9 Air Quality and Climate

9.1 Introduction

This chapter assesses the likely air quality and climate impacts associated with the proposed development at Temple Hill, Monkstown, Blackrock, Co. Dublin. A full description of the development is available in Chapter 2 – Site Context and Development Description.

9.2 Study Methodology

Criteria for Rating of Impacts

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 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 9.1 and Appendix 9.1).

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, which has set limit values for NO_2, PM_{10} and $PM_{2.5}$, which are applicable in relation to this project (see Table 9.1). Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by other EU Directives are used which are triggers for particular actions (see Appendix 9.1).

Pollutant	Directive Note [1]	Limit Type	Value
NO_x	2008/50/EC	Critical level for protection of vegetation	30 µg/m3 NO + NO2
Nitrogen Dioxide (NO_2)	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m3
		Annual limit for protection of human health	40 µg/m3
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 µg/m3
		Annual limit for protection of human health	40 µg/m3
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health	25 µg/m3

Table 9.1 Ambient Air Quality Standards

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

Dust Deposition Guidelines

The concern from a health perspective is focussed on particles of dust which are less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$) and the EU ambient air quality standards outlined in Table 9.1 have set ambient air quality limit values for PM10 and $PM_{2.5}$.

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland. Furthermore, no specific criteria have been stipulated for nuisance dust in respect of this development.

With regard to dust deposition, the German TA-Luft standard for dust deposition (non- hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/(m2*day) averaged over a one-year period at any receptors outside the site boundary. Recommendations from the Department of the Environment, Heritage & Local Government (DEHLG, 2004) apply the Bergerhoff limit of 350 mg/(m2*day) to the site boundary of quarries. This limit value can also be implemented with regard to dust impacts from construction of the proposed development.

Climate Agreements

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Paris Agreement, which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an 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 GHG 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 in the Paris Agreement on elevating adaption onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the EU enacted *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013* (the Regulation). The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. Ireland's obligation under the Regulation is a 30% reduction in non-ETS greenhouse gas emissions by 2030 relative to its 2005 levels.

In 2015, the Climate Action and Low Carbon Development Act 2015 ("the Climate Action Act") was enacted. The purpose of the Act was to enable Ireland '*to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050*', referred to in the Climate Action Act as the '*national transition objective*'.

The *Climate Action Plan* (CAP) (Government of Ireland, published in June 2019), outlines the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The CAP also details the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The CAP

has set a built environment sector reduction target of 40 - 45% relative to 2030 pre-NDP (National Development Plan) projections.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019, and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme in December 2019, followed by the promulgation of the Climate Action and Low Carbon Development (Amendment) Act 2021 ("the 2021 Climate Action Act) in July 2021. The 2021 Climate Action Act was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP.

The purpose of the 2021 ClimateAction Act is to provide for the approval of plans "*for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050*". The 2021 Climate Action Act will also "*provide for carbon budgets and a decarbonisation target range for certain sectors of the economy".* The 2021 Climate Action Act defines the carbon budget as "*the total amount of greenhouse gas emissions that are permitted during the budget period".*

The 2021 Climate Action Act refers to both the Climate Action Plan, as published in 2019, and a series of National Long Term Climate Action Strategies. In addition, the Environment Minister shall request that each Local Authority produce a climate action plan lasting five years, specifying the mitigation measures and the adaptation measures to be adopted by the Local Authority.

The Dun Laoghaire - Rathdown County Council Climate Change Action Plan 2019 – 2024 outlines a number of goals and plans to prepare for and adapt to climate change. There are five key action areas within the plan: Energy and Buildings, Transport, Flood Resilience, Nature-based Solutions and Resource Management. Some of the measures promoted within the Action Plan under the 5 key areas involve building retrofits, energy master-planning, better integration of transport and land use planning, increasing public bike facilities, developing public transport routes, development of flood resilient designs, promotion of the use of green infrastructure and waste prevention initiatives. The implementation of these measures will enable the Dun Laoghaire - Rathdown County Council area to adapt to climate change and will assist in bringing Ireland closer to achieving its climate related targets in future years. New developments need to be cognisant of the Action Plan and incorporate climate friendly designs and measures where possible.

Construction Phase

Air Quality

The assessment focuses on identifying the existing baseline levels of PM_{10} and $PM_{2.5}$ in the region of the proposed development by an assessment of EPA monitoring data. Thereafter, the impact of the construction phase of the development on air quality was determined by a qualitative assessment of the nature and scale of dust generating construction activities associated with the proposed development.

