9 CLIMATE (AIR QUALITY AND CLIMATE CHANGE)

9.1 Introduction

This Chapter assesses the likely air quality and climate impacts associated with the proposed residential development at Dunshaughlin, Co. Meath. The proposed development is in two distinct sites and comprise a total area of 14.8 Ha. The proposed development will involve construction of a residential development, a childcare facility and all associated ancillary and infrastructural works. A full description of the development is available in Chapter 3: Description of the Proposed Development.

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9.2 Assessment Methodology

9.2.1 Criteria for Rating of Impacts

9.2.1.1 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 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 (S.I. No. 180 of 2011), which incorporate EU Directive 2008/50/EC, which has set limit values for a number of pollutants. The limit values for NO_2, PM_{10}, $PM_{2.5}$, benzene and CO are relevant to this assessment (see Table 9.1). 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 Appendix 9.1).

Pollutant	Regulation Note 1	Limit Type	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m^3
		Annual limit for protection of human health	40 µg/m^3
		Critical level for protection of vegetation	30 µg/m^3 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 µg/m^3
		Annual limit for protection of human health	40 µg/m^3
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health	25 µg/m^3
Benzene	2008/50/EC	Annual limit for protection of human health	5 µg/m^3
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	10 mg/m^3 (8.6 ppm)

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

Table 9.1: Air Quality Standards Regulations

9.2.1.2 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 PM_{10} 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/(m^2*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/(m^2*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.

9.2.1.3 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 42 kt for SO_2 (67% below 2001 levels), 65 kt for NO_X (52% reduction), 55 kt for VOCs (37% reduction) and 116 kt 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 $PM_{2.5}$.

European Commission Directive 2001/81/EC, 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 (DEHLG, 2004; 2007). The data available from the EPA in 2020 (EPA, 2020a) indicated that Ireland complied with the emissions ceilings for SO_2, NH_3,NO_X and NMVOCs (non-methane volatile organic compounds) in recent years. 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, $PM_{2.5}$ and CH_4. In relation to Ireland, 2020 emission targets are 25.5 kt for SO_2 (65% on 2005 levels), 66.9 kt for NO_X (49% reduction on 2005 levels), 56.9 kt for NMVOCs (25% reduction on 2005 levels), 112 kt for NH_3 (1% reduction on 2005 levels) and 15.6 kt for $PM_{2.5}$ (18% reduction on 2005 levels). In relation to 2030, Ireland's emission targets are 10.9 kt (85% below 2005 levels) for SO_2, 40.7 kt (69% reduction) for NO_x, 51.6 kt (32% reduction) for NMVOCs, 107.5 kt (5% reduction) for NH_3 and 11.2 kt (41% reduction) for $PM_{2.5}$.

9.2.1.4 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 (UNFCC, 1997, 1999). 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 from the 2nd to 13th 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 is currently ratified by 187 nations, and 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 gigatons 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, in 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 (Emission 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 27% for the share of renewable energy consumed in the EU in 2030.

The "*Draft National Energy and Climate Plan (NECP) 2021-2030*" (Government of Ireland, 2018) was published in December 2018 and was to be submitted by the government, as a final version, to the EU by the end of 2019. The plan, when finalised, will outline the roadmap for meeting the legal energy and climate obligations including a 30% reduction target in greenhouse gas emissions from the non-ETS sectors including transport, buildings, agriculture and waste management.

In order to meet the objectives of the Paris Agreement and to reduce Ireland's GHG emissions the Irish government has established several policies at a national level. The Climate Action and Low Carbon Development Act 2015 (Government of Ireland, 2015) was developed to provide for the approval of plans by the government in relation to climate change and to enable achievement of the national transition objective of achieving decarbonisation by 2050. Under this Act the National Mitigation Plan (DCCAE, 2017) and the National Adaptation Framework (DCCAE, 2018) were established. The National Mitigation Plan sets out objectives for achieving a reduction in GHG emissions and transitioning the four key sectors (power generation, built environment, transport and agriculture) to decarbonisation, while the National Adaptation Framework aims to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts. Under the National Adaptation Framework each local authority was obligated to produce a Climate Adaptation Strategy for their functional area detailing the risks and challenges posed by climate change and the measures that will be put in place to adapt to those climatic changes.

The Government has also published the Climate Action Plan 2019 (Government of Ireland, 2019). This Plan is "*committed to achieving a net zero carbon energy systems objective for Irish society and in the process, create a resilient, vibrant and sustainable country*". This will be led by the Government who will outline a set of policies to achieve the targets of the Plan. In order to meet the EU 2030 targets established for Ireland and the overall aim of decarbonisation by 2050 several plans and policies in the key sectors of electricity, built environment, transport, enterprise, agriculture and waste are outlined within the Climate Action Plan. In addition, the "*Draft General Scheme of the Climate Action (Amendment) Bill 2019*" was published in January 2020 (Government of Ireland, 2020). This is a key action of the Government's Climate Action Plan 2019 and aims to enshrine in law the approach outlined in the Climate Action Plan.

