Drumlins Park Wind Farm Substation & Grid Connection

Chapter 8:
Air Quality & Climate

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8.1 Introduction

8.1.1 Background

This chapter comprises an assessment of the likely effect on air quality and climate associated with the proposed development. This report provides a baseline assessment of the setting of the proposed development in terms of air quality and climate, and discusses the likely and significant effects that the construction, operation and decommissioning of the proposed development will have on them. Where required, appropriate mitigation measures to limit any identified likely significant adverse effects to air quality and climate are recommended.

It should be noted that the assessment of air quality and climate effects undertaken in respect of the Drumlin Park Wind Farm (see **Chapter 8**, **Volume III**) incorporated the construction of a 110kV electricity substation and associated grid connection as it was evaluated as requiring the greatest use of natural materials (aggregates, concrete etc) and, of the 3 no. grid connection options considered, it would result in a greater volume of emissions. Therefore, it is considered that a comprehensive assessment of the likely impacts of a 110kV substation and ancillary infrastructure at the location of the proposed development has already been completed; however, due to minor alterations to the precise siting of infrastructure and to ensure that this EIAR is based on current and precise data, the proposed 110kV electricity substation and associated infrastructure has been fully re-assessed.

8.1.2 Description of the Proposed Development

A full description of the proposed development is presented in **Chapter 3**. In summary, the proposed development comprises the following main components:-

- A 110 kilovolt (kV) 'loop-in/loop-out' Air-Insulated Switchgear (AIS) electrical substation, including single-storey control buildings and all associated electrical equipment;
- Approximately 700m of 110kV underground electricity lines;
- Replacement of 1 no. existing pole-set with 2 no. lattice-type end masts, to a maximum height of up to 16m; and
- All associated and ancillary site development, excavation, construction, landscaping and reinstatement works, including provision of site drainage infrastructure.

The entirety of the proposed development is located within the administrative area of County Monaghan; while candidate quarries which may supply construction materials are also located within County Cavan.

8.1.3 Statement of Authority

The assessment of likely effects on air quality and climate, and preparation of this EIAR chapter, has been undertaken by various members of the Galetech Energy Services (GES) Environment & Planning Team. GES has substantial experience in preparing EIARs and having prepared and reviewed Air Quality & Climate EIAR chapters for numerous wind farm developments.

8.2 Standards & Guidance

8.2.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air quality for a range of air pollutants. These limit values or 'Air Quality Standards' are health or environmental-

based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set, see **Table 8.1** below.

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate EU Directive 2008/50/EC and combines the previous air quality framework and subsequent daughter directives (see **Table 8.1**). Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions (see **Annex 8.1**, **Volume II**).

The focus from a health perspective is on particles of dust which are less than 10 microns. EU ambient air quality standards (Council Directive 2008/50/EC transposed into Irish law as S.I. 180 of 2011) centres on PM_{10} (particles less than 10 microns) as it is these particles which may be inhaled into the lungs and possibly cause adverse health effects. The Directive also sets an ambient standard for $PM_{2.5}$ (particles less than 2.5 microns and form part of PM_{10}) which came into force in 2015 (see **Table 8.1**).

8.2.1.1 Gothenburg Protocol

In 1999, Ireland signed the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. The initial objective of the Protocol was to control and reduce emissions of Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_X), Volatile Organic Compounds (VOCs) and Ammonia (NH_3). To achieve the initial targets, Ireland was obliged, by 2010, to meet national emission ceilings of 42kt for SO_2 (67% below 2001 levels), 65kt for NO_X (52% reduction), 55kt for VOCs (37% reduction) and 116kt for NH_3 (6% reduction). In 2012, the Gothenburg Protocol was revised to include national emission reduction commitments for the main air pollutants to be achieved in 2020 and beyond and to include emission reduction commitments for $PM_{2.5}$. In relation to Ireland, 2020 emission targets are 25kt for SO_2 (65% below 2005 levels), 65kt for NO_X (49% reduction), 43kt for VOCs (25% reduction), 108kt for NH_3 (1% reduction) and 10kt for $PM_{2.5}$ (18% reduction). COM (2013) 917 Final is the "Proposal for a Council Decision for the acceptance of the Amendment to the 1999 Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground-level Ozone".

