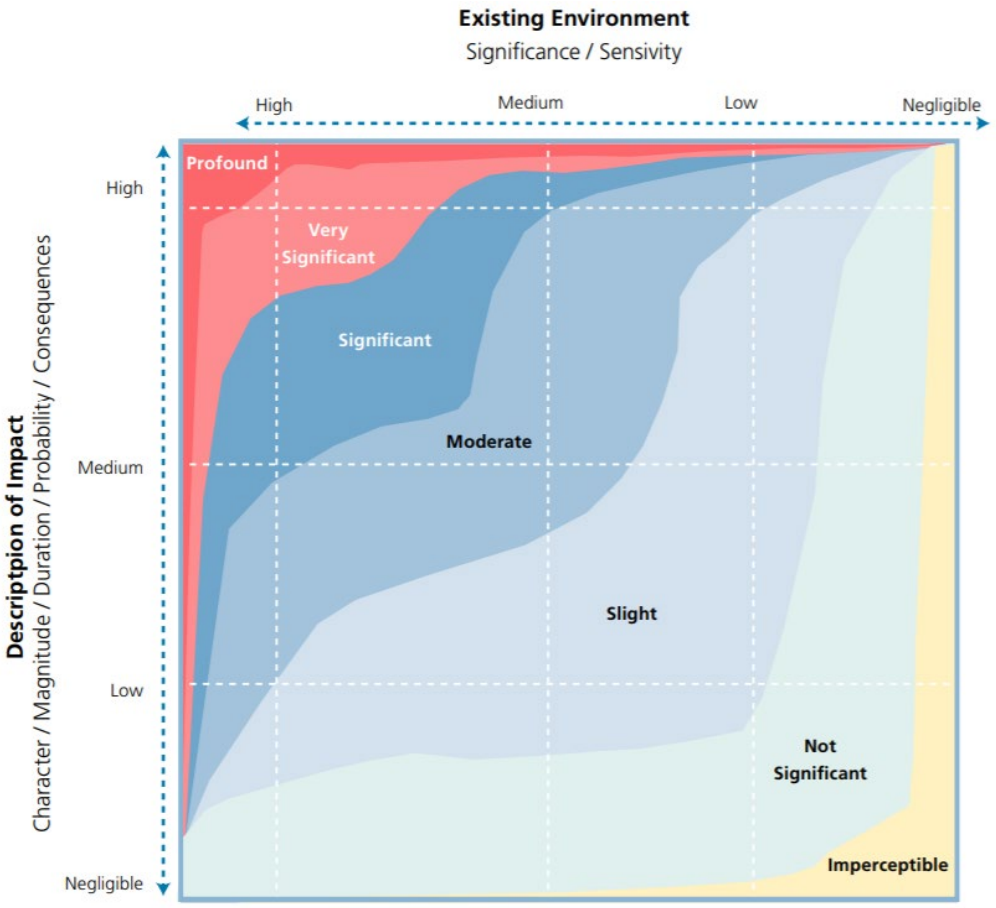

Figure 10-1: Classifications of Significance of Impacts (EPA, 2022)[3]

10.2.2 Air Quality

A review of existing air quality monitoring data undertaken by the Environmental Protection Agency (EPA) was reviewed on the EPA website (airquality.ie) in August 2025 and used to characterise the existing environment.

The WHO[4] defines dust as: *"Airborne contaminants (which) occur in the gaseous form (gases and vapours) or as aerosols. In scientific terminology, an aerosol is defined as a system of particles suspended in a gaseous medium, usually air in the context of occupational hygiene, is usually air. Aerosols may exist in the form of airborne dusts, sprays, mists, smokes and fumes".* In more general terms, dust is an airborne particulate matter ranging in diameter from 10 to 50 microns which is generated by organic and inorganic matter such as coal, grain, metal, ore, rock and wood. Dust can be generated by activities which process organic and inorganic matter. Dust can be stirred up from inert states through weather and wind conditions and deposit on all parts of the study area.

There are no statutory limits for dust deposition in Ireland. However, a maximum deposition rate of 350 mg/m2/day, applied as a monthly average with 95% compliance, is specified in the GermanTA Luft Standard (2002).

[3] Guidelines on the information to be contained in Environmental Impact Assessment Reports, EPA, 2022, *Available at:* Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)
[4] https://www.who.int/occupational_health/publications/en/oehairbornedust3.pdf

The impact assessment methodology involved the review and assessment of the construction methods for the Proposed Development, and the associated infrastructure to identify the potential for air emissions during construction and decommissioning.

To assess the impacts of construction dust emissions, the Institute of Air Quality Management (IAQM) guidance document: 'Guidance on the Assessment of Dust from Demolition and Construction'[5] was used, as is recommended in Transport Infrastructure Ireland's (TII) Air Quality Assessment of the NRA's Assessment Criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation in Place[6] was used. This approach involves several "steps" to assess the potential impact of dust on nearby receptors and is considered to be best practice.

The guidance involves a stepped approach, where Step 1 is a screening assessment, where the Proposed Development is screened in or out for the requirement of a full air quality assessment (AQA). Per Step 1, the Proposed Development will require an AQA if it exceeds any of the below criteria:

- Road alignment change of 5 metres or more;
- Daily traffic flow changes by 1,000 AADT or more;
- HGVs flows change by 200 vehicles per day or more;
- Daily average speed changes by 10 km/h or more; or
- Peak hour speed changes by 20 km/h or more.

If any of the above criteria are exceeded, the AQA proceeds to the following steps. Typically for wind farm developments, the AQA is screened out at Step 1. This screening process will be completed in Section 10.4.2.

The steps involved in the dust impact assessment, as prescribed by the IAQM, are as follows:

1. Screen the requirement for a dust impact assessment
2. Assess the risk of dust impacts by:
   - 2A The scale and nature of the works – the "magnitude" of the potential dust emission
   - 2B The sensitivity of the surrounding area
   - 2C Combining 2A and 2B into a risk matrix to assess the risk of dust impacts
3. Identify site-specific mitigation measures
4. Examine the residual impacts and assess if these are significant
5. Prepare a Dust Assessment Report

Step 1 in the screening process has been set out by the IAQM to be deliberately conservative. One of the threshold criteria which will trigger the requirement for a dust impact assessment, for example, is if a human receptor exists within 350m of the site boundary. As this is the case for the Proposed Development, the screening process indicates that a dust impact assessment is required.

[5] http://iaqm.co.uk/wp-content/uploads/guidance/iaqm_guidance_report_draft1.4.pdf
[6] https://www.tiipublications.ie/library/PE-ENV-01107-01.pdf

Step 2 of the process is described in the Impact Assessment section of this chapter (Section 10.4.2). Step 3 is outlined in Section 10.5.1 - Mitigation Measures and Section 10.6.1 - Residual Impacts provides a summary of Step 4. Therefore, Step 5 has been addressed by writing the process and results of the dust impact assessment herein.

Table 10.3, Table 10.4, and Table 10.5 show the descriptors for changes in annual mean PM_{10}, $PM_{2.5}$, and nitrogen dioxide at receptors.