The Institute of Air Quality Management in the UK (IAQM) guidelines (2014) outline an assessment method for predicting the impact of dust emissions from demolition, earthworks, construction and haulage activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase of this development in order to predict the likely magnitude of the dust impacts in the absence of mitigation measures. The UK guidance is used in the absence of specific Irish guidance as is considered best practice.

Construction phase traffic also has the potential to impact air quality and climate. The UK Design Manual for Roads and Bridges (DMRB) guidance (UK Highways Agency, 2019a), 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. The TII guidance (2011) recommends the use of the UK guidance and was based on the previous version of the UK DMRB guidance (UK Highways Agency, 2007) and notes that the TII guidance should be adapted for any updates to the DMRB (see Section 1.1 of Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, 2011) .

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- A change in speed band;
- A change in carriageway alignment by 5m or greater.

Worst-case construction phase traffic will occur during peak construction periods associated with removal of excavated materials, import of any fill materials and concrete deliveries. The construction stage traffic was reviewed in reference to the above scoping criteria and in consultation with the civil engineers for the project. It was determined that the construction phase traffic will not increase by 1,000 AADT or 200 HDV AADT on the surrounding roads. Therefore the construction stage traffic does not meet the above scoping criteria and has been scoped out from any further assessment as there is no potential for significant impacts to air quality as a result of traffic emissions.

Climate

The impact of the construction phase of the development on climate was determined by a qualitative assessment of the nature and scale of greenhouse gas generating construction activities associated with the proposed development.

Operational Phase

Air Quality Assessment

Operational phase traffic has the potential to impact air quality. The air quality assessment has been carried out following procedures described in the publications by the EPA (2015; 2017) and using the methodology outlined in the guidance documents published by the UK Highways Agency (2019a) and UK Department of Environment Food and Rural Affairs (DEFRA) (2016; 2018). Transport Infrastructure Ireland (TII) reference the use of the UK Highways Agency and DEFRA guidance and methodology in their document *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (2011). This approach is considered best practice in the absence of Irish guidance and can be applied to any development that causes a change in traffic.

The UK Highways Agency guidance *LA 150* (2019a) scoping criteria outlined in Section 9.2.2 was used to determine the road links required for inclusion in the modelling assessment. The proposed development will increase the AADT on the surrounding roads by at most 627 on the N31 to the west of the site. This is well below the 1000 AADT change required for a modelling assessment. Therefore, as none of the road links impacted by the proposed development met the scoping criteria a detailed assessment was scoped out as there is no potential for significant impacts to air quality from traffic emissions.

Air Quality Impact on Ecological Sites

For routes that pass within 2 km of a designated area of conservation (either Irish or European designation) the TII requires consultation with an ecologist (TII, 2011). However, in practice the

potential for impact to an ecological site is highest within 200 m of the proposed scheme and when significant changes in AADT (>5%) occur. Only sites that are sensitive to nitrogen deposition should be included in the assessment. In addition, the UK Highways Agency (2019a) states that a detailed assessment does not need to be conducted for areas that have been designated for geological features or watercourses.

Transport Infrastructure Ireland's *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (2009) and *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities* (DEHLG, 2010) provide details regarding the legal protection of designated conservation areas.

If both of the following assessment criteria are met, an assessment of the potential for impact due to nitrogen deposition should be conducted:

- A designated area of conservation is located within 200 m of the proposed development; and
- A significant change in AADT flows (>5%) will occur.

There are no ecological sites within 200 m of any impacted road links and there is no significant change in AADT flows. As a result, a detailed assessment has been scoped out as there is no potential for significant impacts to any designated sites.

Climate Assessment

Ireland has annual GHG targets which are set at an EU level and need to be complied with in order to reduce the impact of climate change. Impacts to climate as a result of GHG emissions are assessed against the targets set out by the EU under *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013*. Which has set a target of a 30% reduction in non-ETS sector emissions by 2030 relative to 2005 levels.

As per the EU guidance document *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment* (European Commission, 2013) the climate baseline is first established by reference to EPA data on annual GHG emissions (see Section 9.3.3). Thereafter, the impact of the proposed development on climate is determined. Emissions from road traffic associated with the proposed development have the potential to emit carbon dioxide (CO_2) which will impact climate.

The UK Highways Agency has published an updated DMRB guidance document in relation to climate impact assessments *LA 114 Climate* (UK Highways Agency 2019b). The following scoping criteria are used to determine whether a detailed climate assessment is required for a proposed project during the operational stage. If any of the road links impacted by the proposed development meet or exceed the below criteria, then further assessment is required.