9.2.2 Construction Phase

The current 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.

Construction phase traffic also has the potential to impact air quality and climate. The UK 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) 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.

In addition, the impact of construction activities on vehicle movements shall be assessed where construction activities are programmed to last for more than 2 years (UK Highways Agency, 2019a). The construction stage traffic does not meet the above scoping criteria and therefore, has been scoped out from any further assessment as there is no potential for significant impacts.

9.2.3 Operational Phase

9.2.3.1 Air Quality Assessment

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.

In 2019 the UK Highways Agency DMRB air quality guidance was revised with *LA 105 Air Quality* replacing a number of key pieces of guidance (HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15). This revised document outlines a number of changes for air quality assessments in relation to road schemes but can be applied to any development that causes a change in traffic. Previously the DMRB air quality spreadsheet was used for the majority of assessments in Ireland with detailed modelling only required if this screening tool indicated compliance issues with the EU air quality standards. Guidance from Transport Infrastructure Ireland (TII, 2011) recommends the use of the UK Highways Agency DMRB spreadsheet tool for assessing the air quality impacts from road schemes. However, the DMRB spreadsheet tool was last revised in 2007 and accounts for modelled years up to 2025. Vehicle emission standards up to Euro V are included but since 2017, Euro 6d standards are applicable for the new fleet. In addition, the model does not account for electric or hybrid vehicle use. Therefore, this a somewhat outdated assessment tool. The LA 105 guidance document states that the DMRB spreadsheet tool may still be used for simple air quality assessments where there is unlikely to be a breach of the air quality standards. Due to its use of a "dirtier" fleet, vehicle emissions would be considered to be higher than more modern models and therefore any results will be conservative in nature and will provide a worst-case assessment.

The 2019 UK Highways Agency DMRB air quality revised guidance *LA 105 Air Quality* states that modelling should be conducted for NO_2 for the base, opening and design years for both the do minimum (do nothing) and do something scenarios. Modelling of PM_{10} is only required for the base year to demonstrate that the air quality limit values in relation to PM_{10} are not breached. Where the air quality modelling indicates exceedances of the PM_{10} air quality limits in the base year then PM_{10} should be included in the air quality model in the do minimum and do something scenarios. Modelling of $PM_{2.5}$ is not required as there are currently no issues with compliance with regard to this pollutant. The modelling of PM_{10} can be used to show that the project does not impact on the $PM_{2.5}$ limit value as if compliance with the PM_{10} limit is achieved then compliance with the $PM_{2.5}$ limit will also be achieved. Historically modelling of carbon monoxide (CO) and benzene (Bz) was required however, this is no longer needed as concentrations of these pollutants have been monitored to be significantly below their air quality limit values in recent years, even in urban centres (EPA, 2019a). The key pollutant reviewed in this assessment is NO_2. Concentrations of PM_{10} have been modelled for the base year to indicate that there are no potential compliance issues. Modelling of operational NO_2 concentrations has been conducted for the do nothing and do something scenarios for the opening year (2024) and design year (2039).

The TII guidance (2011) states that the assessment must progress to detailed modelling if:

- Concentrations exceed 90% of the air quality limit values when assessed by the screening method.
- Sensitive receptors exist within 50m of a complex road layout (e.g. grade separated junctions, hills etc).

The UK Highways Agency guidance *LA 150* (2019) scoping criteria outlined in Section 9.2.2 was used to determine the road links required for inclusion in the modelling assessment.

Sensitive receptors within 200m of impacted road links are included within the modelling assessment. Pollutant concentrations are calculated at these sensitive receptor locations to determine the impact of the proposed development in terms of air quality. The guidance states a proportionate number of representative receptors which are located in areas which will experience the highest concentrations or greatest improvements as a result of the proposed development are to be included in the modelling (UK Highways Agency, 2019a). The TII guidance (2011) defines sensitive receptor locations as: residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present. A total of two high sensitivity residential receptors (R1 and R2) were included in the modelling assessment and are detailed in Figure 9.1.

The following model inputs are required to complete the assessment using the DMRB spreadsheet tool: road layouts, receptor locations, annual average daily traffic movements (AADT), percentage heavy goods vehicles (%HGV), annual average traffic speeds and background concentrations. Using this input data, the model predicts the road traffic contribution to ambient ground level concentrations at the worst-case sensitive receptors using generic meteorological data. The DMRB model uses conservative emission factors, the formulae for which are outlined in the DMRB Volume 11 Section 3 Part 1 – HA 207/07 Annexes B3 and B4. These worst-case road contributions are then added to the existing background concentrations to give the worst-case predicted ambient concentrations. The worst-case ambient concentrations are then compared with the relevant ambient air quality standards to assess the compliance of the proposed development with these ambient air quality standards.