10.2.3 Climate

A desktop study assessment was undertaken of available climatic information to characterise the existing environment. The climatic conditions for the wider geographical area have been derived from historical meteorological measurements compiled by Met Éireann at Oak Park weather station which is approximately 54 km northeast of the Site and associated infrastructure, this is the closest weather station to the Site.

Monthly meteorological data from Met Eireann was reviewed in August 2025 (source: www.met.ie/climate) to gain an understanding of the existing climatic condition of the Site. These meteorological measurements provided measurements of total rainfall, mean temperature, and wind speed for Oak Park weather station for the period of January 2022 – November 2025.

Please refer to the climate impact assessment (Section 10.4.3) of this EIAR chapter for the impacts on both the micro- and macro-climates of the Proposed Development and activities associated with the construction, operational and decommissioning phases of the Proposed Development.

10.2.4 Carbon Emissions

The impact assessment considered the net impact that operating the Proposed Development will have in terms of CO_2 and its displacement of CO_2 from other energy sources over the carbon losses caused by its manufacturing, transportation, construction and decommissioning using the Scottish Carbon Calculator tool.

The impact assessment also considered the positive impacts the Proposed Development will have on contributing to national targets for the reduction of greenhouse gas emissions.

The amount of CO_2 that could potentially be avoided on an annual basis due to the Proposed Development is estimated based on the expected output of the wind farm. The net displacement value may increase or decrease somewhat, as the type/range of electricity generation in Ireland develops, under different fuel price scenarios and as demand changes over time, and as more storage, interconnection and demand side management (smart meters) come online. Refer to Section 10.4.4 for details of the calculations for carbon saving as a result of the Proposed Development.

The updated Scottish Government carbon calculator was developed in 2008 to calculate the impact of wind farm developments on the soil carbon stocks held in peat. This methodology was refined and updated in 2011 based on feedback from users of the initial methodology and further research in the area. The web-based version of the carbon calculator, which supersedes the excel based versions of the tool, was released in 2016. The tool provides a straightforward method for estimating the impacts of wind farms on the carbon dynamics of peatlands. The tool also provides guidance when figure inputs are unknown. The carbon calculator, whilst designed for Scottish wind farm developments is used for assessing Irish wind farm developments due to the similarity in development sites, i.e. high ground on peatlands which contain forestry in a similar climate and in our professional opinion this methodology constitutes best practice for carbon assessments in Ireland.

The calculator was created to calculate the loss of carbon from acidic bog or fen habitat and defines peat soils as soils with a surface horizon greater than 50 cm deep. The calculator takes into account the carbon fixing potential from peatland plants (which is small) and calculates the total area of peat excavation and the total area of peat affected by drainage, using the annual gains due to carbon fixing potential and the time required for any habitat restoration. Carbon stored within the peat itself represents a large potential source of carbon which can be lost during excavation and drainage.

Forestry on proposed wind farm sites can affect wind energy yields and therefore clear felling is generally required. Carbon losses due to felling are calculated from the area to be felled, the average carbon sequestered annually, and the lifetime of the wind farm. The calculator also considers the carbon emissions from the life cycle analysis of the wind turbines and the backup source to calculate carbon savings and carbon payback times of a wind farm. Site specific capacity factor is also required to provide a realistic payback time for a site. The calculator also takes into account a grid mix emission factor. The calculator uses default values from the Intergovernmental Panel on Climate Change (IPCC, 1997) as well as site specific equations from scientific literature to calculate carbon loss.

In keeping with guidance, specific figures have been used wherever possible, and where this information was not available the guidance provided by the calculator was used. The assumption to use the fossil fuel generation emission factor was made based on the reality that additional wind generation will displace fossil fuel generation (Scot. Gov., 2018). With regards to the Proposed Development characteristics the following presumptions for the Site were made: the lifetime of the windfarm is 35 years; the capacity factor is 31% and the fraction of output to back up is 1.55% (i.e. 5% of capacity factor).

An average depth of peatland was provided for the entire site (1.5m) and turbine areas (1.03m). Whilst the carbon content for dry peat, dry bulk density and extent of drainage around drainage features was unknown and were likely to be below the figures provided in the accompanied guidance, guidance figures were used with a worst-case scenario of 0.5m taken for drainage, the average depth of peatland across the site is significantly less than 0.5m, therefore 0.5m is considered the maximum depth and therefore worst-case scenario. It is therefore highly likely that the carbon loss figure for the project will be slightly higher than the actual carbon loss for the site.

The Scottish Government online carbon calculator as outlined above, was used to assess the impacts of the Proposed Development in terms of potential carbon losses and savings taking into account the whole life of the wind farm development including materials manufacture, transport and installation and all construction activities including peat removal, drainage, and forestry felling. A copy of the outputs is provided as Appendix 10.1, Volume 3 of this EIAR. A summary of the main CO_2 losses due to the Proposed Development are summarised in Table 10.8, Section 10.4.4 of this chapter.

10.2.5 Technical Difficulties and Limitations

In lieu of a specific tool available for calculating the carbon emissions from a wind farm development based in Ireland, the Scottish online carbon calculator was used, as described in Section 10.2.4 above. Whilst designed for Scottish wind farm developments, it is used for assessing Irish wind farm developments due to the similarity in development sites, i.e. high ground on peatlands which contain forestry in a similar climate. The tool has become an 'industry standard' for the purposes of environmental impact assessment on climate for wind farm developments in Ireland.

No other technical difficulties or limitations were encountered in the production of this EIAR chapter.

10.3 Existing Environment

10.3.1 Air Quality

European air quality legislation requires that each member state be defined in terms of Zones and Agglomerations for air quality, with Ireland divided into four zones. The EPA has designated four zones within Ireland[7]:

- Zone A: Dublin City and its environs
- Zone B: Cork City and its environs
- Zone C: 24 cities and towns (such as Galway, Limerick and Waterford cities and towns such as Naas, Newbridge, Celbridge, Leixlip) with a population of greater than 15,000
- Zone D: covers the remainder of the country

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives. The site of the Proposed Development, including the grid connection (GC) are in Zone D.

The air quality in each zone is monitored by the EPA and classified with respect to upper and lower assessment thresholds based on measurements over the previous five years. The number of monitoring locations required is dependent on population size and whether ambient air quality concentrations exceed the upper assessment threshold, are between the upper and lower assessment thresholds, or are below the lower assessment threshold. The Air Quality in Ireland Report 2023 (EPA 2024) noted that Ireland meets the current EU standards for air quality. However, Ireland is not on track to meet the health-based air quality guidelines set out by the WHO for 2026, as outlined in the National Clean Air Strategy[8].

The report showed that: particulate matter $PM_{2.5}$, originating primarily from the domestic burning of solid fuels, and NO_2, primarily an emission from road transport; are the main threats to good air quality in Ireland. $PM_{2.5}$ has been highlighted by the EEA as being predominantly responsible for most of the 1,410 estimated premature deaths. The Air Quality Index for Health map on the EPA website, shows that the current air quality within the Site, GC and Turbine Delivery Route (TDR) is classed as *Good*[9].

