11.0 AIR QUALITY AND CLIMATE

11.1 Introduction

This chapter assesses the likely air quality and climate impacts, if any, associated with the proposed strategic housing development at a 1.54 ha site at the former Aldi Site, Carmanhall Road, Sandyford Business District, Dublin 18.

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11.2 Methodology

11.2.1 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 11.1 and Appendix 11.1).

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}, $PM_{2.5}$, benzene and CO (see Table 11.1). 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 11.1).

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 11.1: Air Quality Standards Regulations

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 11.1 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, Health & 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.

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

(UNFCCC, 1997). For the purposes of the EU burden sharing agreement under Article 4 of the Doha Amendment to the Kyoto Protocol, in December 2012, Ireland agreed to limit the

net growth of the six Greenhouse Gases (GHGs) under the Kyoto Protocol to 20% below the 2005 level over the period 2013 to 2020 (UNFCCC, 2012). The UNFCCC is continuing detailed negotiations in relation to GHGs reductions and in relation to technical issues such as Emission Trading and burden sharing. The most recent Conference of the Parties to the Convention (COP24) took place in Katowice, Poland from the 4th to the 14th December 2018 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 was agreed by over 200 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 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to greenhouse gas emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made on elevating adaption onto the same level as action to cut and curb emissions.

The EU in 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 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.

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 and the National Emissions Ceiling Directive (NECD), prescribes the same emission limits as the 1999 Gothenburg Protocol. A National Programme for the progressive reduction of emissions of these four transboundary pollutants has been in place since April 2005. The data available from the EPA in 2019 (EPA, 2019a) indicated that Ireland complied with the emissions ceilings for SO_2 and NH_3 but failed to comply with the ceiling for NO_X and NMVOCs. 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 $PM_{2.5}$.

11.2.2 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.

11.2.3 Operational

Phase Local Air

Quality

The air quality assessment has been carried out following procedures described in the publications by the EPA (EPA, 2002; 2003; 2015; 2017) and using the methodology outlined in the guidance documents published by the UK DEFRA (UK DEFRA 2016, 2018; UK DETR, 1998). The assessment of air quality was carried out using a phased approach as recommended by the UK DEFRA (UK Highways Agency, 2007). The phased approach recommends that the complexity of an air quality assessment be consistent with the risk of failing to achieve the air quality standards. In the current assessment, an initial scoping of possible key pollutants was carried out and the likely location of air pollution "*hot-spots*" identified. An examination of recent EPA and Local Authority data in Ireland (EPA, 2019b; 2019c) has indicated that SO_2 and smoke are unlikely to be exceeded at the majority of locations within Ireland and thus these pollutants do not require detailed monitoring or assessment to be carried out. However, the analysis did indicate potential issues in regards to nitrogen dioxide (NO_2), PM_{10} and $PM_{2.5}$ at busy junctions in urban centres (EPA, 2019b; 2019c). Benzene, although previously reported at quite high levels in urban centres, has recently been measured at several city centre locations to be well below the EU limit value (EPA, 2019b; 2019c). Historically, CO levels in urban areas were a cause for concern. However, CO concentrations have decreased significantly over the past number of years and are now measured to be well below the limits even in urban centres (EPA, 2019c). The key pollutants reviewed in the assessments are NO_2, PM_{10}, $PM_{2.5}$, benzene and CO, with particular focus on NO_2 and PM_{10}.

Key pollutant concentrations will be predicted for nearby sensitive receptors for the following scenarios:

- The Existing Baseline scenario (2019), for model verification;
- Opening Year (2023) Do-Nothing scenario (DN), which assumes no development in

place;
- Opening Year (2023) Do-Something scenario (DS), which assumes the proposed development is in place;
- Design Year (2038) Do-Nothing scenario (DN), which assumes no development in place; and
- Design Year (2038) Do-Something scenario (DS), which assumes the proposed development is in place.

The assessment methodology involves air dispersion modelling using the UK DMRB Screening Model (UK Highways Agency, 2007) (Version 1.03c, July 2007), the NO_x to NO_2 Conversion Spreadsheet (UK DEFRA, 2019) (Version 7.1, 2019), and following guidance issued by the TII (2011), UK Highways Agency (2007), UK DEFRA (2016, 2018) and the EPA (2002, 2003, 2015, 2017).

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; or
- Sensitive receptors exist within 50m of a complex road layout (e.g. grade separated junctions, hills etc).

The UK DMRB guidance (UK Highways Agency, 2007), on which the TII guidance was based, states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment:

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

Concentrations of key pollutants are calculated at sensitive receptors that have the potential to be affected by the proposed development. For road links which are deemed to be affected by the proposed development and within 200 m of the chosen sensitive receptors inputs to the air dispersion model consist of: road layouts, receptor locations, annual average daily traffic movements (AADT), percentage heavy goods vehicles, annual average traffic speeds and background concentrations. The UK DMRB guidance states that road links at a distance of greater than 200 m from a sensitive receptor will not influence pollutant concentrations at the receptor. 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 *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (TII, 2011) detail a methodology for determining air quality impact significance criteria for road schemes and this can be applied to any project that causes a change in traffic flows. 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 11.2 Table A11.2.1 to Table A11.2.3. The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the annual mean limit values (40 µg/m^3). However, the criteria have also been applied to the predicted 8-hour CO, annual benzene and annual $PM_{2.5}$ concentrations for the purposes of this assessment.