The TII document *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (2011) details a methodology for determining air quality impact significance criteria for road schemes which can be applied to any project that causes a change in traffic. The degree of impact is determined based on both the absolute and relative impact of the proposed development. The TII significance criteria have been adopted for the proposed development and are detailed in Appendix 9.2 Table A9.2.1 to Table A9.2.3. The significance criteria are based on NO_2 and PM_{10} as these pollutants are most likely to exceed the annual mean limit values (40 µg/m^3).

Conversion of NO_x to NO_2

NO_X (NO + NO_2) is emitted by vehicles exhausts. The majority of emissions are in the form of NO, however, with greater diesel vehicles and some regenerative particle traps on HGVs the proportion of NO_X emitted as NO_2, rather than NO is increasing. With the correct conditions (presence of sunlight and O_3) emissions in the form of NO, have the potential to be converted to NO_2.

Transport Infrastructure Ireland states the recommended method for the conversion of NOx to NO_2 in "*Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes*" (2011). The TII guidelines recommend the use of DEFRAs NOx to NO_2 calculator (2019) which was originally published in 2009 and is currently on version 7.1. This calculator (which can be downloaded in the form of an excel spreadsheet) accounts for the predicted availability of O_3 and proportion of NOx emitted as NO for each local authority across the UK. O_3 is a regional pollutant and therefore concentrations do not vary in the same way as concentrations of NO_2 or PM_{10}.

The calculator includes Local Authorities in Northern Ireland and the TII guidance recommends the use of 'Armagh, Banbridge and Craigavon' as the choice for local authority when using the calculator. The choice of Craigavon provides the most suitable relationship between NO_2 and NO_x for Ireland. The "All Non-Urban UK Traffic" traffic mix option was used.

Update to NO_2 Projections using DMRB

In 2011 the UK DEFRA published research (Highways England, 2013) on the long term trends in NO_2 and NO_X for roadside monitoring sites in the UK. This study marked a decrease in NO_2 concentrations between 1996 and 2002, after which the concentrations stabilised with little reduction between 2004 and 2010. The result of this is that there now exists a gap between projected NO_2 concentrations which UK DEFRA previously published and monitored concentrations. The impact of this 'gap' is that the DMRB screening model can under-predict NO_2 concentrations for predicted future years. Subsequently, the UK Highways Agency published an Interim advice note (IAN 170/12) in order to correct the DMRB results for future years. This methodology ha been used in the current assessment to predict future concentrations of NO_2 as a result of the proposed development.

Traffic Data Used in Modelling Assessment

Traffic flow information was obtained from Waterman Moylan on 20/08/2020 for the purposes of this assessment. Data for the Do Nothing and Do Something scenarios for the base year 2020, opening year 2024 and design year 2039 were provided. The traffic data is detailed in Table 9.2. Only road links that met the DMRB scoping criteria outlined in Section 9.2.2 and that were within 200m of receptors were included in the modelling assessment. Background concentrations have been included as per Section 9.3.3 of this chapter based on available EPA background monitoring data (EPA, 2019a).

This traffic data has also been used in the operational stage climate impact assessment.

Road Name	Speed (kph)	% HGV	Base Year 2020	Opening Year 2024		Design Year 2039	
				Do Nothing	Do Something	Do Nothing	Do Something
Junction 1 Arm C	50	70	2%	5,607	6,370	7,047	8,082
Junction 3 Arm A	50	295	8%	2,787	3,088	3,412	3,810
Junction 3 Arm B	50	50	3%	6,138	7,028	7,723	8,654
Junction 3 Arm C	50	128	4%	6,216	7,026	8,270	8,719
Junction 3 Arm D	50	62	4%	2,395	2,644	3,874	3,207
Junction 4 Arm A	50	60	2%	6,138	7,088	8,034	9,203
Junction 4 Arm B	50	50	3%	6,138	7,042	7,737	8,667
Junction 5 Arm A	80	128	4%	6,216	7,019	8,256	8,659
Junction 5 Arm B	80	220	4%	6,216	7,369	9,373	10,496
Junction 6 Arm A	80	62	4%	2,395	2,644	3,867	3,219
Junction 7 Arm A	80	95	4%	6,216	7,371	9,890	10,497
Junction 7 Arm B	80	220	4%	6,216	7,371	9,375	10,497

Table 9.2: Traffic Data Used in Modelling Assessment

Figure 9.1: Approximate Location of Receptors used in Local Air Quality Modelling Assessment.

9.2.3.2 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 (2019) 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 Scheme*s (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.
- A significant change in AADT flows (>5%) will occur.

There are no designated sites within 200m of any of the road links impacted by the proposed development. Therefore, a detailed NO_X assessment is not required.

9.2.3.3 Climate Assessment

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.
- A change in daily average speed of more than 20 km/hr.