The EPA undertakes continuous ambient air monitoring at various stations in Ireland. Although no data is available for air quality in the immediate vicinity of the study area, it is expected that the air quality data from the nearest stations to the proposed Site are representative of the air quality at the Site. In the case of the Proposed Development, the closest EPA monitoring stations are listed below:

- Station 36 Callan Road, Co. Kilkenny (26 km east of the Site) - measures NO_2, O_3, and PM_{10}
- Station 75 Clonmel, Co. Tipperary (29 km south of the Site) - measures PM_{10} and $PM_{2.5}$
- Station 16 Portlaoise, Co. Laois (44 km north-east of the Site) - measures NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$

[7] EPA. Air Quality Zones
[8] 2023 02 24 NEW CAS WIP
[9] Air Quality Index for Health Map, EPA, *Available at:* Home | AirQuality.ie, *Accessed on:* 30 Jul. 25

A summary of data collected at these monitoring stations is found in the following sections. The EPA allows a maximum of 6 months of data to be exported to CSV files. Therefore, data for 17th of February 2025 to 17th of August 2025 has been used to create the summary tables below.

10.3.1.1 Sulphur Dioxide (SO_2)

Sulphur Dioxide for the period 17th of February 2025 to 17th of August 2025 recorded at Station 16 - Portlaoise, Co. Laois is presented in Table 10.2. Both the hourly limit value of 350 µg.m-3 and the maximum 24-hour limit value of 50 µg.m-3 as set out in the CAFE Directive were not exceeded during the monitoring period.

Table 10-2: Sulphur Dioxide Data from Station 16. Portlaoise, Co. Laois 17/02/2025 - 17/08/2025

Parameter	Measurement
Number of Hours	4353
No. of measured values	4324
Percentage Coverage	99%
Maximum hourly value	15.75 µg.m-3
98 percentile for hourly values	5.18 µg.m-3
Mean hourly value	2.40 µg.m-3
Maximum 24 hour mean	6.06 µg.m-3
98 percentile for 24-hour mean	4.87 µg.m-3

10.3.1.2 Particulate Matter (PM_{10})

Particulate matter are very small particles which can be either solid or liquid. Some of these particles occur naturally, while many are man-made. Particulate matter is referred to as PM. The number following the PM is used to show how small the PM is. The EPA monitors two types of PM and compare levels to limit values in the CAFE (Clean Air for Europe) Directive and WHO guidelines. These are PM_{10} and $PM_{2.5}$.

Particulate matter (PM_{10}) data for the period 17th of February 2025 to 17th of August 2025 recorded at Station 36 - Callan Road, Kilkenny is presented in Table 10.3. The maximum daily value of PM_{10} recorded during the period was 39.88 µg.m-3. This is below the threshold of 45 µg.m-3 which must not be exceeded any more than 18 times in a year. Therefore, it is assumed that the PM_{10} concentrations throughout the year are compliant with the CAFÉ Directive. The mean daily value recorded during the period was 11.29 µg.m-3 which does not exceed the threshold in the CAFÉ Directive of 20 µg.m-3 annual mean concentration.

Table 10-3: Particular Matter (PM_{10}) data from Station 36. Callan Road, Kilkenny 17/02/2025 - 17/08/2025

Parameter	Measurement
No. of Days	182
No of days for measured values	155
Percentage coverage	85%
Maximum daily value	39.88 µg.m-3
Mean daily value	11.29 µg.m-3

10.3.1.3 Particulate Matter ($PM_{2.5}$)

Particulate matter ($PM_{2.5}$) data for the 17th of February 2025 to 17th of August 2025 monitoring period in Station 75 Clonmel, Co. Tipperary is presented in Table 10.4.

The maximum daily value of $PM_{2.5}$ recorded during the period was 35.94 µg/m3 which is above the threshold of 25 µg/m3 which must not be exceeded any more than 18 times in a year. However, this was only exceeded on one occasion. Therefore, it is assumed that the $PM_{2.5}$ concentrations throughout the year are compliant with the CAFE Directive. The mean daily value recorded during the period was 7.02 µg/m3 which does not exceed the threshold in the CAFE Directive of 10 µg/m3 annual mean concentration.

Table 10-4: Particular Matter ($PM_{2.5}$) data from Station 75. Clonmel, Co. Tipperary 17/02/2025 - 17/08/2025

Parameter	Measurement
No. of Days	182
No of measure values	177
Percentage coverage	97%
Maximum daily value	35.94 µg.m-3
Mean daily value	7.02 µg.m-3

10.3.1.4 Nitrogen Dioxide (NO_2)

Nitrogen dioxide (NO_2) data for the 17th of February 2025 to 17th of August 2025 monitoring period in Station 36 - Callan Road, Kilkenny is presented in Table 10.5. The hourly limit values for the protection of human health were not exceeded during the assessment. Neither the hourly threshold (200 µg.m-3) nor the annual mean threshold (40 µg.m-3) values were exceeded during the monitoring period.

Table 10-5: Nitrogen Dioxide data from Station 36 Callan Road, Kilkenny 17/02/2025 - 17/08/2025

Parameter	Measurement
No. of Hours	4384
No of measure values	4363
Percentage coverage	99.5%
Maximum hourly value (NO_2)	38.87 µg.m-3
98 percentile for hourly rates (NO_2)	17.45 µg.m-3
Mean hourly value (NO_2)	4.38 µg.m-3

10.3.2 Climate

Climate is defined by the EPA as "the average weather over a period of time". Climate change is a term that is used to describe a "significant change in the measures of climate, such as temperature, rainfall, or wind, lasting for an extended period – decades or longer. [10]" There is scientific evidence[11] which suggests that the current climate is rapidly warming, having reached approximately 1°C above pre-industrial levels in 2017, increasing at a rate of 0.2 °C per decade. Warmer weather places pressure on flora and fauna which cannot adapt to a rapidly changing environment. In Ireland, the pressure on flora and fauna is mitigated due to the dominant influence of the Gulf Stream on Ireland's climate. Consequently, Ireland does not suffer from the extremes of temperature experienced by many other countries at similar latitudes.

The climatic conditions for the wider geographical area have been derived from historical meteorological measurements compiled by Met Éireann at Oak Park weather station which is approximately 53km northeast of the Site. These meteorological conditions are presented in Table 10.6 for the period of January 2022 - November 2025 (source: www.met.ie/climate). The long-term average (LTA) for the Oak Park weather station runs from 1981 - 2010.