European Commission Directive 2001/81/EC and the National Emissions Ceiling Directive (NECD), prescribes the same emission limits as the 1999 Gothenburg Protocol. A National Programme for the progressive reduction of emissions of these four transboundary pollutants has been in place since April 2005. Directive (EU) 2016/2284 "On the Reduction of National Emissions of Certain Atmospheric Pollutants and Amending Directive 2003/35/EC and Repealing Directive 2001/81/EC" was published in December 2016. The Directive will apply the 2010 NECD limits until 2020 and establish new national emission reduction commitments which will be applicable from 2020 and 2030 for SO_2, NO_X, NMVOC, NH_3 and $PM_{2.5}$. In relation to Ireland, 2020-29 emission targets are for SO_2 (65% below 2005 levels), for NO_X (49% reduction), for VOCs (25% reduction), for NH_3 (1% reduction) and for $PM_{2.5}$ (18% reduction). In relation to 2030, Ireland's emission targets are for SO_2 (85% below 2005 levels), for NO_X (69% reduction), for VOCs (32% reduction), for NH_3 (5% reduction) and for $PM_{2.5}$ (41% reduction). The data available from the EPA in 2020 (EPA, 2020a) show that Ireland exceeded its emission ceiling for NH_3, NOx and NMVOC) in 2018.

For 2030, NMVOC and NH_3 are projected to be in non-compliance with emission ceilings

Pollutant	Regulation	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	None	200 µg/m³ NO_2
		Annual limit for protection of human health	None	40 µg/m³ NO_2
		Annual limit for protection of vegetation	None	30 µg/m³ NO + NO_2
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50%	50 µg/m³ PM_{10}
		Annual limit for protection of human health	20%	40 µg/m³ PM_{10}
$PM_{2.5}$	2008/50/EC	Annual limit for protection of human health	None	25 µg/m³ $PM_{2.5}$

Table 8.1: Air Quality Standards Regulations 2011 (Based on Directive 2008/50/EC and S.I. 180 of 2011)

8.2.2 Climate Agreements

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994 and the Kyoto Protocol in principle in 1997 and formally in May 2002 (Framework Convention on Climate Change, 1999 and Framework Convention on Climate Change, 1997). For the purposes of the EU burden sharing agreement under Article 4 of the Doha Amendment to the Kyoto Protocol, in December 2012, Ireland agreed to limit the net growth of the six Greenhouse Gases (GHGs) under the Kyoto Protocol to 20% below the 2005 level over the period 2013 to 2020 (UNFCCC 2012).

The UNFCCC is continuing detailed negotiations in relation to GHG reductions and in relation to technical issues such as Emission Trading and burden sharing. The most recent Conference of the Parties to the Convention (COP25) took place in Madrid, Spain in December 2019 and focussed on advancing the implementation of the Paris Agreement. The Paris Agreement was established at COP21 in Paris in 2015 and is an important milestone in terms of international climate change agreements. The Paris Agreement, agreed by over 200 nations, has a stated aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to greenhouse gas emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made on elevating adaption onto the same level as action to cut and curb emissions.

The EU, on the 23 & 24 October 2014, agreed the *2030 Climate and Energy Policy Framework* (EU, 2014). The European Council endorsed a binding EU target of at

least a 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990. The target will be delivered collectively by the EU in the most cost-effective manner possible, with the reductions in the ETS (Emissions Trading Scheme) and non-ETS sectors amounting to 43% and 30% by 2030 compared to 2005, respectively. Secondly, it was agreed that all Member States will participate in this effort, balancing considerations of fairness and solidarity. The policy also outlines, under "Renewables and Energy Efficiency", an EU binding target of at least 32% for the share of renewable energy consumed in the EU in 2030.

The EPA 2019 *GHG Emissions Projections Report* (EPA, 2019a) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National Development Plan (NDP) which was published in 2018. Implementation of these policies and measures are classed as a "With Additional Measures scenario" for future scenarios. A change from generating electricity using coal and peat to wind power and diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in animal numbers. However, over the period 2013-2020 Ireland is projected to cumulatively exceed its compliance obligations with the EU's Effort Sharing Decision (Decision No. 406/2009/EC) 2020 targets by approximately 10 Mt CO_2 equivalent under the "Without Existing Measures scenario" and 9 Mt CO_2 equivalent under the "With Additional Measures scenario". The most recent EPA (EPA, 2020b) projections show that full implementation of the 2019 *Climate Action Plan* will result in a reduction in Ireland's total greenhouse gas emissions by up to 23% by 2030 compared to the 2019 greenhouse gas inventory levels.

8.3 Methodology

The methodology employed as part of this assessment comprised a desktop appraisal and evaluation of existing environmental conditions; the likely effects which may arise during the construction, operational and decommissioning phases; and identification of measures to off-set or reduce likely adverse effects. The following sections set out the methodology utilised to assess air quality and climate in respect of the construction, operational and decommissioning phases.

8.3.1 Construction Phase

8.3.1.1 Air Quality

The assessment of air quality has been carried out using a phased approach as recommended by the Department for Environment, Food and Rural Affairs in the United Kingdom [UK DEFRA, 2016]. The phased approach recommends that the complexity of an air quality assessment be consistent with the risk of failing to achieve the air quality standards.

The current assessment thus focused firstly on identifying the existing baseline levels of NO_2 and PM_{10} in the region of the proposed development by an assessment of EPA monitoring data. Thereafter, the effect of the development during the construction phase of the project on air quality at the neighbouring sensitive receptors was determined by an assessment of the dust generating construction activities associated with the proposed development. The effect of dust from the construction phase will be short-term in nature and is assessed in **Section 8.5.2.1**.