There are a small number of road links that will experience an increase of 10% or more in the AADT. These road links have been included in the detailed climate assessment (see Table 9.2).

The impact of the proposed development at a national / international level has been determined using the procedures given by Transport Infrastructure Ireland (2011) and the methodology provided in Annex D in the UK Design Manual for Roads and Bridges (UK Highways Agency, 2007). The assessment focused on determining the resulting change in emissions of carbon dioxide (CO_2). The Annex provides a method for the prediction of the regional impact of emissions of these pollutants from road schemes and can be applied to any project that causes a change in traffic. The inputs to the air dispersion model consist of information on road link lengths, AADT movements and annual average traffic speeds (see Table 9.2).

9.3 Receiving Environment

9.3.1 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 Casement Aerodrome, which is located approximately 25 km south-east of the site. Casement Aerodrome met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 9.2). For data collated during five representative years (2015 – 2019), the predominant wind direction is westerly to south-westerly with a mean wind speed of 5.5 m/s over the period 1981 - 2010 (Met Eireann, 2020).

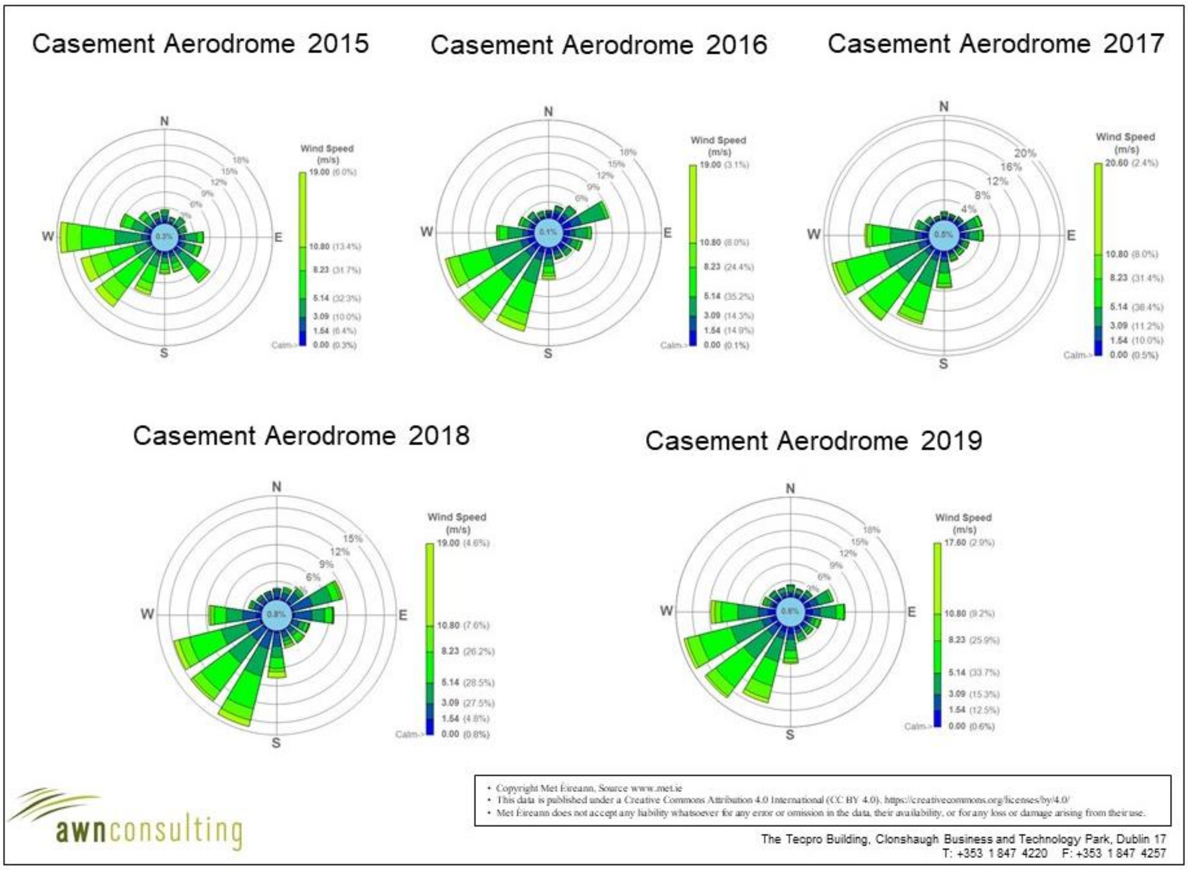

Figure 9.2: Casement Aerodrome Windrose 2015 – 2019

9.3.2 Trends in Air Quality

Air quality is variable and subject to both significant spatial and temporal variation. In relation to spatial variations in air quality, concentrations generally fall significantly with distance from major road sources (WHO, 2006). Thus, residential exposure is determined by the location of sensitive receptors relative to major roads sources in the area. Temporally, air quality can vary significantly by orders of magnitude due to changes in traffic volumes, meteorological conditions and wind direction.