[10] https://www.epa.ie/climate/communicatingclimatescience/whatisclimatechange/

[11] IPCC Special Report "Global Warming of 1.5°C": https://www.ipcc.ch/sr15/download/#chapter

Table 10-6: Climate Records January 2022 - November 2025

Total rainfall in millimetres for OAK PARK

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2025	103.8	91.2	21.0	80.4	31.7	62.7	59.8	37.5	87.5	106.2	110.1	48.3	840.2
2024	70.8	66.6	110.5	84.5	54.9	36.5	57.4	41.8	55.6	49.7	87.2	62.3	777.8
2023	66.1	14.3	103.4	49.4	23.3	46.0	144.0	62.9	126.8	141.8	53.8	104.6	936.4
2022	28.0	82.5	58.6	43.3	36.0	62.5	25.4	36.5	153.2	153.1	93.5	68.0	840.6
LTA	80.3	62.5	61.7	57.5	56.4	60.1	61.2	69.3	67.9	92.6	92.5	89.1	851.1

Mean temperature in degrees Celsius for OAK PARK

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2025	4.4	6.3	8.3	10.6	12.8	15.3	17.3	16.9	12.9	11.4	8.4	7.6	11.3
2024	4.5	7.8	7.8	9.6	13.3	13.6	15.1	15.5	12.8	11.3	8.1	7.1	10.6
2023	6.0	7.4	7.5	9.4	13.1	16.6	15.7	16.1	15.2	11.3	7.9	7.5	11.2
2022	5.4	7.2	7.4	8.4	12.6	14.2	17.2	16.9	13.5	12.1	8.9	3.8	10.7
LTA	5.3	5.5	6.8	8.7	11.3	14.0	15.8	15.5	13.4	10.4	7.4	5.6	10.0

Mean wind speed (knots) for OAK PARK

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2025	6.3	12.0	7.1	6.7	7.3	6.9	6.1	5.4	5.9	8.7	8.6	6.3	7.3
2024	8.3	7.3	8.5	7.5	5.7	5.8	8.5	7.3	6.8	5.5	7.3	10.3	7.4
2023	7.6	7.2	8.5	8.6	5.9	6.8	6.1	8.4	6.2	7.1	6.0	8.2	7.2
2022	7.1	8.9	6.7	5.8	5.9	7.7	6.4	7.0	7.3	7.6	7.3	-	7.1

10.4 Impact Assessment

10.4.1 Do-Nothing Impact (and Likely Evolution of the Baseline)

Irrespective of whether the Proposed Development proceeds or not, the peatlands within the site will continue to accumulate CO_2, as the Proposed Wind Farm will not interfere with the rehabilitation or compromise re-wetting and revegetation or regeneration at the site scale.

If the Proposed Development does not proceed, up to 9,585 tonnes of additional CO_2 could be accumulated by bog plants locally under the footprint of land lost due to the Wind Farm construction and the areas affected by drainage. This represents only 0.3% of the carbon emission saved (fossil fuel - mix electricity generation) over the 35-year lifetime.

On a national scale, if the Proposed Development does not proceed, there will be an increase in greenhouse gas emissions if increasing future electricity needs are not met by alternative renewable sources which has the potential to contribute to air pollution and climate change. The opportunity to contribute to Ireland's commitments under the Paris Agreement and to meet national targets as set out in the Climate Action Plan would also be lost.

Please note that irrespective of the consenting of the Proposed Wind Farm the remaining measures outlined in the Rehabilitation Plans, i.e. monitoring of the Littleton, Longfordpass and Lanespark Phase 1 measures and enhanced Phase 2 measures at nearby Ballybeg and Derryvella bogs, will continue to be implemented by BnM in agreement with the EPA. Please see Appendix 2.1 (Volume 3 of the EIAR) and Section 2.2.1 of Chapter 2 of the EIAR for further detail.

10.4.2 Air Quality

10.4.2.1 Construction Phase Impacts

The principal sources of potential air emissions during the construction of the Proposed Development will be from the Site, GC, TDR, and the haulage routes; from dust arising from earthworks, trench excavation along cable routes, construction of the new access tracks, the temporary storage of excavated materials, the construction of the proposed substation, the movement of construction vehicles, loading and unloading of aggregates/materials and the movement of material around the site.

Dust emissions can lead to elevated PM_{10} and $PM_{2.5}$ concentrations and may also cause dust soiling. The amount of dust generated and emitted from a working site and the likely effect on the surrounding areas varies according to:

- The type and quantity of material and working methods;
- Distance between site activities and sensitive receptors;
- Climate/local meteorology and topography.

Table 10-7: IAQM descriptions for the magnitude of an earthworks project

Source	
Scale	**Description**
Large	Total site area greater than 10,000m^2, potentially dusty soil type, more than 10 heavy earth-moving vehicles active at any one time, formation of bunds greater than 8 m in height, total material moved greater than 100,000 tonnes.
Medium	Total site area greater 2,500m^2, moderately dusty soil type, 5-10 heavy earth-moving vehicles active at any one time, formation of bunds 4 to 8 m in height, total material moved 20,000 tonnes to 100,000 tonnes.
Small	Total site area less than 2,500m^2, soil type with large grain size (e.g. sand), less than 5 heavy earth-moving vehicles active at any one time, formation of bunds less than 4 m in height, total material moved less than 20,000 tonnes, earthworks during wetter months.

Source: IAQM, 2014

Applying the IAQM criteria in Table 10.7, the overall construction of the Proposed Development is considered a large-scale construction site as the site area is greater than 10,000m^2 and the total material moved will likely exceed 100,000 tonnes. The "magnitude" of the potential emissions is therefore "large".

Due to the small number of human receptors (refer to Figure 5.2 within EIAR Volume 4 which shows the Residential Receptors within 1km vicinity of the Wind Farm Site), and distance from the source of the dust emissions, with the closest residential dwelling being approximately 90 m from the source of dust, the "sensitivity" of the area is "low", as per the criteria set out in the guidance (IAQM, 2014). For further information on human receptors, please refer to Chapter 5 – Population and Human Health, within EIAR Volume 2.

Combining the large magnitude of the earthworks with the low sensitivity, the IAQM guidance indicates that the Risk of Dust Impacts are "Low Risk" for the Proposed Development. The likelihood of a significant adverse environmental effect is low. The effect is considered to be adverse in nature, temporary in duration and not significant.

Construction dust has the potential to be generated from on-site activities such as excavation and backfilling. 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, peat) 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 vehicles and plant emissions have the potential to increase concentrations of compounds such as NO_2, Benzene and PM_{10} in the receiving environment as they travel along the haul route. Local receptors may be exposed to these emissions. This exposure would be slight and short duration (but also recurring) as the setting is rural and will allow for emissions to rapidly dilute in the open air, therefore is not likely to be a significant effect.

There will be no likely significant effect on air quality due to traffic from the Proposed Development as the effects will fall below the screening criteria set out in the UK Guidance, Design Manual for Roads and Bridge (DMRB) (UK Highways Agency 2007), on which the TII guidance (specified in the methodology of this chapter in Section 10.2.1) is based. This UK DMRB guidance states that road links meeting one or more of the following criteria can be defined as being 'affected' by a Proposed Development and should be included in the local air quality assessment:

Road alignment change of 5 metres or more;

- Daily traffic flow changes by 1,000 AADT or more;
- HGVs flows change by 200 vehicles per day or more;
- Daily average speed changes by 10 km/h or more; or
- Peak hour speed changes by 20 km/h or more.