Dust is characterised as encompassing particulate matter with a particle size of between 1 and 75 microns (1- 75 µm). Deposition typically occurs in close proximity

to each site and effects generally occur within 500 metres of the dust generating activity as dust particles fall out of suspension in the air. Larger particles deposit closer to the generating source and deposition rates will decrease with distance from the source. Sensitivity to dust depends on the duration of the dust deposition, the dust generating activity and the nature of the deposit. Therefore, a higher tolerance of dust deposition is likely to be shown if only short periods of dust deposition are expected and the dust generating activity is either expected to stop or move on.

The likelihood of dust emissions will depend on the type of activity being carried out in conjunction with environmental factors including levels of rainfall, wind speed and wind direction. Activities associated with the proposed development such as excavation and backfill are likely to generate dust.

As indicated, dust generation rates depend on the site activity, particle size (in particular the silt content, defined as particles smaller than 75 microns in size), the moisture content of the material and weather conditions. Dust emissions are dramatically reduced where rainfall has occurred due to the cohesion created between dust particles and water and the removal of suspended dust from the air. It is appropriate to assume that no dust is generated under "wet day" conditions where rainfall greater than 0.2 mm has fallen. Information collected at the Clones Meteorological Station (Met Eireann 2020, 30-year averages) identified that 218 days per annum are typically classed as "wet". Thus, almost 70% of the time no significant dust generation will be likely due to meteorological conditions.

Large particle sizes (greater than 75 microns) fall rapidly out of atmospheric suspension and are subsequently deposited in close proximity to the source. Particle sizes of less than 75 microns are of interest as they can remain airborne for greater distances and can give rise to dust nuisance at the sensitive receptors. This size range would broadly be described as silt. Emission rates are normally predicted on a site-specific particle size distribution for each dust emission source. The nearest sensitive (inhabited) residential receptor is at a distance of approximately 270m from the proposed electricity substation which will involve the greatest volume of potential dust generating activity; however there are residential receptors in closer proximity to the construction traffic haul route and proposed grid connection infrastructure.

Research carried out in the United States has shown that haul trucks generate the majority of dust emissions from surface mining sites, accounting for an estimated 78 - 97% of total dust emissions (UK ODPM, 2000). The Institute of Air Quality Management Construction Dust Guidance (IAQM, 2014) states that 'track out' (the spreading of dust onto roads from the wheels of vehicles leaving construction sites) related construction dust impact increases with respect to the number of movements of HGV's per day, length of unpaved road, distance to receptors and the sensitivity of local receptors. While the dust emission magnitude can be high, due to the short length of on-site unpaved access track, the paved nature of proposed haul route (public roads), the distance to receptors and low ambient background PM_{10} concentrations, the risk of effects with respect to health effects and dust soiling is initially considered as likely to be low; however, this will be assessed in detail below.

8.3.1.2 Climate – Construction Traffic and Materials

Under the EU Commission's Climate and Energy Package, Ireland is required to deliver a 20% reduction in non-ETS greenhouse gas emissions by 2020 (relative to 2005 levels). In addition, Ireland also has binding annual emission limits for the period

2013-2020 to ensure a gradual move towards the 2020 target. In 2014, the EU agreed the *2030 Climate and Energy Policy Framework* (EU, 2014). The European Council endorsed a binding EU target of at least a 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990. In terms of 2030 reduction targets the, EU Effort Sharing Regulation (Regulation (EU) 2018/842) requires that Ireland reduce its non-ETS emissions by 30% on 2005 levels by 2030.

The non-ETS sectors cover those that are outside the EU ETS and include the agriculture, transport, residential, commercial, waste and non-energy intensive industries. In order to assess the effect on GHG concentrations of the combined total of embodied energy from construction materials, forestry loss and peat extraction; the three are summed. This value is then compared to Ireland's 2017 total national GHG emissions and the targets which Ireland must achieve. No set guidance is available on significance of the increase in GHG emissions and therefore professional judgement must be used when reviewing this effect.

Climate change is a result of increased levels of carbon dioxide and other GHGs in the atmosphere causing the heat trapping capacity of the atmosphere to increase. GHGs can be emitted from vehicles and embodied energy associated with materials used in the construction of a development. Embodied energy refers to the sum of the energy needed to produce a good or service. It incorporates the energy needed in the mining or processing of raw materials, the manufacturing of products and the delivery of these products to site. A number of embodied GHGs could be emitted during the construction phase of the development. For example, construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions as well as the large quantities of material such as stone, concrete and steel that will be required for the project. The Institute of Air Quality Management *Guidance on the Assessment of Dust from Demolition and Construction* (IAQM, 2014) states that site traffic and plant is unlikely to make a significant effect on climate.