Regional Air Quality and Climate Assessment

The impact of the proposed development at a national / international level is determined using the procedures given by Transport Infrastructure Ireland (TII, 2011) and the methodology provided in Annex 2 in the UK Design Manual for Roads and Bridges (UK DEFRA, 2018). The assessment focuses on determining the resulting change in emissions of volatile organic compounds (VOCs), nitrogen oxides (NO_x) and 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 development that causes a change in traffic flows. The inputs to the air dispersion model consist of information on road link lengths, AADT movements and annual average traffic speeds.

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 HGV's the proportion of NOx 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 NO_x to NO_2 in "*Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes*" (TII, 2011). The TII guidelines recommend the use of DEFRAs NO_x 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 NO_x 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 Other 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 (HA) published an Interim advice note (IAN 170/12) in order to correct the DMRB results for future years.

11.3 Description of Receiving Environment

11.3.1 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 Dublin Airport meteorological station, which is located approximately 16.5 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 11.1). For data collated during five representative years (2014 - 2018) (MET, 2019), the predominant wind direction is westerly to south-westerly with a mean wind speed of 5.3 m/s in 2005 - 2018.

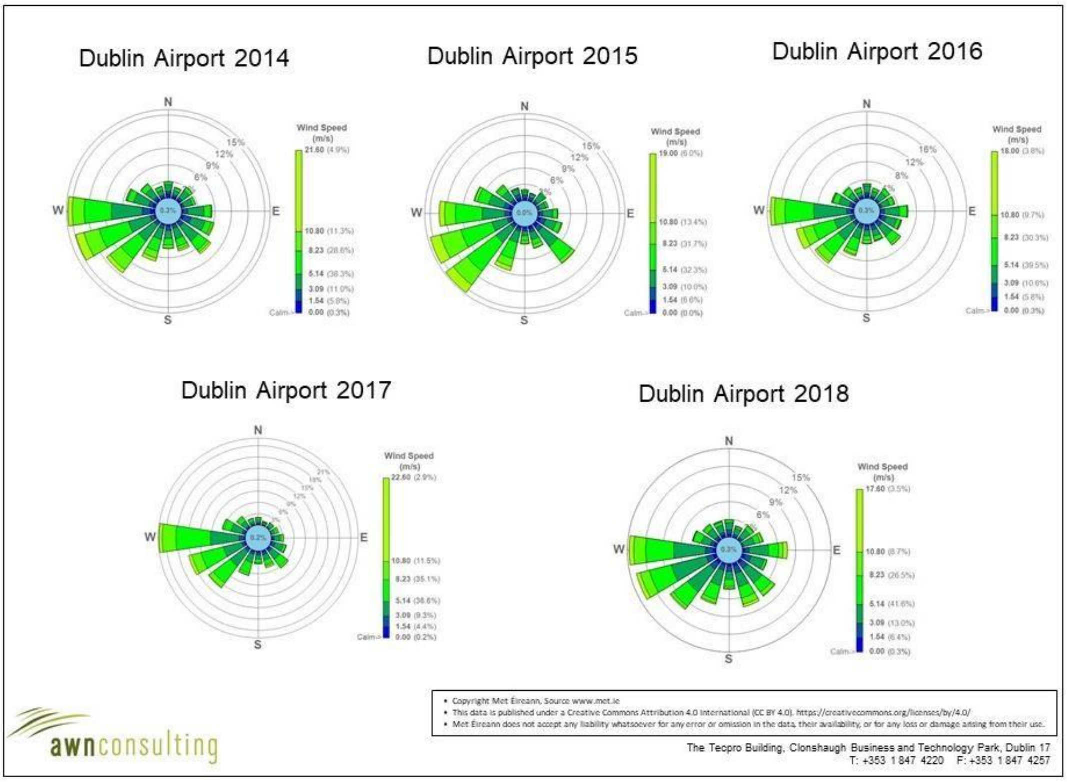

Figure 11.1: Dublin Airport Windroses 2014 – 2018.

11.3.2 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.

11.3.3 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, 2019b). 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, 2019c).

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, 2019c). 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 A (EPA, 2019c) . 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 A suburban background locations of Rathmines, Dún Laoighaire, Swords and Ballyfermot for the period 2014 - 2018 (EPA, 2019b). Long term average concentrations are significantly below the annual average limit of 40 µg/m^3, average results range from 13 – 20 µg/m^3 for the suburban background locations. The NO_2 annual average for this five year period suggests an upper average limit of no more than 19 µg/m^3 (Table 11.2) for an urban background location. Based on the above information and keeping regard for the further distance from the city centre, a conservative estimate of the current background NO_2 concentration for the region of the proposed development is 19 µg/m^3.