On the surrounding road network as detailed in Chapter 15, Volume 2, there will be an increase in traffic volumes over a construction period of 24 months. Traffic volumes in Chapter 15 are described in terms of Light Goods Vehicles (LGVs) such as cars (incl. 4x4 vehicles) and vans used by the workers and supervisory staff involved in the construction works, and Heavy Goods Vehicles (HGVs) transporting materials to and from the site, including road making materials, concrete, building materials, drainage/ducting materials, cabling, electrical components and excavated material.

It is estimated that the construction phase for the Proposed Development will lead to 35,557 HGV trips (two-way) over the duration of the installation works which is estimated to last 24 months (i.e. approx. 8,269 trips per week).

Calculations of HGV movements associated with the construction of the Proposed Development indicate an average daily increase of 22 HGV trips per day. This increases to a peak of 64 HGV trips per day during the peak month which occurs in month 7 of the programme for HGV traffic (see Chapter 15, Volume 2 of the EIAR).

An average workforce of 40 no. site staff is anticipated, increasing to 60 during peak periods. This is estimated to give rise to an average increase in LGV traffic of 60 no. trips per working day and rising to 77 no. during peak construction periods which occurs in months 7 - 10 inclusive of the programme for LGV traffic. The combined HGV and LGV average daily increase are 83 vehicles per day and rising to 140 vehicles per day during peak construction periods occurring in month 7 of the construction programme.

For context, these average daily increases in traffic are significantly below the threshold of 1,000 annual average daily traffic (AADT) referenced in standard traffic and air quality assessment criteria, below which construction traffic impacts are generally considered to be not significant. The relatively low volume of additional traffic is not expected to result in a significant effect on air quality.

The Proposed Development does not meet or exceed any of the criteria set out in the UK DMRB. Therefore, the air quality assessment model is not required in this instance. Given the relatively small increase in traffic at the Site, and the conclusion of no significant impacts from Chapter 15, no effects on air quality are expected.

Some receptors have the potential for dust soiling due to trucks travelling along local routes. This is a temporary, slight adverse effect, which is not considered to be significant.

Plant and machinery such as generators, excavators etc. will be required at various stages of the construction works. These will be relatively small units which will be operated on an intermittent basis. Although there will be an emission from these units, given their scale and the length of operation time, the adverse effects of emissions from these units will be imperceptible; hence no likely significant effects will arise.

In general, air quality impacts during the construction phase of the Proposed Development are predicted to be short-term, localised, and minor in nature. No significant effects on air quality are anticipated during the construction phase.

10.4.2.1.1 Proposed Substation and Grid Connection

The construction of the GC route is considered a medium scale construction site under the IAQM guidance. Due to the number of residential dwellings located in close proximity to the GC route, some less than 10 m, the sensitivity of the surrounding area would be considered "medium". Therefore, there would be a "medium risk" of dust impacts affecting the residential dwellings along the GC route. Some houses may experience soiling and deposition of vegetation effects if they are located close to the road corridor. Construction vehicles and plant emissions have the potential to increase concentrations of compounds such as NO_2, Benzene and PM_{10} in the receiving environment. However, due to the nature of construction along the GC route, which works as a "rolling" construction site, meaning that these works will not be concentrated in any one area of the route, these effects in relation to dust and air pollutants are considered to be short term, slight negative impacts on air quality.

10.4.2.1.2 Turbine Delivery Route (TDR)

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

- Loads will depart the Port of Entry (PoE) of Foynes and navigate to the M8 motorway;
- Loads approaching from the south will depart the M8 at Junction 4 and contra flow through the western roundabout;
- Loads approaching from the south will continue along the R693 straight through the east roundabout;
- Loads approaching from the north will depart the M8 at Junction 4 and turn left at the east roundabout;
- Loads will continue towards the R693 / R639 Roundabout and turn right at the roundabout;
- Loads will continue along the R639 through Urlingford;
- Loads will continue south-west along the R639 through Longford Pass to the proposed site entrance located to the left.

The construction works associated with the TDR is considered a moderate construction site as it will result in soiling effects which have the potential to occur up to 50m from the source, with PM_{10} deposition and vegetation effects occurring up to 15m from the source. Many of the TDR work areas are very small and require minor works such as hedge/tree cutting, relocation of powerlines/poles, relocation of street furniture (lampposts, signage) and local road widening, the locations of which are detailed in the Abnormal Indivisible Load Route Survey Report, located in Appendix 15.2, Volume 3 of the EIAR.

The impacts on air quality are due to air pollutants from plant and vehicles and the potential for dust when excavating to formation level and placing the imported stone into the excavation. Compaction of the layers of stone may also result in some dust migration. These impacts are considered to be short term, and due to the road improvements being small relative to a typical road works project, the impacts are considered slight in magnitude. Therefore, these road improvement works will amount to a short term, slight negative impact on air quality.

10.4.2.2 Operational Phase Impacts

Once the Proposed Development is constructed there will be no likely significant direct emissions to atmosphere. A diesel generator will be located at the proposed wind farm substation; however, this will only be operated as a back-up/emergency power supply.

Emissions from the diesel generator will therefore be infrequent. During use, a diesel generator will emit carbon dioxide, nitrogen oxide and particulate matter, however, due to the low usage, the effect will likely be imperceptible (therefore non-significant).

Maintenance vehicles will access the Site during the operational period, however, due to the low traffic movements involved (see Chapter 15), the potential adverse effects from their operation will be imperceptible and not significant. Additionally, the operational phase of the wind farm will result in positive effects on air quality due to the displacement of fossil fuels as an energy source. This would have a significant positive effect on Tipperary County Council meeting their CDP and CAP targets: and a slight, positive effect on Ireland meeting its various climate targets set out in Section 10.1.3 of this Chapter and in Chapter 2, Volume 2 of the EIAR. The likely effect on Climate Change on a global scale would be imperceptible and as such non-significant.

10.4.2.3 Decommissioning Phase Impacts

In terms of decommissioning, there will be truck movements required for removing the wind turbines, earthmoving to cover foundations, and landscaping resulting in vehicular emissions and dust. However, the number of truck movements will be significantly less than the construction phase and the likely potential adverse effects on air quality will be temporary, imperceptible and not significant. There will also be emissions from machinery on site including for the movement of soil to cover the foundations, however, the related effects on air quality will be not significant.

During the decommissioning phase, the substation, grid connection and ancillary electrical equipment will form part of the national grid and shall be left in situ. The internal ducts for cabling, and all the internal access roads, and turbine hard standings will be left in situ, resulting in no additional truck movements and hence no adverse effects from emissions from machinery.

As turbine foundations will be left in-situ following decommission, the Risk of Dust effects on air quality during the decommissioning stage will be imperceptible, temporary and not significant.

10.4.3 Climate

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

Microclimate

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

The total area of proposed new permanent hardstanding surface is approximately 2.1% of the wind farm site and consequently there will be no direct or indirect effect on air temperature and microclimate because of the relatively small proportion of new permanent hardstanding surface proposed.