8.3.1.3 Climate – Forestry and Peat Removal

Trees are a natural carbon sink and absorb CO_2 from the atmosphere helping in the reduction of climate change; any felling of forestry results in a loss of this carbon sink thus, increasing the levels of CO_2 in the atmosphere. However, increased planting of trees on suitable lands will, over time, help to increase the carbon sink capacity of the land and benefit climate. The *Best Practice Guidelines for the Irish Wind Energy Industry* (IWEA, 2012) is used for calculating the GHG sinks due to the loss of forestry.

The GHG emissions associated with peat excavation has been assessed using the 2006 Intergovernmental Panel on Climate Change (IPCC) *Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use, Chapter 7 Wetlands* (IPCC, 2006).

8.3.2 Operational Phase

8.3.2.1 Air Quality

An assessment of baseline air quality in the region has been conducted to determine whether current levels of key pollutants are significantly lower than their limit values.

8.3.2.2 Climate

There will be no greenhouse gas emissions from the operation of the proposed development. However, the operation of the proposed development will facilitate

export of renewably generated electricity to the national grid from the permitted Drumlins Park Wind Farm and the displacement of GHG emissions will be calculated.

Vehicular traffic is often a dominant source of greenhouse gas emissions as a result of developments and their contribution to GHG emissions will be evaluated. .

8.3.3 Decommissioning Phase

As set out at **Chapter 3** (**Sections 3.2** and **3.8**), the proposed development will form part of the national electricity network and decommissioning of the substation is not proposed. Therefore, decommissioning phase effects will not occur.

8.4 Description of the Existing Environment

8.4.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (WHO, 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ – PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Clones, which is located approximately 5 km northwest of the site. While this station shut in 2007, the most recent 30-year average data sets include the Clones station. Clones meteorological data has been examined to identify the prevailing wind direction and average wind speeds over the long-term data set from 1981 - 2007. The average wind speed over the period 1981 – 2007 is approximately 4 m/s at ground level. Although the wind data gives an indication of the prevailing wind speed in the general area, this data is not used in the air quality and climate assessment of the proposed development.

In addition, and as set out above, 30-year average data indicates that 218 days per annum are typically classed as "wet" which would significantly curtail the likelihood for significant emissions of dust.

8.4.2 Available Background Data

8.4.2.1 Air Quality

Air pollution is the single largest environmental health risk in Europe (EEA, 2020a). The latest figures for Ireland from the European Environment Agency attribute in excess of 1300 no. premature deaths annually to poor air quality. Recent air quality monitoring suggests that there are more extensive air quality issues than was previously thought (EPA, 2020c).

Air quality monitoring programmes have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality *Air Quality in Ireland 2018* (EPA 2019c), details the range and scope of monitoring undertaken throughout Ireland. As part of the implementation of the Air Quality Standards

Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2019b). Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The rural area within which the proposed development is located is classed as Zone D.

NO_2 monitoring was carried out at two rural Zone D locations in 2018, Emo Court (County Laois) and Kilkitt (County Monaghan) and the urban site of Castlebar (County Mayo) (EPA 2019c). The NO_2 annual average in 2018 for both rural sites was 3µg/m^3 with a result of 8µg/m^3 for the urban site. Hence, long-term average concentrations measured at all locations were significantly lower than the annual average limit value of 40µg/m^3. Based on the above information, a conservative estimate of the background NO_2 concentration at the proposed development site and its environs, given its rural setting, is 4µg/m^3.

PM_{10} monitoring was carried out at the Zone D locations of Castlebar, Cobh, Claremorris, Kilkitt, and Roscommon Town in 2018 (EPA 2019c). The average annual mean concentration measured in 2018 is 11.8µg/m^3 (EPA 2019c). Therefore, average PM_{10} concentrations measured at these locations were significantly lower than the annual average limit value of 40µg/m^3. Given the rural location of the proposed development site and its relative proximity to the Kilkitt monitoring station, it is considered that PM_{10} levels are likely to be similar to those at Kilkitt which, in 2018, recorded an average of 9µg/m^3.

The results of $PM_{2.5}$ monitoring at Claremorris (Zone D) in 2018 (EPA 2019c) indicated an average $PM_{2.5}/PM_{10}$ ratio of 0.5. Based on this information, a ratio of 0.5 was used to generate a rural background $PM_{2.5}$ concentration of 6µg/m^3. Again, long-term average $PM_{2.5}$ concentrations measured at this location were significantly lower than the annual average limit value of 25 µg/m^3.

In summary, existing baseline levels of NO_2, PM_{10} and $PM_{2.5}$ are substantially below ambient air quality limit values for Zone D, which encompasses the proposed development site. It is also noteworthy that the given the proximity of the proposed development site to the Kilkitt monitoring station, the data gathered at Kilkitt is considered to be particularly representative of conditions at the proposed development site.