- A change of more than 10% in AADT;
- A change of more than 10% to the number of heavy duty vehicles; and
- A change in daily average speed of more than 20 km/hr.

The operational stage traffic was reviewed and it was determined that, as none of the impacted road links met the above criteria, a detailed climate assessment was not required as there is no potential for significant impacts to climate as a result of traffic emissions.

The EU guidance (2013) also states indirect GHG emissions as a result of a development must be considered, this includes emissions associated with energy usage. The Energy & Sustainability Report prepared in relation to the proposed development has been reviewed and used to inform the operational phase climate assessment. This report outlines a number of measures in relation to energy usage for the proposed development. A number of measures have been incorporated into the overall design of the development to reduce the impact to climate where possible .

9.3 The Existing Receiving Environment (Baseline)

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). 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 Dublin Airport meteorological station, which is located approximately 15 km north of the site. Dublin Airport met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 9.1). For data collated during five representative years (2016 – 2020), the predominant wind direction is westerly to south-westerly, with generally moderate wind speeds (Met Éireann, 2021).

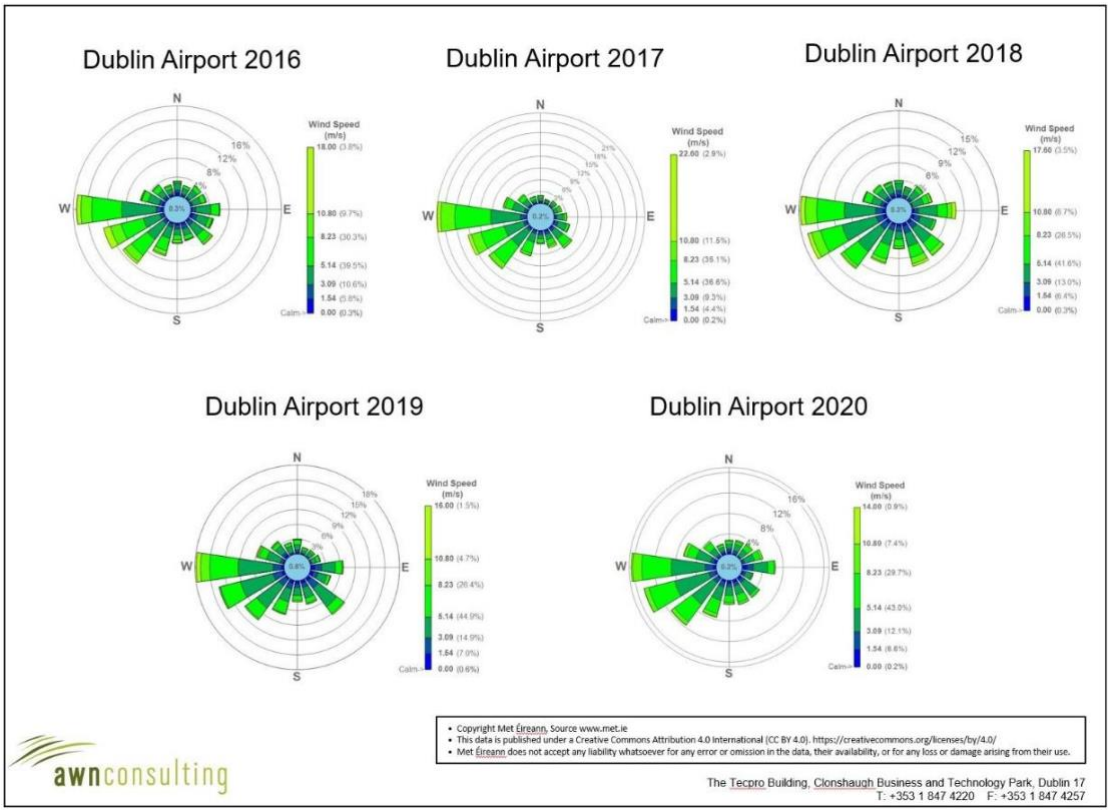

Figure 9.1 Dublin Airport Windroses 2016 – 2020

Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality in Ireland is "Air Quality In Ireland 2019" (EPA, 2020). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA, 2021a).