Macroclimate

Carbon dioxide (CO_2) is a greenhouse gas which if released in excessive amounts can lead to increases in global temperatures known as 'global warming' which can influence climate change. Section 10.4.4 details the carbon savings that have been calculated for the Proposed Development.

The Proposed Development has the potential to offset the carbon emissions associated with fossil fuel power stations, which are the primary providers of electricity in Ireland. Offsetting these carbon emissions would have a significant positive effect on Tipperary County Council meeting their CDP and CAP targets: and a slight, positive effect on Ireland meeting its various climate targets set out in Section 10.1.2 of this Chapter and in Chapter 2, Volume 2 of the EIAR. The likely effect on Climate Change on a global scale would be imperceptible and as such non-significant.

The Proposed Development provides Ireland an indigenous form of sustainable electricity and will contribute to the security of supply against our dependence on imports in addition to the overarching positive effects on the macroclimate.

The vulnerability of the Proposed Development to future changes in the climate and its capacity to adapt to possible climate change impacts over the course of its lifetime has been considered. Additional capacity has been included for watercourse crossing designs to account for future climate conditions. For further information, please refer to the Site-Specific Flood Risk Assessment (SSFRA) located in Appendix 9.1, Volume 3 of the EIAR and Sections 5.7.16.2 to 5.7.16.7 of Chapter 5 - Population and Human Health within Volume 2 of the EIAR.

10.4.4 Carbon Balance

In terms of carbon losses and savings, in the absence of any Irish tools, the online Scottish Windfarm Carbon Assessment Tool (https://informatics.sepa.org.uk/CarbonCalculator/index.jsp) was used in May 2026 to estimate carbon savings as a result of the proposed construction and operation of the wind farm. Appendix 10.1, Volume 3 contains a summary of the variables / inputs used to generate a model for the Proposed Development.

Based on the Scottish Windfarm Carbon Assessment Tool, embodied carbon emissions associated with the manufacturing and transportation of turbines (11 no.), together with emissions from construction and decommissioning activities, will release 60,212 tonnes of CO_2 to the atmosphere. This is based on the assessment of a wind turbine generator with a power output rating of 6.2MW. This represents 36% of total wind farm CO_2 losses that are attributable to turbine life losses. Losses during the construction and decommissioning phases will be due to reduced carbon fixing potential and losses from soil organic matter. Carbon emission values for turbine life are presented in Table 10.8.

In total, it is estimated that 2,787,319 tonnes of CO_2 will be displaced over the proposed 35-year lifetime of the wind farm i.e. 79,638 tonnes of CO_2 per annum, which assists in reaching the ambitious goals of the Climate Action Plan 2024. From an operational perspective, the Proposed Development will displace the emission of CO_2 from other less clean forms of energy generation and will assist Ireland in meeting its renewable energy targets and obligations. The burning of fossil fuels for energy creates greenhouse gases, which contributes significantly to climate change. These and other emissions also create acid rain and air pollution.

Offsetting these carbon emissions would have a significant positive effect on Tipperary County Council meeting their CDP and CAP targets: and a slight, positive effect on Ireland meeting its various climate targets set out in Section 10.1.3 of this Chapter and in Chapter 2, Volume 2 of the EIAR. The likely effect on Climate Change on a global scale would be imperceptible and as such non-significant.

For the Proposed Development with 11 no. turbines assuming a turbine power rating of 6.2 MW, and operational period of 35 years, the payback time for the manufacture, construction and decommissioning phases (including carbon losses from soil, etc.) is estimated at approximately 2.1 years. Should further restoration measures be put in place, the total carbon emissions and carbon payback time would be reduced. Refer to the Biodiversity Enhancement and Management Plan (BEMP), contained in Appendix 6.1, EIAR Volume 3 for more information on the proposed restoration measures.

Table 10-8: Estimated Carbon Emissions and Savings for Turbine Life (11 no.)

Origin of Losses	**Estimated CO_2 Losses (tonnes CO_2 equivalent)**
Turbine manufacture, construction and decommissioning	60,212
Losses due to Backup	44,957
Losses due to reduced carbon fixing potential	9,585
Losses from soil organic matter	50,974
Other	1,730
Total Expected Losses	167,457
Emissions Savings	**Expected CO_2 emission savings (tonnes CO_2 per Annum)**
Fossil fuel mix electricity generation	79,638
2024 Grid - mix electricity generation	37,782
Energy output from windfarm	**MWhr/year**
Estimated Annual Output	185,204
Carbon payback time	**Years**
Fossil fuel mix of electricity generation	2.1
2024 Grid - mix electricity generation	4.4

10.4.4.1 Loss of CO_2 fixing / accumulation

The Proposed Development footprint is limited and will result in localised effects only (proposed infrastructure occupies c.1.9% of the Site; Peat Deposition Areas occupy c. 1.6%). It will not interfere with key drainage management implemented for rewetting and as such is compatible with rewetting at the site scale. The infrastructure layout of the Proposed Development was sited as far as possible to avoid the wetland areas and other key habitats that have developed since the implementation of the Phase 1 rehabilitation measures. Where there are existing access tracks on the Site, the layout has incorporated these into the design. While there will be localised effects arising from habitat loss and drainage, the Proposed Wind Farm will not interfere with the rehabilitation or compromise re-wetting and revegetation or regeneration at the site scale.

There will be a loss of CO_2 fixing bog plants locally under the footprint of land lost due to the Wind Farm construction and the areas affected by drainage. The Scottish Government Wind farm Carbon assessment Tool used to inform the EIAR and presented in Appendix 10.1 accounts for this very loss of CO_2 fixing / accumulation. The calculation completed and presented in Appendix 10.1 accounts for loss of carbon fixing / accumulation across the 35-year lifetime of the wind farm. The calculation is also extended to account for loss of carbon fixing / accumulation after the wind farm is decommissioned, and in doing so, accounts for the fact that much of the infrastructure will be left in place and/ or covered with peat upon decommissioning rather than being replaced with peat and fully restored.

A raised bog in a natural state is a carbon sink and has the greatest predicted carbon accumulation rate, however, when the peatland is disturbed and oxidised, it becomes a carbon emitter, with a considerable reduction in the accumulation capacity. While the Phase 1 rehabilitation measures have already been undertaken at this site between 2018-2021, the capacity and rate at which the rehabilitated area can accumulate carbon may not recover immediately. An exact estimate of the peatland CO_2 accumulation rate for the site and how it changes with time and under different management or rehabilitation scenarios has not been undertaken for this assessment. Instead, the calculation presents an extremely conservative assumption in this regard, assuming the loss of CO_2 fixing potential of the peatland across the wind farm lifetime and beyond is equal to that of an undisturbed raised peatland in a natural state (i.e. 0.6 tC ha-1 yr-1 as per Ward et al, 2007).

The results of the carbon balance calculation show that the *Total loss of carbon fixation by plants* at the Site is 9,585 t CO_2 over the wind farm lifetime and after wind farm is decommissioned. This represents only 0.3% of the *Total CO2 savings by the wind farm* compared to fossil fuel - mix electricity generation.