8.4.2.2 Climate

Anthropogenic emissions of greenhouse gases in Ireland included in the EU 2020 strategy are outlined in the most recent review by the EPA which details emissions up to 2017 (EPA, 2019d). Agriculture was the largest contributor in 2017 at 33.3% of the total, with the transport sector accounting for 19.8% of emissions of CO_2 (EPA, 2019d).

2017 is the fifth year where compliance with the European Union's Effort Sharing Decision "EU 2020 Strategy" (Decision 406/2009/EC) was assessed. Ireland had total GHG emissions of 60.74 Mt CO_2eq in 2017. This is 2.94 Mt CO_2eq higher than Ireland's annual target for emissions in 2017 (EPA, 2019d). Emissions are predicted to continue to exceed the targets in future years and, therefore, reduction measures are required in all sectors.

The EPA 2020 GHG Emissions Projections Report for 2019–2040 (EPA 2020b) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that form part of the

National Development Plan (NDP) which was published in 2018. Implementation of the "With Additional Measures" scenario" (including the impact of the 2019 Climate Action Plan) is projected to save 79 Mt CO2 eq over the period 2021-2030 compared to the "With Existing Measures" scenario. This represents an average annual reduction of 2.9% over the period. Ireland is projected to meet non-ETS EU targets over the period 2021 to 2030. This assumes full implementation of the 2019 Climate Action Plan and the use of flexibilities in relation to land use, land use change and forestry. However, Ireland's non-ETS emissions are projected to be only 2-4% below 2005 levels in 2020, compared to the EU target of 20%.

8.5 Description of Likely Effects

From an air quality perspective, the construction phase for the proposed development will be the key aspect in relation to the generation of dust and other fugitive emissions from construction activities. Additionally, the construction phase will involve the operation of plant and machinery throughout which will result in exhaust emissions. The operational phase, although requiring some vehicular movements resulting in exhaust emissions, is not anticipated to result in significant effects.

From a climate perspective, the operational phase of the project is expected to lead to a beneficial effect on climate by displacing fossil-fuel derived electricity from the national electricity network in favour of renewable electricity generated at the Drumlins Park Wind Farm.

8.5.1 Construction Phase

8.5.1.1 Construction Dust

Whilst construction activities are likely to produce some level of dust during excavation and earth moving phases of the project, these activities are likely be confined to particles of dust greater than 10 microns which may be considered a nuisance but are not likely to result in significant health effects. For instance, bulldozing and compacting operations release 84% of particles which are greater than PM_{10} with only 16% of particles being less than 10 microns (IAQM, 2014).

In terms of receptor sensitivity to dust soiling, there are 5 no. highly sensitivity receptors (i.e. residential dwellings) within 400m of groundworks or construction activities which could give rise to dust the proposed development. While there is an increased number of dwellings within 400m of the proposed construction material haul route (see **Chapter 3**), including the unpaved permitted Drumlins Park Wind Farm access tracks, it is assessed that there is limited opportunity for effects to arise due to the absence of groundworks and the separation distances involved.

Of the 5 no. receptors evaluated to be highly sensitive to dust soiling; 2 no. are located with 20m of a possible source, 1 no. within 100m of a possible source, and 2 no. in excess of 300m from a possible dust source. It is also noted that the works located within 100m of a residential dwelling are limited to UGL trenching and minor groundworks associated with the end mast foundations and are not capable of significant dust generation. The most likely source of dust generation is from the more substantial works associated with the proposed electricity substation, located in excess of 250m from the nearest residential dwelling.

Therefore, the overall sensitivity rating of dust soiling effects on sensitive receptors, in accordance with the IAQM guidance in **Table 8.2** (IAQM, 2014), is Low.

Receptor Sensitivity	Number of Receptors	Distance from source (m)			
		<20	<50	<100	<400
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 8.2: Sensitivity of the Area to Dust Soiling Effects on People and Property (IAQM, 2014)

In addition, the IAQM guidelines also outline the criteria for assessing the human health effect from PM_{10} emissions arising from construction activities. This assessment is based on the current annual mean PM_{10} concentration, receptor sensitivity and the number of receptors affected. In accordance with **Section 8.4.2.1** above, current PM_{10} concentration at the proposed development site is estimated to be 9µg/m3. As shown in **Table 8.3**, the sensitivity to human health effects from PM_{10} (high sensitivity, distance of less than 400m to groundworks and with receptor numbers of between 1 no. and 10 no.) is considered to be Low.

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from source (m)			
			<20	<50	<100	<400
High	<24µg/m^3	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	<24µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	<24µg/m^3	>1	Low	Low	Low	Low

Table 8.3: Sensitivity of the Area to Human Health Effects (IAQM, 2014)

Dust deposition effects on ecology can occur due to chemical or physical effects. This can include a reduction in photosynthesis due to smothering as a result of the settling of dust on plants and chemical changes such as acidity to soils. Often, effects will be reversible once the works are completed, and dust deposition ceases. The proposed development is not located within sufficient proximity to highly sensitive ecological areas such that significant effects could occur and these have, therefore, been screened from further assessment.