In assessing baseline air quality, two tools are generally used: ambient air monitoring and air dispersion modelling. In order to adequately characterise the current baseline environment through monitoring, comprehensive measurements would be required at a number of key receptors for PM_{10}, NO_2 and benzene. In addition, two of the key pollutants identified in the scoping study (PM_{10} and NO_2) have limit values which require assessment over time periods varying from one hour to one year. Thus, continuous monitoring over at least a one-year period at a number of locations would be necessary in order to fully determine compliance for these pollutants. Although this study would provide information on current air quality it would not be able to provide predictive information on baseline conditions (UK DETR, 1998), which are the conditions which prevail just prior to opening in the absence of the development. Hence the impacts of the development were fully assessed by air dispersion modelling (UK DETR, 1998) which is the most practical tool for this purpose. The baseline environment has also been assessed using modelling, since the use of the same predictive technique for both the 'do-nothing' and 'do-something' scenario will minimise errors and allow an accurate determination of the relative impact of the development.

9.3.3 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 2018*" (EPA, 2019a). 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, 2020b).

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, 2019a). 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 site is within Zone D (EPA, 2019a) . The long-term 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.).

Long-term NO_2 monitoring was carried out at the Zone D locations of Castlebar, Kilkitt and Emo for the period 2014 - 2018 (EPA, 2019a). Long term average concentrations are significantly below the annual average limit of 40 µg/m^3, average results range from 2 – 9 µg/m^3. The NO_2 annual average for this five year period suggests an upper average limit of no more than 8 µg/m^3 (Table 9.3) as a background concentration. Based on the above information, a conservative estimate of the current background NO_2 concentration for the region of the proposed development is 8 µg/m^3.

Station	Averaging Period	Year				
		2014	2015	2016	2017	2018
Castlebar	Annual Mean NO_2 (µg/m^3)	8	8	9	7	8
	Max 1-hr NO_2 (µg/m^3)	106	96	91	112	92
Kilkitt	Annual Mean NO_2 (µg/m^3)	3	2	3	2	3
	Max 1-hr NO_2 (µg/m^3)	38	97	80	25	37
Emo	Annual Mean NO_2 (µg/m^3)	3	3	4	3	3
	Max 1-hr NO_2 (µg/m^3)	30	34	194	33	31

Note 1 Annual average limit value of 40 µg/m^3 and hourly limit value of 200 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Table 9.3: Trends in Zone D Air Quality – NO_2.

Continuous PM_{10} monitoring was carried out at three Zone D locations from 2014 - 2018, Castlebar, Kilkitt and Claremorris. These showed an upper average limit of no more than 12 µg/m^3 (Table 9.4). Levels range from 8 – 13 µg/m^3 over the five year period with at most 2 exceedances of the 24-hour limit value of 50 µg/m^3 in any year (35 exceedances are permitted per year) (EPA, 2019a). Based on the EPA data, a conservative estimate of the current background PM_{10} concentration in the region of the proposed development is 12 µg/m^3.

Station	Averaging Period	Year				
		2014	2015	2016	2017	2018
Castlebar	Annual Mean PM_{10} (µg/m^3)	12	13	12	11	11
	24-hr Mean > 50 µg/m^3 (days)	2	2	1	1	0
Kilkitt	Annual Mean PM_{10} (µg/m^3)	9	9	8	8	9
	24-hr Mean > 50 µg/m^3 (days)	2	1	0	0	0
Claremorris	Annual Mean PM_{10} (µg/m^3)	10	10	10	11	12
	24-hr Mean > 50 µg/m^3 (days)	0	0	0	1	0

Note 1 Annual average limit value of 40 µg/m^3 and 24-hour limit value of 50 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Table 9.4: Trends in Zone D Air Quality – PM_{10}.

Average $PM_{2.5}$ levels in Claremorris over the period 2014 - 2018 ranged from 5 – 6 µg/m^3, with a $PM_{2.5}/PM_{10}$ ratio ranging from 0.5 – 0.6 (EPA, 2019a). Based on this information, a conservative ratio of 0.7 was used to generate an existing $PM_{2.5}$ concentration in the region of the development of 8.4 µg/m^3.

In terms of benzene, recent monitoring data for Zone D sites is not available, data from the Zone C location of Kilkenny has been used to inform background concentrations for this assessment. Concentrations of benzene over the period 2014 – 2018 ranged from 0.13 – 0.20 µg/m^3. This is well below the limit value of 5 µg/m^3. Based on this EPA data a conservative estimate of the current background benzene concentration in the region of the proposed development is 0.5 µg/m^3.