While re-wetting peatlands is proven to be a viable solution to reducing land-use carbon emissions, this only gets significant when considering re-wetting and land-use carbon emission reductions across large land areas and over long periods. The calculations provided indicate that wind energy is ultimately much more effective at reducing carbon emissions over the relatively short lifetime of the wind farm, when compared to re-wetting peatlands across equivalent areas and equivalent time periods on a like-by-like basis. Integrating this wind energy development, which will take up only a small footprint, within this much larger rehabilitated peatland site improves the overall carbon emissions reductions associated with the Site.

10.4.5 Cumulative Effects

The geographic extent of the cumulative assessment is considered on a case-by-case basis, in line with the Guidance on the preparation of the Environmental Impact Assessment Report (European Union, 2017).

Potential cumulative effects on air quality and climate between the Proposed Development and other projects in the vicinity were considered as part of this assessment. The projects considered as part of the cumulative effect are described in Appendix 1.2 Volume 3 of Chapter 1 of this EIAR and considered below.

There are several operational and consented wind developments located within 20 km of the Proposed Wind Farm that could potentially generate a cumulative impact in relation to air quality during construction, operation and decommissioning.

A 20 km distance is considered a suitable zone of influence considering the emissions associated with the Proposed Development will be focused on the construction site and significant emissions beyond the construction site are not envisaged as concentrations of the pollutants will have dissipated. Emissions relating to the TDR have been considered, however, these were screened out of the cumulative assessment as emissions associated with the transport of turbines, and construction works relating to the upgrade of TDR nodes are non-significant.

In line with the 2022 EPA Guidelines on the information to be contained in EIARs, consideration has also been given to the potential for the Proposed Development to (i) cause major accidents or disasters, and (ii) be vulnerable to such accidents or disasters (for example, lightning strikes). In relation to air quality and climate, no such risks arise: the Proposed Development would not give rise to accidents or disasters with the potential to significantly affect air quality, nor is the Proposed Development vulnerable to such events in a way that would result in significant air quality or climate impacts.

Table 10-9: Wind Farm Developments within 20km of Littleton Wind Farm

Development Name	Number of Turbines	Status	Approx. Distance & Direction from Nearest Turbine
Brittas Wind Farm	12	Unconsented	12.10984 NW (T4)
Brisklagh Wind Farm	7	Unconsented	15.49918 E (T1)
Borrisbeg Wind Farm	10	Consented	21.25749 NW (T1)
Knockroe Wind Farm	7	Consented	14.00603 S (T11)
Farranrory Wind Farm	9	Consented	10.11609 E (T6)
Lisheen Wind Farm 1	18	In Operation	11.39686 N (T1)
Lisheen Wind Farm 3	8	In Operation	13.14048 N (T1)
Bruckana Wind Farm	14	In Operation	13.91004 N (T1)
Lisdowney Wind Farm	4	In Operation	19.46397 NE (T1)
Foyle/Foyleature Wind Farm	4	In Operation	12.57826 E (T1)
Kyleballyoughter Wind Farm	2	In Operation	13 E (T1)
Ballybay Wind Farm	5	In Operation	9.315062 E (T1)
Knocknamuck/Cnoc Wind Farm	5	In Operation	7.978342 E (T1)
Gurteen Wind Farm	1	In Operation	4.250567 E (T6)
Ballincurry Wind Farm	2	In Operation	4.935713 SE (T11)
Kill Hills	16	In Operation	9.997494 SW (T11)
Lisheen Wind Farm 2	12	In Operation	7.593389 N (T1)

10.4.5.1 Construction Phase

As established in Section 10.4.2.1, there are no significant effects on air quality during the construction phase from:

- Exhaust emissions during the construction of turbines
- Substation and all other infrastructure exhaust emissions during the construction of borrow pits
- Exhaust emissions through the transportation of materials to the Wind Farm Site
- Dust emissions during the construction of turbines, substation and all other infrastructure
- Dust emissions during the construction of borrow pits
- Dust emissions through the transportation of materials to the Wind Farm Site
- Carbon dioxide (CO_2), oxides of nitrogen (NO_x), and Sulphur dioxide (SO_2) emissions through plant and vehicle emissions

Therefore, it is considered there will be no cumulative effects on air quality should other proposed or consented plans and project within the surrounding landscape be constructed in parallel with the Proposed Development.

As established in Section 10.4.2.1, there are no significant effects on climate during the construction phase from:

- construction of turbines, substation and all other infrastructure
- construction of borrow pits
- transportation of materials to the Wind Farm Site

Therefore, it is considered there will be no cumulative effects on climate and greenhouse gas emission should other proposed or consented plans and projects within the surrounding landscape be constructed in parallel with the Proposed Development.

10.4.5.2 Operational Phase

As established in Section 10.4.2.2, there are no significant effects on air quality during the operational phase from:

- Exhaust emissions from maintenance and amenity visitors to the site
- Dust emissions from maintenance and amenity visitors to the site

Therefore, it is considered there will be no cumulative effects on air quality should other proposed or consented plans and projects within the surrounding landscape be operational in parallel with the Proposed Development.

As established in Section 10.4.2.2, there is a significant long-term moderate positive indirect effect on air quality during the operational phase. There will be 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 significant positive effect on air quality due to the offsetting of approximately 79,638 tonnes of CO_2 per annum (against EU FFC and supply renewable energy of approximately 44,096 Irish households with electricity per year[12]). This is a significant long-term moderate positive indirect effect on air quality.

The nature of the Proposed Development and other wind energy developments both within 20km and on the island of Ireland are such that, once operational, they will have a cumulative long-term, significant, positive effect on the air quality and climate and would assist the national and international objectives for offsetting CO_2 emissions and achieving a climate neutral Ireland by 2050 as set out in the Climate Action and Low Carbon Development (Amendment) Act 2021.

[12] Average household electricity consumption in Ireland is approximately 4,200 - 4,500 kWh per year.

10.4.5.3 Decommissioning Phase

As established in Section 10.4.2.3, there are no significant effects on air quality and climate during the decommissioning phase from:

- Exhaust emissions for removing the wind turbines, earthmoving to cover foundations, and landscaping.
- Dust emissions for removing the wind turbines, earthmoving to cover foundations, and landscaping.

Therefore, it is considered there will be no cumulative effects on air quality should other proposed or consented plans and projects within the surrounding landscape be decommissioned in parallel with the Proposed Development.