Demolition

The construction of the proposed development does not involve the demolition of any existing buildings or structures.

Earthworks

Earthworks will primarily involve excavation, haulage, tipping, landscaping and stockpiling. The dust emission magnitude from earthworks can be classified as small, medium or large and are described as follows:-

- **Large**: Total site area >10,000m^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 > 8m in height, total material moved >100,000 tonnes;
- **Medium**: Total site area 2,500m^2–10,000m^2, moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 8m in height, total material moved 20,000 – 100,000 tonnes; and
- **Small**: Total site area <2,500m^2, soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4m in height, total material moved <20,000 tonnes, earthworks during wetter months.

The dust emission magnitude for the proposed earthwork activities can be classified as Large due to the proposed development site area and the presence of clay; however, the height of bunds will not exceed 8m in height nor will the total volume of material moved exceed 100,000 tonnes. Combining this classification with the previously established sensitivity of the area to dust soiling and human health effects (low sensitivity respectively), an overall Low risk of temporary dust soiling impacts and Low risk of temporary human health effects is reached, per **Table 8.4**.

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 8.4: Risk of Dust Impacts - Earthworks

Construction of Buildings

Dust emission magnitudes from the construction of buildings can be classified as small, medium or large and are described as follows:-

- **Large**: Total building volume >100,000m^3, on-site concrete batching, sandblasting;
- **Medium**: Total building volume 25,000m^3–100,000m^3, potentially dusty construction material (e.g. concrete), on-site concrete batching; and
- **Small**: Total building volume <25,000m^3, construction material with low likelihood of dust release (e.g. metal cladding or timber).

The dust emission magnitude for the proposed construction activities can be classified as Small. As set out at **Chapter 3**, the proposed development will involve the construction of an IPP control building (c. 850m^3) and Eirgrid control building (c. 2,665m^3). Therefore, due to the limited scale and volume of the proposed buildings and the overall Low risk of temporary dust soiling impacts and Low risk of temporary human health effects, there is an overall Negligible risk of temporary human health effects as a result of the proposed construction activities, as outlined in **Table 8.5**.

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 8.5: Risk of Dust Impacts - Construction

Trackout

Trackout refers to the movement of dust and dirt from a construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. The factors which determine the magnitude of dust emissions are vehicle size, vehicle speed, vehicle numbers, geology and duration. Dust emission magnitudes from trackout can be classified as small, medium or large and are described as follows:-

- **Large**: >50 HGV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- **Medium**: 10 - 50 HGV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50-100m; and
- **Small:** <10 HGV (> 3.5t) outward movements in any one day, surface material with low likelihood of dust release, unpaved road length <50m.

The trackout activities associated with the proposed development are classified as Medium i.e. 10-50 HGV outward movements per day (see **Chapter 13**). This results in an overall Low risk of temporary dust soiling impacts and an overall Low risk of temporary human health effects as a result of trackout effects, as outlined in **Table 8.7**.

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 8.6: Risk of Dust Impacts – Trackout

Summary of Construction Dust Emission Risk

The proposed development is not assessed as likely to result in any significant dust soiling or human health effects as a result of fugitive construction phase dust emissions. As set out at **Table 8.8**, the magnitude of effects range from Low to Negligible. While these magnitude ranking are on the lower end of the significance spectrum, a suite of mitigation measures have been proposed at **Section 8.6** to further reduce any effects. The overall effects of construction phase dust emissions are direct, short-term and low.

. Impact	Dust Emission Magnitude			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Low	Low	Low
Human Health	N/A	Low	Negligible	Low

Table 8.7: Summary of Construction Dust Impact Magnitudes

8.5.1.2 Climate – Construction Traffic and Materials

Construction traffic is expected to be the dominant source of greenhouse gas emissions as a result of the proposed development as construction vehicles will give rise to greenhouse gas emissions during trips to/from the site and during construction activities within the site. Due to the absence of suitable materials on-site (**Chapter 6**), there will be no processing of materials on site including crushing, or screening of aggregates or batching of concrete and all such materials will be transported to site. In total, it is estimated that 12,408m^3 of aggregate/fill material/concrete will be imported for use in the construction phase.

The worst-case (i.e. furthest distance) candidate quarry (see **Chapter 13**) for the supply of aggregates, Pitwood Quarries, is located approximately 30km from the proposed development site (via R212, L2010, R188, R189, Drumlins Park Wind Farm access tracks and LT62013). The construction phase will also require the importation of concrete for the construction of substation buildings and plinths for the installation of electrical apparatus. The worst-case candidate quarry for the supply of concrete is B.D. Flood (Concrete) and is located approximately 32km from the proposed development site (via N3, R165, R188, R189, Drumlins Park Wind Farm access tracks and LT62013).