With regard to CO, recent monitoring data from Zone D sites is not available and data from the Zone C location of Portlaoise has been used to inform this assessment. Annual averages over the 2014 – 2018 period are low, peaking at 0.5 mg/m^3 which is well below the limit value of 10 mg/m^3 (EPA, 2019a). Based on this EPA data, a conservative estimate of the current background CO concentration in the region of the proposed development is 0.5 mg/m^3.

Background concentrations for the Opening Year 2024 and Design Year of 2039 have been calculated for the local air quality assessment. These have used current estimated background concentrations and the year on year reduction factors provided by Transport Infrastructure Ireland in the *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (2011) and the UK Department for Environment, Food and Rural Affairs LAQM.TG(16) (2018).

9.3.4 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 emissions up to 2018 (EPA, 2020c). The data published in 2020 states that Ireland has exceeded its 2018 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC1 by 5.59 Mt. For 2018, total national greenhouse gas emissions are estimated to be 60.93 million tonnes carbon dioxide equivalent (Mt CO_2eq). This is 0.1% lower (0.07 Mt CO_2eq) than emissions in 2017. Agriculture is the largest contributor in 2018 at 33.9% of the total, with the transport sector accounting for 20.1% of emissions of CO_2.

Greenhouse gas emissions from the transport sector increased by 1.6% or 0.20 Mt CO_2eq in 2018. This is the fifth year out of the last six with increased emissions in transport. Private diesel cars increased by 7.7% in 2018 while the number of passenger petrol cars decreased by 4.5%. Road transportation accounted for 12,225 kt CO_2eq which is 20.1% of the total 2018 emissions and an increase of 1.6% on 2017.

The EPA 2019 GHG Emissions Projections Report for 2018 – 2040 (EPA, 2019b) 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 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_2eq under the "With Existing Measures" scenario and 9 Mt CO_2eq under the "With Additional Measures" scenario (EPA, 2019b).

9.4 Characteristics of the Proposed Development

9.4.1 Proposed Development

The proposed development is in two distinct sites and comprise a total area of 14.8 Ha. The proposed development will involve construction of a residential development, a childcare facility and all associated ancillary and infrastructural works. A full description of the development is available in Chapter 3: Description of the Proposed 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.
- Operational phase.

9.4.1.1 Construction Stage

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 and construction activities.
- Potential fugitive dust emissions from trucks associated with construction.
- Engine emissions from construction vehicles and machinery.

The construction phase impacts will be short-term in duration.

9.4.1.2 Operational Stage

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.

The potential sources of air and climatic emissions during the operational phase of the proposed development are deemed long-term.

9.4.2 Cumulative

The potential impacts identified for the proposed development for both the construction and operational phases are the same for the cumulative assessment.

9.5 Potential Impact of the Proposed Development

9.5.1 Proposed Development

9.5.1.1 Construction Stage

Air Quality

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. The proposed development can be considered major in scale and therefore there is the potential for significant dust soiling 100 m from the source (TII, 2011) (Table 9.5). While construction dust tends to be deposited within 350 m of a construction site, the majority of the deposition occurs within the first 50 m. There are a number of high sensitivity receptors (residential properties) to the direct east of the site boundary in Eden Court, Manor Court. The Phase 1 development which is at an advanced stage of construction also borders the site to the north and east. Therefore, there is the potential for significant dust impacts to nearby sensitive receptors in the absence of mitigation. In order to minimise dust emissions during construction, a series of mitigation measures have been prepared in the form of a Dust Management Plan which will be incorporated into the Construction Management Plan (CMP) for the site. Provided the dust minimisation measures outlined in the plan (see Appendix 9.3) are adhered to, the air quality impacts during the construction phase will not be significant. These measures are summarised in Section 9.6.1.

Source		**Potential Distance for Significant Effects (Distance from source)**		
Scale	**Description**	**Soiling**	**PM_{10}**	**Vegetation Effects**
Major	Large construction sites with high use of haul routes	100m	25m	25m
Moderate	Moderate sized construction sites with moderate use of haul routes	50m	15m	15m
Minor	Minor construction sites with limited use of haul routes	25m	10m	10m

Source: Appendix 8: Assessment of Construction Impacts taken from “Guidelines for the Treatment of Air Quality During the Planning & Construction of National Road Schemes” (TII, 2011)

Table 9.5: Assessment Criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation in Place

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 and referenced below.

- 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.

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 atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O 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

Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active 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 (see Table 9.1). Therefore, the impact of construction of the proposed development is likely to be neutral, short-term and imperceptible with respect to human health.

9.5.1.2 Operational Stage

Air Quality

The impact of the proposed development has been assessed by modelling emissions from the traffic generated as a result of the development. The impact of NO_2 emissions for the opening and design years was predicted at the nearest sensitive receptors to the development. This assessment allows the significance of the development, with respect to both relative and absolute impacts, to be determined.