As part of the implementation of the Air Quality Standards Regulations, four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2021a). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air monitoring and assessment, the proposed development is within Zone A (EPA, 2021a). The long-term EPA monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

With regard to NO_2, continuous monitoring data from the EPA (EPA, 2020) at suburban Zone A locations in Ballyfermot, Dun Laoghaire, Swords and Rathmines show that current levels of NO_2 are below both the annual and 1-hour limit values, with annual average levels ranging from 15 – 22 µg/m^3 in 2019 (see Table 9.2). Sufficient data is available for all stations to observe the long-term trend since 2015 (EPA, 2020) (see Table 9.2), with results ranging from 13 – 22 µg/m^3 and few exceedances of the one-hour limit value. The station in Dún Laoghaire is approximately 3 km south-east of the proposed development site and monitored background concentrations would be representative of the site location. Concentrations of NO_2 at the Dún Laoghaire site over the period 2015 – 2019 ranged from 15 - 19 µg/m^3. Based on the above information, an estimate of the current background NO_2 concentration in the region of the proposed development is 19 µg/m^3.

Station	Averaging Period Notes [1,2]	Year				
		2015	2016	2017	2018	2019
Rathmines	Annual Mean NO_2 (µg/m3)	18	20	17	20	22
	Max 1-hr NO_2 (µg/m^3)	106	102	116	138	183
Dún Laoghaire	Annual Mean NO_2 (µg/m3)	16	19	17	19	15
	Max 1-hr NO_2 (µg/m^3)	103	142	153	135	104
Swords	Annual Mean NO_2 (µg/m3)	13	16	14	16	15
	Max 1-hr NO_2 (µg/m^3)	170	206	107	112	108
Ballyfermot	Annual Mean NO_2 (µg/m3)	16	17	17	17	20
	Max 1-hr NO_2 (µg/m^3)	142	127	148	217	124

Table 9.2 Trends in Zone A Air Quality – Nitrogen Dioxide (NO_2)

Note 1 Annual average limit value - 40 µg/m3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 1-hour limit value - 200 µg/m3 as a 99.8th%ile, i.e. not to be exceeded >18 times per year (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Continuous PM_{10} monitoring carried out at the Zone A locations of Tallaght, Rathmines, Phoenix Park and Dún Laoghaire showed 2015 – 2019 annual mean concentrations ranging from 9 – 15 µg/m^3 (35 exceedances are permitted per year). The most representative location is Dún Laoghaire which had an average annual mean concentration of 12.6 µg/m^3 over the five year period. Based on the EPA data (Table 9.3) a conservative estimate of the current background PM_{10} concentration in the region of the proposed development is 13 µg/m^3.

Station	Averaging Period Notes [1,2]	Year				
		2015	2016	2017	2018	2019
Tallaght	Annual Mean PM_{10} (µg/m^3)	14	14	11.8	15	12
	24-hr Mean > 50 µg/m^3 (days)	4	0	2	1	3
Rathmines	Annual Mean PM_{10} (µg/m^3)	15	15	13	15	15
	24-hr Mean > 50 µg/m^3 (days)	5	3	5	2	9
Phoenix Park	Annual Mean PM_{10} (µg/m^3)	12	11	9	11	11
	24-hr Mean > 50 µg/m^3 (days)	2	0	1	0	2
Dún Laoghaire	Annual Mean PM_{10} (µg/m^3)	13	13	12	13	12
	24-hr Mean > 50 µg/m^3 (days)	3	0	2	0	2

Table 9.3 Trends in Zone A Air Quality – PM_{10}

Note 1 Annual average limit value - 40 µg/m3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 24-hour limit value - 50 µg/m3 as a 90.4th%ile, i.e. not to be exceeded >35 times per year (EU Council Directive 1999/30/EC & S.I. No. 180 of 2011).

Continuous $PM_{2.5}$ monitoring carried out at the Zone A location of Rathmines showed $PM_{2.5}/PM_{10}$ ratios ranging from 0.60 – 0.68 over the period 2015 – 2019. Based on this information, a conservative ratio of 0.7 was used to generate a background $PM_{2.5}$ concentration in the region of the proposed development of 9.1 µg/m^3.

Based on the above information the air quality in the suburban Dublin area is generally good, with concentrations of the key pollutants generally well below the relevant limit values. However, the EPA have indicated that road transport emissions are contributing to increased levels of NO_2 with the potential for breaches in the annual NO_2 limit value in future years at locations within urban centres and roadside locations. In addition, burning of solid fuels for home heating is contributing to increased levels of particulate matter (PM_{10} and $PM_{2.5}$). The EPA predict that exceedances in the particulate matter limit values are likely in future years if burning of solid fuels for residential heating continues (EPA, 2020).