Where possible, excavated material will be temporarily stockpiled on-site and used for landscaping or reinstatement. Where material is not to be used for reinstatement or landscaping or reinstatement, it is will stored at the spoil deposition areas.

Emissions which could possibly cause climate change will arise from embodied carbon dioxide in site materials, as well as the kilometres travelled by vehicles delivering/removing this material to and from the construction site. Due to the relatively small volume of construction traffic associated with the proposed development; this effect is assessed as likely to be a direct, short-term, imperceptible effect.

8.5.1.3 Climate – Forest Loss

As discussed in the *Best Practice Guidelines for the Irish Wind Energy Industry,* forest loss can be a contributor to carbon losses. The Guidance states that "*the carbon impact of proposed tree felling i.e. loss of carbon sink should be included in any carbon calculations*" (IWEA, 2012).

While the proposed development will not result in the loss of any forestry; the removal of existing hedgerows and trees to facilitate the construction of the proposed development is proposed. As set out at **Chapter 3**, the proposed landscaping proposals will bring about an overall increase in the extent of hedgerows and an increase level of tree planting in the local area and, therefore, there will be no carbon losses due to forestry/vegetation loss.

8.5.1.4 Climate – Peat Extraction

The *Best Practice Guidelines for the Irish Wind Energy Industry (2012)* (IWEA, 2012) state that the excavation of peat can be a contributor to carbon losses. The Guidance states "*it is good practice to undertake a calculation of the carbon costs of the construction and operation of a wind farm. The carbon release associated with the excavation and oxidization of peat soils can be relatively significant and should be included in any carbon calculation*".

Although the proposed development does not comprise a wind farm, it is an ancillary element of the adjoining permitted Drumlins Park Wind Farm. The geological environment at the proposed development site does not comprise peat and, therefore, the effect associated with peat loss is assessed to be neutral.

8.5.2 Operational Phase

8.5.2.1 Air Quality

The assessment of baseline air quality in the region of the proposed development has shown that current levels of key pollutants are significantly lower than their limit values. There is no likelihood of the proposed development resulting in any significant emissions during the operational phase. It is likely that the operational development will be visited 1-2 times per week by a van or light goods vehicle (LGV); however, such trips will result in a negligible effect on air quality.

The generation of electricity from the permitted Drumlins Park Wind Farm and exported to the national electricity grid via the proposed development will lead to a net savings in terms of GHG emissions. The wind farm is anticipated to generate approximately 136 GWh[1] of renewable electricity per annum which will displace electricity which, otherwise, would have been produced from fossil fuels.

Thus, the proposed development, in combination with the permitted wind farm, will result in a net benefit in terms of greenhouse gas emissions by off-setting c. 55,000 tonnes of CO_2 equivalent per annum.

8.5.2.2 Climate

Vehicular traffic is expected to be the only source of GHG emissions resulting from the operation of the proposed development. Vehicles, associated with the maintenance of the site, will give rise to CO_2 and N_2O emissions en route to the proposed development. However, due to the very small number of movements and the displacement of 136 GWh of electricity which otherwise would have been produced from fossil fuels, there will be a substantial net benefit in terms of greenhouse gas emissions. The export of this electricity to the national grid will off-set approximately 55,000 tonnes (annually) of CO_2 equivalent which would have been emitted by generating this electricity from fossil fuels.

8.5.3 Decommissioning Phase

As set out at **Chapter 3** (**Sections 3.2** and **3.8**), the proposed development will form part of the national electricity network and decommissioning of the substation is not proposed. Therefore, decommissioning phase effects will not occur.

8.5.4 Cumulative Effects

During the construction phase, it is possible that cumulative effects may arise in relation to dust. This effect is only likely to arise should the construction phase of the proposed development run concurrently with the construction of another project.

[1] See **Volume III**, **Chapter 8**, **Section 8.3.1.2**,

Given the relationship between the proposed development and the permitted Drumlins Park Wind Farm, it is highly likely that the developments will be constructed concurrently as a single project.

The Drumlins Park Wind Farm EIAR (**Chapter 8**, **Volume III**) concluded that significant air quality and climate effects were not assessed as likely to occur. Similarly, this EIAR has determined that there is no likelihood of significant effects to arise as a result of the proposed development even in the absence of mitigation. Following the implementation of the measures set out at **Section 8.6**, significant dust emissions from the proposed development are unlikely and are similarly unlikely, in combination with construction activities of other developments, to adversely affect sensitive receptors.

During the operational phase, it is assessed that there is no likelihood of significant adverse cumulative effects. The proposed development will, in combination with the Drumlins Park Wind Farm, result in a long-term beneficial effect on both air quality and climate.

Other existing, permitted and proposed developments, including those described at **Chapter 1**, are not assessed as likely to result in significant cumulative adverse effects on air quality or climate.