10.5 Mitigation Measures

10.5.1 Air Quality

10.5.1.1 Construction Phase

While no likely significant effects have been identified in respect of air quality from the Proposed Development during the construction phase, the Construction Environmental Management Plan (CEMP) (included in Volume 3, Appendix 4.1) includes mitigation measures during the construction phase of the Proposed Development relevant to air quality as follows:

- The internal access tracks will be constructed prior to the commencement of other major elements of the Proposed Development. These tracks will be finished with graded aggregate which compacts, preventing dust;
- A water bowser will be used to spray work areas (wind turbine area and grid connection) and haul roads as required, especially during periods of excavations works coinciding with dry periods of weather, to suppress dust migration from the Site;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Earthworks and exposed areas/soil stockpiles will be re-vegetated (with removed turves) to stabilise surfaces as soon as practicable;
- The access and egress of construction vehicles will be controlled to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits, which shall be reduced in periods of dry, windy weather;
- Construction vehicles and machinery will be serviced and maintained in good working order to avoid hydrocarbon (fuel/lubricant) leaks;
- Wheel washing facilities will be provided within the site near the site entrance points of the Site as described in Chapter 4; and all vehicles entering or leaving the site will be required to use these facilities and the water will be managed and controlled as outlined in the CEMP;

- The contractor will be required to implement the dust control plan as part of the CEMP. Subject to Planning consent, the CEMP will be amended and finalised in consultation with Tipperary County Council and other key statutory agencies; it will include relevant planning conditions, including any additional mitigation measures which are conditioned by the Planning Authority;
- Receptors which have the potential to be affected by dust from the temporary works at TDR nodes located adjacent to dwellings; and dwellings directly adjacent to the construction associated with the grid connection infrastructure that experience dust soiling, where appropriate, and with the agreement of the landowner, will have the facades of their dwelling cleaned if required should soiling occur;
- All construction vehicles will be required to switch off engines when stationary and no idling of vehicles will be permitted; and

For more information on the measures to minimise and control dust and the complaints procedure for dust, please refer to the CEMP, within Volume 3 of the EIAR.

10.5.1.2 Operational Phase

As the operation of the Proposed Development will not have any likely significant effects on air quality, mitigation measures are unnecessary.

10.5.1.3 Decommissioning Phase

While no likely significant effects have been identified in respect of air quality from the Proposed Development during the decommissioning phase, the same mitigation measures with respect to dust control and minimisation will be implemented. The proposed access tracks across the Site will be left in-situ and no mitigation measures are proposed. In terms of the underground cable and substation, these will also be left in situ and so no additional mitigation measures are proposed.

10.5.2 Climate

It is considered that the Proposed Development will have an overall likely positive non-significant effect in terms of carbon reduction and climate change. It will assist Ireland in meeting the EU's latest renewable energy targets set out in the Renewable Energy Directive (2023) which contains a binding target for 2030 of at least 42.5% but aiming for 45%. Also, it will aid in increasing the onshore wind capacity, as per the Climate Action Plan 2024. In terms of renewable energy, the target increase set in the Climate Action Plan 2024 in electricity generated from renewable sources is to increase to 80% by 2030, with 9GW of onshore wind capacity.

As no likely significant effects on climate will arise during construction, operation and decommissioning no mitigation measures are necessary or proposed. In terms of the operational phase, the operation of the Proposed Development will have a positive effect on climate due to the displacement of fossil fuels and will have a significant long-term positive effect on climate change policy and legislation at a local, regional, and national level.

10.6 Residual Effects

10.6.1 Air Quality

Following the implementation of the above mitigation measures, the Site, GC and TDR work areas will result in slight to moderate residual effects arising from fugitive dust emissions during construction activities involving excavations, felling or earthmoving. These will be localised in nature and as they will be associated with elements of the construction phase, they will be temporary in nature and will not result in any likely significant residual effects.

As no likely significant effects on air quality were identified for the construction phase in the pre-mitigation assessment, no likely significant residual effects will arise for the construction phase. While the proposed mitigation measures may reduce the magnitude and duration of the residual effects as compared to the pre-mitigation effects, such mitigation measures are not required to reach a conclusion of no likely significant residual effects.

Effects related to vehicle emissions and dust will reduce during the operational stage and no likely significant effects are expected. There will be a low level of maintenance traffic during the operational period, which will have imperceptible, non-significant effects. Furthermore, the operational phase of the Proposed Development will result in the avoidance of emissions from fossil fuel electricity generators which is a positive effect on local air quality. As with the construction phase, no likely significant effects were identified for the operational phase, and no likely significant residual effects arise.

Additionally, effects on air quality due to vehicle emissions and dust during the decommissioning phase are expected to be similar in nature to those in the construction phase but of a smaller magnitude. They will be temporary in nature and result in slight residual effects, therefore not significant. There will be no permanent or significant residual effects from decommissioning. As no likely significant effects were identified at the pre-mitigation stage for decommissioning, no likely significant residual effects arise. Mitigation measures may further reduce the magnitude and duration of effects but are not required to support the conclusion of no likely significant residual effects.

10.6.2 Climate

Section 10.4.3 assessed the potential effects on climate associated the Proposed Development through microclimate and macroclimate. At the microclimate level, the Proposed Development encompasses approximately 2.1% of the entire site area with hardstanding surfaces (turbine hard standings, access tracks, GC and other structures). The assessment found that a 2.1% increase in hardstanding would not adversely affect the vegetation necessary to maintain a microclimate. For more information, please refer to Chapter 6 – Biodiversity and the BEMP which is contained in Appendix 6.1, EIAR Volume 3.

In terms of macroclimate, it is estimated that an annual average output[13] of 185,204 MWhr for the Proposed Development will result in the net displacement of 79,638 tonnes of CO_2 per annum. This results in positive effects by removing the GHG emissions that would have otherwise been part of the output of traditional energy manufacturing (i.e. coal, natural gas, peat, etc). Potential effects to climate can affect human health (see Chapter 5 Population and Human Health) and the environment. No likely significant negative direct or indirect effect on air temperature, microclimate or macroclimate will be associated with the Proposed Development due to the location of the Site which is predominately a rural agricultural location except for existing public roadways.

The Proposed Development has the potential to offset the carbon emissions associated with fossil fuel power stations, which would have a significant positive effect on Tipperary County Council meeting their CDP and CAP targets: and a slight, positive effect on Ireland meeting its various climate targets set out in Section 10.1.2 of this Chapter and in Chapter 2, Volume 2 of the EIAR. The likely effect on Climate Change on a global scale would be imperceptible and as such non-significant.

10.7 Conclusion

There are no likely significant effects expected on Air Quality or Climate as a result of the construction, operation and decommissioning of the Proposed Development.

There are no likely significant cumulative effects expected on Air Quality and Climate as a result of other existing or proposed projects.

There will be a likely long term positive residual effect on Air Quality and Climate as a result of the Proposed Development due to the displacement of fossil fuels.

The mitigation measures identified in this Chapter will be adopted and implemented by the Contractor and have been incorporated into the construction stage CEMP included in Appendix 4.1, Volume 3 of the EIAR.

Should the Proposed Development not be developed, fossil fuel electricity generation will likely be the primary alternative to provide the required quantities of electricity. This will further contribute to greenhouse gas and other air pollutant emissions, as well as hindering Ireland in its commitment to meet its international commitments in relation to increasing renewable electricity production and reduction in GHG emissions.

[13] Per *Scottish Windfarm Carbon Assessment Tool* (https://informatics.sepa.org.uk/CarbonCalculator/index.jsp, last accessed on 30 July 2025)

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