Climate Baseline

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 final emissions up to 2019 (EPA, 2021b). The data published in 2021 states that Ireland has exceeded its 2019 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC1 by 6.85 Mt. For 2019, total national greenhouse gas emissions are 59.78 million tonnes carbon dioxide equivalent (Mt CO_2eq) with 45.58 MtCO_2eq of emissions associated with the ESD sectors for which compliance with the EU targets must be met. Agriculture is the largest contributor in 2019 at 35.3% of the total, with the transport sector accounting for 20.3% of emissions of CO_2.

GHG emissions for 2019 are 4.4% lower than those recorded in 2018. Emission reductions have been recorded in 6 of the last 10 years. However, compliance with the annual EU targets has not been met for four years in a row. Emissions from 2016 – 2019 exceeded the annual EU targets by 0.29 MtCO2eq, 2.94 MtCO2eq, 5.57 MtCO2eq and 6.85 MtCO2eq respectively. Agriculture is consistently the largest contributor to emissions with emissions from the transport and energy sectors being the second and third largest contributors respectively in recent years.

The EPA 2020 GHG Emissions Projections Report for 2020 – 2040 (EPA, 2021c) 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 and the Climate Action Plan published in 2019. Implementation of these 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 to 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 12.2MtCO2eq under the "With Existing Measures" scenario and under the "With Additional Measures" scenario (EPA, 2021c). The projections indicate that Ireland can meet its non-ETS EU targets over the period 2021 – 2030 assuming full implementation of the 2019 Climate Action Plan and the use of the flexibilities available.

Sensitivity of the Receiving Environment

In line with the UK Institute of Air Quality Management (IAQM) guidance document 'Guidance on the Assessment of Dust from Demolition and Construction' (2014) prior to assessing the impact of dust from a proposed development the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time. Commercial properties and places of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity.

In terms of receptor sensitivity to dust soiling, there are approximately 37 high sensitivity residential properties within 50m of the main works area of the proposed development site. Worst case receptors have been considered for this assessment. Based on the IAQM criteria outlined in Table 9.4, the worst case sensitivity of the area to dust soiling is considered to be medium.

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	<50	<100	<350
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 9.4 Sensitivity of the Area to Dust Soiling Effects on People and Property

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean PM10 concentration, receptor sensitivity based on type (residential receptors are classified as high sensitivity) and the number of receptors affected within various distance bands from the construction works. A conservative estimate of the current annual mean PM_{10} concentration in the vicinity of the proposed development is 13 $\mu g/m^3$ and there are approximately 37 high sensitivity receptors located within 50m of the proposed development site. Based on the IAQM criteria outlined in Table 9.5, the worst case sensitivity of the area to human health is considered to be **low**.

Receptor Sensitivity	Annual Mean PM10 Concentration	Number Of Receptors	Distance from source (m)				
			<20	<50	<100	<200	<350
High	< 24 $\mu g/m^3$	>100	Medium	Low	Low	Low	Low
		10-100	Low	**Low**	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	< 24 $\mu g/m^3$	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	< 24 $\mu g/m^3$	>1	Low	Low	Low	Low	Low

Table 9.5 Sensitivity of the Area to Human Health Impacts

9.4 Characteristics of the Proposed Development

The proposed development is at Temple Hill, Monkstown, Blackrock, Co. Dublin. A full description of the development is available in Chapter 2 – Site Context and Description of Development.

When considering a development of this nature, the potential air quality and climate impact on the surroundings must be considered for each of two distinct stages:

- Construction phase, and;
- Operational phase.

Construction Phase

The key elements of construction of the proposed development with potential for air quality and climate impacts are:

- Potential fugitive dust emissions from general site preparation (demolition works, foundation and basement excavation) and construction activities;
- Potential fugitive dust emissions from trucks associated with construction;
- Engine emissions from construction vehicles and machinery.

Operational Phase

The key elements of operation of the proposed development with potential for air quality and climate impacts are:

- A change in traffic flows on road links nearby the proposed development.

9.5 Potential Impact of the Proposed Development

Construction Phase

Air Quality

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (see Section 9.3.4). The major dust generating activities are divided into four types within the IAQM (2014) guidance to reflect their different potential impacts.

These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (movement of heavy vehicles).

Demolition

Demolition will primarily involve the removal of buildings or structures currently on the site in a potentially dusty manner. This may also involve dust generation at heights. Dust emission magnitude from demolition can be classified as small, medium and large and are described below.

- **Large**: Total building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level;
- **Medium**: Total building volume 20,000 m^3 – 50,000 m^3, potentially dusty construction material, demolition activities 10-20 m above ground level; and
- **Small**: Total building volume less than 20,000 m^3.