Transport Infrastructure Ireland's document '*Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes'* (2011) detail a methodology for determining air quality impact significance criteria for road schemes and this can be applied to any development that causes a change in traffic. The degree of impact is determined based on both the absolute and relative impact of the proposed development. Results are compared against the 'Do-Nothing' scenario, which assumes that the proposed development is not in place in future years, in order to determine the degree of impact. Impacts were assessed at 2 no. worst-case sensitive receptors, residential properties (R1 and R2), within 200m of the road links impacted by the proposed development (see Figure 9.1).

The results of the assessment of the impact of the proposed development on NO_2 in the opening year 2024 are shown in Table 9.6 and for design year 2039 are shown in Table 9.7. The annual average concentration is in compliance with the limit value at all worst-case receptors in 2024 and 2039. Concentrations of NO_2 are at most 22% of the annual limit value in 2024 and 2039. In addition, the hourly limit value for NO_2 is 200 $\mu g/m^3$ and is expressed as a 99.8^{th} percentile (i.e. it must not be exceeded more than 18 times per year). The maximum 1-hour NO_2 concentration is not predicted to be exceeded in any modelled year (Table 9.8).

The impact of the proposed development on annual mean NO_2 concentrations can be assessed relative to "Do Nothing (DN)" levels. Relative to baseline levels, there are predicted to be some imperceptible increases in NO_2 concentrations at receptors R1 and R2. Concentrations will increase by at most 0.5% of the relevant limit value in 2039 at receptor R1. Using the assessment criteria outlined in Appendix 9.2, Table A9.2.1 and Table A9.2.2 the impact of the proposed development in terms of NO_2 is considered negligible. Therefore, the overall impact of NO_2 concentrations as a result of the proposed scheme is long-term, negative and imperceptible.

Concentrations of PM_{10} were modelled for the baseline year of 2020. The modelling showed that concentrations were in compliance with the annual limit value of 40 µg/m^3 at all receptors assessed, therefore, further modelling for the opening and design years was not required. Concentrations reached at most 0.14 µg/m^3. When a background concentration of 12 µg/m^3 is included the overall impact is 30% of the annual limit value at the worst case receptor.

The impact of the proposed development on ambient air quality in the operational stage is considered long-term, negative and imperceptible.

Receptor	Opening Year 2024				
	DN	DS	DS-DN	Magnitude	Description
R1	8.5	8.7	0.16	Imperceptible	Negligible Increase
R2	8.0	8.2	0.14	Imperceptible	Negligible Increase

Table 9.6: Predicted Annual Mean NO_2 Concentrations – Opening Year 2024 (µg/m^3).

Receptor	Design Year 2039				
	DN	DS	DS-DN	Magnitude	Description
R1	8.4	8.6	0.20	Imperceptible	Negligible Increase
R2	7.7	7.9	0.17	Imperceptible	Negligible Increase

Table 9.7: Predicted Annual Mean NO_2 Concentrations – Design Year 2039 (µg/m^3).

Receptor	Opening Year 2024`		Design Year 2039	
	DN	DS	DN	DS
R1	29.9	30.5	29.5	30.2
R2	28.1	28.6	27.1	27.7

Table 9.8: Predicted 99.8th percentile of Daily Maximum 1-hour NO_2 Concentrations (µg/m^3).

Climate

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 for to account for increased rainfall in future years. Therefore, the impact will be imperceptible.

There is the potential for a number of greenhouse gas emissions to atmosphere during the operational phase of the development. The predicted concentrations of CO_2 for the future years of 2024 and 2039 are detailed in Table 9.9. These are significantly less than the 2020 and 2030 targets set out under EU legislation. It is predicted that in 2024 the proposed development will increase CO_2 emissions by 0.0003% of the EU 2020 target. In 2039 CO_2 emissions will increase by 0.00035% of the 2030 target. Therefore, the climate impact of the proposed development is considered neutral, long-term and imperceptible.

Year	Scenario	CO_2 (tonnes/annum)
2024	Do Nothing	527
	Do Something	642
2039	Do Nothing	699
	Do Something	814
Increment in 2024		114.6 Tonnes
Increment in 2039		114.7 Tonnes
Emission Ceiling (kilo Tonnes) 2020		37,943 Note 1
Emission Ceiling (kilo Tonnes) 2030		32,860 Note 2
Impact in 2024 (%)		0.00030 %
Impact in 2039 (%)		0.00035 %

Note 1 Target under European Commission Decision 2017/1471 of 10th August 2017 and amending decision 2013/162/EU to revise Member States' annual emissions allocations for the period from 2017 to 2020

Note 2 Target under Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 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

Table 9.9: Climate Impact Assessment.

Human Health

Traffic related air emissions have the potential to impact air quality which can affect human health. However, air dispersion modelling of traffic emissions has shown that levels of all pollutants are below the ambient air quality standards set for the protection of human health (Table 9.1). It can be determined that the impact to human health during the operational stage is long-term, neutral and imperceptible.