8.5.5 Transboundary Effects

Given the relative proximity of the proposed development to the international boundary with Northern Ireland, it is crucial that an assessment of likely significant transboundary effects is undertaken. The proposed development is located c. 5km from Northern Ireland and, at this distance, it is assessed that there is no likelihood for any dust or exhaust emissions to adversely affect any sensitive receptors during the construction phase and it is concluded, therefore, that the likelihood of significant transboundary effects is assessed as negligible.

It is also noted that, as part of the transboundary consultation process undertaken (see **Chapter 1**), the Environmental Health Department of Fermanagh & Omagh District Council considered that *"...it is unlikely that there would be significant environmental impacts from the proposed substation in terms of noise or air quality."*

8.6 Mitigation and Monitoring

The preceding sections have determined that the proposed development is not assessed as likely to result in any significant adverse effects on air quality and climate. Notwithstanding this, and in order to sufficiently ameliorate effects which are likely to arise, a schedule of air quality control measures has been formulated for both the construction and operational phases of the proposed development.

Specific mitigation measures, additional to best practice methods, are not proposed in relation to climate as the proposed development will result in a net benefit in the abatement of GHG emissions.

8.6.1 Construction Phase

8.6.1.1 Air Quality

The greatest likelihood of effects on air quality during the construction phase is from construction dust emissions and nuisance dust. In order to minimise dust emissions during construction, a series of mitigation measures have been prepared in the form of an outline Dust Minimisation Plan (see **Annex 8.2**, **Volume II**).

A detailed Dust Minimisation Plan will be formulated prior to the construction phase of the project. Measures to be included within the detailed Dust Minimisation Plan include:-

- Access tracks and public roads in the vicinity of the site shall be regularly cleaned to remove mud, aggregates and debris and maintained as appropriate. All road sweepers shall be water assisted;
- Any access track that may give rise to fugitive dust shall be regularly watered, as appropriate, during dry and/or windy conditions;
- Vehicles delivering materials, which could give rise to dust, shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust;
- In the event of dust nuisance occurring outside the site boundary, movement of materials will be immediately terminated and satisfactory procedures implemented to rectify the problem before the resumption of operations;
- Public roads in the vicinity of the site shall be regularly inspected for cleanliness and cleaned as necessary;
- If issues persist and the above measures are not satisfactorily control dust emissions, a wheel washing system with rumble grids to dislodge accumulated dust and mud prior to leaving the site should be installed; and
- The dust minimisation plan shall be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures.

8.6.1.2 Climate

Construction related plant, machinery and vehicles will give rise to CO_2 and N_2O emissions. However, due to the short-term and temporary nature of these works, the effect on climate will not be significant. Best practice construction methods including just in time delivery methods to prevent material waste, reuse of on-site materials (where possible) and the minimisation of fuel use will reduce construction related climate emissions.

8.6.2 Operational Phase

8.6.2.1 Air Quality

The proposed development will not result in any significant adverse air quality effects during the operational phase and no mitigation measures are proposed.

8.6.2.2 Climate

The proposed development will have a positive and beneficial effect on climate through the reduction of GHG emissions associated with energy generation and will make a significant contribution to Ireland's GHG abatement commitments. Thus, no mitigation measures are necessary in terms of the operational phase of the proposed development.

8.6.3 Decommissioning Phase

As set out at **Chapter 3** (**Sections 3.2** and **3.8**), the proposed development will form part of the national electricity network and decommissioning of the substation is not proposed. Therefore, no decommissioning phase mitigation measures are required.

8.7 Residual Effects

8.7.1 Construction Phase

With effective implementation of the Dust Minimisation Plan and other best practice measures outlined above, the proposed development is likely to have a short-term negligible effect on air quality and climate.

8.7.2 Operational Phase

The likely effect on air quality during the operational phase will be imperceptible as, essentially, there will be no change in traffic volumes as a result of the scheme. As discussed above, the operational development will be visited, on average, 1-2 times per week.

The likely effect of climate will be beneficial by facilitating the export of c. 136 GWh of renewable electricity per annum to the national grid thus leading to a reduction in CO_2 equivalent emissions.

8.7.3 Decommissioning Phase

As set out at **Chapter 3** (**Sections 3.2** and **3.8**), the proposed development will form part of the national electricity network and decommissioning of the substation is not proposed. Therefore, residual decommissioning phase effects will not occur.

8.8 Summary

An assessment of the likely air quality and climate effect associated with the proposed development has been undertaken. The assessment of baseline air quality in the region has shown that current levels of key pollutants are significantly lower than their limit values.

This assessment has concluded that any likely adverse construction phase effects on air quality and climate are assessed as ranging from Low to Negligible and thus no likely significant adverse effect on the environment. During the operational phase, the development will result in a long term positive effect on both air quality and climate.

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