A significant amount of demolition has been undertaken on site as per the previous planning permission and was assessed as part of that assessment. As per the dust emission magnitude classification, the proposed demolition activities can be classified as "small" as the total building

volume to be demolished is less than 20,000 m^3. As the overall sensitivity of the area to dust soiling impacts is medium, therefore, there is a low risk of dust soiling impacts from the proposed demolition activities according to the IAQM guidance (see Table 9.6). There is an overall negligible risk of human health impacts as a result of the demolition activities as the overall sensitivity of the area to human health impacts is low (Section 9.3.4).

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

Table 9.6 Risk of Dust Impacts - Demolition

Earthworks

Earthworks primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category. The dust emission magnitude from earthworks can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

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

The total developable site area is greater than 10,000 m^2. However, it is conservatively estimated that the material to be moved during excavation and infill operations will be less than 100,000 tonnes. Therefore, the dust emission magnitude for the proposed earthwork activities can be classified as medium.

The sensitivity of the area, as determined in Section 9.3.4, is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 9.7 combining the medium dust emission magnitude with a medium sensitivity to dust soiling results in an overall medium risk of potential dust impacts as a result of the proposed earthworks activities in the absence of mitigation. There is an overall low risk of human health impacts as a result of the earthworks activities as the overall sensitivity of the area to human health impacts is low (Section 9.3.4).

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 9.7 Risk of Dust Impacts – Earthworks

Construction

Dust emission magnitude from construction can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

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

The dust emission magnitude for the proposed construction activities can be classified as large as worst-case as the total building volume will be greater than 100,000 m^3. As outlined in Table 9.8, combining this with a medium sensitivity to dust results in an overall medium risk of dust soiling impacts as a result of the proposed construction activities in the absence of mitigation. There is an overall low risk of human health impacts as a result of the construction activities as the overall sensitivity of the area to human health impacts is low (Section 9.3.4).

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 9.8 Risk of Dust Impacts – Construction

Trackout

Factors which determine the dust emission magnitude are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

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

The dust emission magnitude for the proposed trackout can be classified as large as at a worst- case as there will be greater than 50 outward HGV movements per day at peak times. As outlined in Table 9.9, combining this with a medium sensitivity to dust soiling results in an overall medium risk of impacts as a result of the proposed trackout activities in the absence of mitigation. There is an overall low risk of human health impacts as a result of trackout activities as the overall sensitivity of the area to human health impacts is low (Section 9.3.4).

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 9.9 Risk of Dust Impacts – Trackout

Summary of Dust Emission Risk

The risk of dust impacts as a result of the proposed development are summarised in Table 9.10 for each activity. The magnitude of risk determined is used to prescribe the level of site specific mitigation required for each activity in order to prevent significant impacts occurring.

Overall, in order to ensure that no dust nuisance occurs during the demolition, earthworks, construction and trackout activities, a range of dust mitigation measures associated with a worst-case medium risk of dust impacts must be implemented. In the absence of mitigation, there is the potential for short-term, negative, significant impacts to air quality as a result of construction dust emissions.

Potential Impact	Dust Emission Magnitude			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	Low Risk	Medium Risk	Medium Risk	Medium Risk
Human Health	Negligible Risk	Low Risk	Low Risk	Low Risk

Table 9.10 Summary of Dust Impact Risk used to Define Site-Specific Mitigation

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase. Particularly due to the increase in HGVs accessing the site. The construction stage traffic has been reviewed and a detailed air quality assessment has been scoped out as none of the road links impacted by the proposed development satisfy the DMRB assessment criteria in Section 9.2.2. It can therefore be determined that the construction stage traffic will have an imperceptible, neutral and short-term impact on air quality.

Climate

There is the potential for a number of greenhouse gas emissions to enter the atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO2 and N2O emissions. The Institute of Air Quality Management document "*Guidance on the Assessment of Dust from Demolition and Construction*" (IAQM, 2014) states that site traffic and plant is unlikely to make a significant impact on climate. Therefore, the impact on climate is considered to be imperceptible, neutral and short term.

Human Health

Dust emissions from the construction phase of the proposed development have the potential to impact human health through the release of PM_{10} and $PM_{2.5}$ emissions. As per section 9.3.4 the surrounding area is of low sensitivity to dust related human health impacts. It was determined that there is an overall low risk of dust related human health impacts as a result of the construction phase of the proposed development. Therefore, in the absence of mitigation there is the potential for imperceptible, negative, short-term impacts to human health as a result of the proposed development.