9.5.1.3 Alternative Road Layout

There is the potential for the proposed link road between Character Area 3 (CA3) and Character Area 4 (CA4) to be omitted from the proposed development design. This change will not have a significant impact on either air quality or climate. This alternative layout will not result in a significant change in construction dust emissions, provided the mitigation measures outlined in Section 9.6.1 are implemented predicted impacts will be shot-term and not significant.

Operational phase air quality impacts will remain unchanged from those assessed in Section 9.5.1.2 as there will be no significant change to the traffic on the local road network. Operational phase air quality impacts will be long-term, negative and imperceptible.

Impacts to climate will be long-term, neutral and imperceptible as assessed in Section 9.5.1.2 as the alternative layout will not significantly alter the traffic composition on the local existing road network.

9.5.1.4 Do-Nothing Impact

The Do Nothing scenario includes retention of the current site without the proposed development in place. In this 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).

9.5.2 Cumulative

9.5.2.1 Construction Stage

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. A review of recent planning permissions for the area was conducted and it was found that there were no developments within 350m of the proposed site that have the potential to cause cumulative construction dust impacts. 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 neutral.

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

9.5.2.2 Operational Stage

The traffic data used to assess the operational stage impacts to air quality and climate included the cumulative traffic associated with the Phase 1 development as well as other existing and permitted developments in the local area. 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.

9.5.2.3 Do-Noting Impact

The Do-Nothing impact detailed for the proposed development is the same as that for the cumulative development.

9.6 Mitigation Measures (Ameliorative, Remedial or Reductive Measures)

9.6.1 Proposed Development

9.6.1.1 Construction Stage

Air Quality

The pro-active 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 main contractor will be responsible for the coordination, implementation and ongoing monitoring of the Dust Management Plan. The key aspects of controlling dust are listed below. Full details of the Dust Management Plan can be found in Appendix 9.3. These measures will be incorporated into the Construction Management Plan (CMP) prepared for the site.

In summary the measures which will be implemented will 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 where appropriate, 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 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 would 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 can 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.

9.6.1.2 Operational Stage

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 additional site specific mitigation measures are required.

A number of measures will be incorporated into the design of the proposed development in order to reduce the impact on climate once operational. The Energy Statement prepared by Waterman Moylan Consulting Engineers and submitted with this planning application outlines the proposed measures for the dwellings and creche. The buildings will meet the requirements of the Building Regulations Part L 2019 and 2017 and the buildings will also be Nearly Zero Energy Building (NZEB) compliant.

The exact systems to be installed will be determined during the detailed design stage however the Energy Statement outlines the most likely solutions for the proposed development, these include, installing air source heat pumps or exhaust air heat pumps, achieving an air tightness standard of 3 $m^3/m^2/hr$ for the dwellings and 5 $m^3/m^2/hr$ for the creche and achieving a U-Value that is 20% to 30% higher than the minimum required. These measures will ensure the impact of the proposed development on climate is minimised.

9.6.2 Cumulative

9.6.2.1 Construction Stage

As there are no developments within 350m of the site that have the potential to cause cumulative construction dust impact, mitigation measures are not required other than those listed in Section 9.6.1.1.

9.6.2.2 Operational Stage

The traffic data used to assess the operational stage impacts to air quality and climate included the cumulative traffic associated with the Phase 1 development as well as other existing and permitted developments in the local area. Therefore, the cumulative impact is included within the operational stage impact for the proposed development. The impact is predicted to be imperceptible and therefore mitigation measures are not required.

9.7 Residual Impact of the Proposed Development

9.7.1 Proposed Development

9.7.1.1 Construction Stage

Once the dust minimisation measures outlined in Section 9.6 and Appendix 9.3 are implemented, the impact of the proposed development in terms of dust soiling will be short-term and not significant at nearby receptors.

9.7.1.2 Operational Stage

The impact of the proposed development on air quality is considered long-term, negative and imperceptible. The impact to climate is considered long-term, neutral and imperceptible.

9.7.1.3 Worst Case Impact

As part of the air dispersion modelling, worst-case traffic data was used in the assessment. In addition, conservative background concentrations were used in order to ensure a robust assessment. Thus, the predicted results of the operational stage assessment are worst-case and will not cause a significant impact on either air quality or climate.

9.7.2 Cumulative

The residual impact of the cumulative development is the same as that detailed above in Section 9.7.1 for the proposed development for both the construction and operational stages.

9.8 Monitoring

9.8.1 Proposed Development

9.8.1.1 Construction Stage

Monitoring of construction dust deposition at 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/(m^2*day) during the monitoring period between 28 – 32 days.

9.8.1.2 Operational Stage

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

9.9 Reinstatement

Not applicable to air quality and climate.

9.10 Difficulties Encountered

There were no difficulties encountered when conducting this assessment.