Operational Phase

Air Quality

There is the potential for a number of emissions to the atmosphere during the operational phase of the development. In particular, the traffic-related air emissions may generate quantities of air pollutants such as NO_2, PM_{10} and $PM_{2.5}$.

Traffic flow information obtained from NRB Consulting, the consulting engineers on this project, was reviewed prior to assessing the impact of the proposed development. It was concluded that further assessment of impacts from the aforementioned pollutant emissions can be screened out using the UK DMRB guidance (UK Highways Agency, 2019a), on which the TII guidance was based.

The proposed development will not increase traffic levels by more than the scoping criteria (see Section 9.2.2), therefore, an assessment of the impact of traffic emissions during the operational phase on ambient air quality is not necessary as no significant impacts are likely. It can be concluded that the impact of the proposed development in terms of air quality is long-term, localised, neutral and imperceptible.

Climate

The impact of the proposed development on emissions of CO_2 impacting climate were assessed using the DMRB screening criteria as outlined in Section 9.2.3 (UK Highways Agency, 2019b). As with the air quality assessment, impacts on climate can be screened out due to no road links being classed as impacted. Therefore, the likely overall magnitude of the changes on climate in the operational stage is imperceptible, neutral and long-term.

Climate change has the potential to alter weather patterns and increase the frequency of rainfall in future years. As a result of this there is the potential for flooding related impacts on site in future years. A detailed flood risk assessment has been undertaken as part of this planning application and adequate attenuation and drainage have been provided to account for increased rainfall in future years. Therefore, the impact will be imperceptible.

In addition, the proposed development has been designed to reduce the impact to climate where possible during operation. A number of measures have been incorporated into the overall design of the development, for example UV free-LED fittings and timer controls are considerations being undertaken to improve the impact lighting may have on climate. In addition, the proposed development is situated in an area with excellent transport nodes. As per the Traffic & Transport Assessment (TTA) prepared in relation to the development, the development within an area with existing high levels of public transport and connectivity is beneficial in regards to reducing the reliance on private cars. The reduction in private car use is beneficial to climate as it reduces transport related GHG emissions. The proposed development promotes the use of alternative modes of transport other than private cars by incorporating a high number of cycle spaces and through its proximity to Dublin Bus routes and the DART. Further details of the measures to be incorporated into the design of the development are outlined within the Energy & Sustainability Report prepared in support of this planning application.

Human Health

Traffic related air emissions have the potential to impact air quality which can affect human health. However, the change in traffic associated with the proposed development was not of the magnitude to require detailed air dispersion modelling as there is no potential for significant impacts. Therefore, traffic emissions are predicted to be below the ambient air quality standards set for the protection of

human health. It can be determined that the impact to human health during the operational stage is long-term, neutral and imperceptible.

9.6 Do Nothing Scenario

In the Do Nothing scenario, ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from potential new developments in the surrounding area, changes in road traffic, etc) as per Section 9.3. The Do Nothing scenario is considered neutral in terms of air quality and climate.

9.7 Mitigation Measures

Construction Phase

Air Quality

The proactive control of fugitive dust will ensure the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released. The measures for controlling fugitive dust, and the manner in which they are to be implemented, have been set out in the Dust Management Plan which can be found in Appendix 9.2. These measures will be incorporated into the Construction Environmental Management Plan (CEMP) prepared for the site.

In summary the measures which will be implemented include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles exiting the site shall make use of a wheel wash facility prior to entering onto public roads.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials especially soil, both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Climate

Construction stage traffic and embodied energy of construction materials are expected to be the dominant source of greenhouse gas emissions as a result of the construction phase of the

development. Construction vehicles, generators etc., may give rise to some CO_2 and N_2O emissions. However, due to short-term nature of these works, the impact on climate will not be significant.

Nevertheless, some site-specific mitigation measures will be implemented during the construction phase of the proposed development to ensure emissions are reduced further. In particular the prevention of on-site or delivery vehicles from leaving engines idling, even over short periods. Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.

Operational Phase

The impact of the proposed development on air quality and climate is predicted to be imperceptible with respect to the operational phase in the long term. Therefore, no site specific mitigation measures are required.

The proposed development has been designed to minimise the impact to climate where possible during operation. Details of the measures to be incorporated into the design of the development are outlined in Section 9.5.2 and within the Energy & Sustainability Report prepared in support of this planning application.

9.8 Residual Impacts of the Proposed Development

Construction Phase

Air Quality

Once the dust minimisation measures outlined in Section 9.8 and Appendix 9.2 are implemented, the impact of the proposed development in terms of dust soiling will be short-term, localised, negative and imperceptible at nearby receptors.

Climate

According to the IAQM guidance (2014) site traffic, plant and machinery are unlikely to have a significant impact on climate. Therefore the predicted impact is neutral, short-term and imperceptible.

Human Health

Best practice mitigation measures shall be implemented during the construction phase of the proposed development, which will focus on the proactive control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the impact of construction of the proposed development is likely to be negative, short-term, localised and imperceptible with respect to human health.

Operational Phase

Air Quality

As the traffic generated by the proposed development does not meet the criteria detailed in Section 9.2.2 for requiring a detailed air quality assessment, the residual impact to air quality from traffic emissions during the operational stage is predicted to be neutral, long-term and imperceptible.

Climate

The traffic associated with the operational phase of the proposed development is below the criteria requiring a detailed climate assessment.. The residual impact to climate as a result of traffic emissions during the operational phase is predicted to be long-term, neutral and imperceptible. In addition, the proposed development has been designed to reduce the impact to climate where possible during operation.

Human Health

Emissions of air pollutants are predicted to be significantly below the ambient air quality standards which are based on the protection of human health, impacts to human health are long-term, neutral and imperceptible.

9.9 Cumulative Impacts

Construction Phase

According to the IAQM guidance (2014) should the construction phase of the proposed development coincide with the construction phase of any other developments within 350m then there is the potential for cumulative construction dust related impacts to nearby sensitive receptors. However, provided the mitigation measures outlined in Section 9.7 and Appendix 9.2 are implemented throughout the construction phase of the proposed development significant cumulative dust impacts are not predicted.

Due to the short-term duration of the construction phase and the low potential for significant CO_2 and N_2O emissions cumulative impacts to climate are considered imperceptible.

There are no significant cumulative impacts to air quality or climate predicted for the construction phase.

Operational Phase

The traffic data used to assess the operational stage impacts to air quality and climate included the cumulative traffic associated with the proposed development as well as other existing and permitted developments in the local area (see Chapter 13 Traffic and Transport). Therefore, the cumulative impact is included within the operational stage impact for the proposed development. The impact is predicted to be long-term and imperceptible with regards to air quality and climate.

9.10 Monitoring

Construction Phase

Monitoring of construction dust deposition along the site boundary to nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/(m2*day) during the monitoring period between 28 - 32 days.

Operational Phase

There is no monitoring recommended for the operational phase of the development as impacts to air quality and climate are predicted to be imperceptible.

9.11 Reinstatement

Not applicable.

9.12 Interactions

Air quality does not have a significant number of interactions with other topics. The most significant interactions are between population and human health and air quality. An adverse impact due to air quality in either the demolition, construction or operational phase has the potential to cause health and dust nuisance issues. The mitigation measures that will be put in place at the proposed development will ensure that the impact of the proposed development complies with all ambient air quality legislative limits and therefore the predicted impact is short-term, imperceptible and negative with respect to population and human health during construction and long-term, imperceptible and neutral during operation phase.

Interactions between air quality and traffic (Chapter 12) can be significant. With increased traffic movements and reduced engine efficiency, i.e. due to congestion, the emissions of vehicles increase. The impacts of the proposed development on air quality are assessed by reviewing the change in annual average daily traffic on roads close to the site. In this assessment, the impact of the interactions between traffic and air quality are considered to be long-term, imperceptible and neutral.

Construction phase activities such as land clearing, excavations, stockpiling of materials etc. have the potential for interactions between air quality and land and soils in the form of dust emissions. With the appropriate mitigation measures to prevent fugitive dust emissions, it is predicted that there will be no significant interactions between air quality and land and soils.

As set out in Chapter 7 (Land, Soils, Geology, Hydrogeology and Utilities), dust generation can occur during extended dry weather periods as a result of construction traffic. Dust suppression measures (e.g. dampening down) will be implemented as necessary during dry periods and vehicle wheel washes will be installed. The works involve stripping of topsoil and excavations, which will remove some vegetation such as trees and scrub. It will also generate dust and potentially impact on the air quality in the locality. However, the generation of dust will be temporary during construction phase and is not anticipated to have a significant impact on biodiversity.

The impact of the interactions between land, soils and geology, biodiversity and air quality are considered to be short-term, imperceptible and neutral.

No other significant interactions with air quality and climate have been identified.

9.13 Difficulties Encountered

There were no difficulties encountered when compiling this assessment.

9.14 References

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