Year	Rathmines	Dún Laoghaire	Swords	Ballyfermot
2014	17	15	14	16
2015	18	16	13	16
2016	20	19	16	17
2017	17	17	14	17
2018	20	19	16	17
Average	**18.4**	**17.1**	**14.5**	**16.6**

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

Table 11.2: Trends In Zone A Air Quality - Nitrogen Dioxide (NO_2).

Continuous PM_{10} monitoring was carried out at four Zone A locations from 2014 - 2018, Rathmines, Dún Laoghaire, Tallaght and Phoenix Park. These showed an upper average limit of no more than 15 µg/m^3 (Table 11.3). Levels range from 9 - 15 µg/m^3 over the five year period with at most 2 exceedances (in Rathmines) of the 24-hour limit value of 50 µg/m^3 in 2018 (35 exceedances are permitted per year) (EPA,2019b). Based on the EPA data, a conservative estimate of the current background PM_{10} concentration in the region of the proposed development is 15 µg/m^3.

Year	Rathmines	Dún Laoghaire	Tallaght	Phoenix Park
2014	14	14	15	12
2015	15	13	14	12
2016	15	13	14	11
2017	13	12	12	9
2018	15	13	15	11
Average	**14.4**	**13.0**	**14.0**	**10.9**

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

Table 11.3: Trends In Trends In Zone A Air Quality - PM_{10}.

Average $PM_{2.5}$ levels in Rathmines over the period 2013 - 2017 ranged from 9 - 11 µg/m^3, with a $PM_{2.5}/PM_{10}$ ratio ranging from 0.60 – 0.68 (EPA, 2019b). 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 10.5 µg/m^3.

In terms of benzene, the annual mean concentration in the Zone A monitoring location of Rathmines for 2018 was 0.3 µg/m^3. This is well below the limit value of 5 µg/m^3. Between 2014- 2018 annual mean concentrations at the Zone A site ranged from 0.30 – 1.01 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 1.0 µg/m^3.

With regard to CO, annual averages at the Zone A, locations of Winetavern Street and Coleraine Street over the 2014 – 2018 period are low, peaking at 0.5 mg/m^3 (EPA, 2019b). 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 and design years have been calculated using the predicted current 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).

11.3.4 Climate

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

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

The EPA 2019 GHG Emissions Projections Report for 2018 – 2040 (EPA 2019e) 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, 2019e).

11.4 Characteristics of the Proposed Development

The development, which will have a Gross Floor Area of 49,342 sq m will principally consist of: the demolition of the existing structures on site and the provision of a Build-to-Rent residential development comprising 564 No. apartments (46 No. studio apartments, 205 No. one bed apartments, 295 No. two bed apartments and 18 No. three bed apartments) in 6 No. blocks as follows: Block A (144 No. apartments) is part 10 to part 11 No. storeys over basement; Block B (68 No. apartments) is 8 No. storeys over basement; Block C (33 No. apartments) is 5 No. storeys over lower ground; Block D (103 No. apartments) is part 16 to part 17 No. storeys over lower ground; Block E (48 No. apartments) is 10 No. storeys over semi-basement; and Block F (168 No. apartments) is 14 No. storeys over semi basement.

The development provides resident amenity spaces (1,095 sq m) in Blocks A, C and D including concierge, gymnasium, lounges, games room and a panoramic function room at Roof Level of Block D; a creche (354 sq m); café (141 sq m); a pedestrian thoroughfare from Carmanhall Road to Blackthorn Drive also connecting into the boulevard at Rockbrook to the west; principal vehicular access off Carmanhall Road with servicing and bicycle access also provided off Blackthorn Drive; 285 No. car parking spaces (254 No. at basement level and 31 No. at ground level); 21 No. motorcycle spaces; set-down areas; bicycle parking; bin storage; boundary treatments; hard and soft landscaping; lighting; plant; ESB substations and switchrooms; sedum roofs; and all other associated site works above and below ground.

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.

During the construction stage the main source of air quality impacts will be as a result of fugitive dust emissions from site activities. Emissions from construction vehicles and machinery have the potential to impact climate. The primary sources of air and climatic emissions in the operational context are deemed long term and will involve the change in traffic flows in the local areas which are associated with the development.

Section 11.5 describes the primary sources of potential air quality and climate impacts which have been assessed as part of this EIAR.

11.5 Potential Impact of the Proposed Development

11.5.1 Construction

Phase 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 moderate in scale and therefore there is the potential for significant dust soiling 50m from the source (TII, 2011) (Table 11.4). While construction dust tends to be deposited within 200m of a construction site, the majority of the deposition occurs within the first 50m. There are a large number of sensitive receptors, in apartment blocks bordering the site to the west and in the Lakelands Close housing estate to the north. In order to minimise dust emissions during construction, a series of mitigation measures have been prepared in the form of a dust minimisation plan. Provided the dust minimisation measures outlined in the plan (see Appendix 11.3) are adhered to, the air quality impacts during the construction phase will not be significant. These measures are summarised in Section 11.8.

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 roads	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul roads	50m	15m	15m
Minor	Minor construction sites, with limited use of haul roads	25m	10m	10m

Table 11.4: Assessment Criteria for the Impact of Dust from Construction, with Standard Mitigation in Place (TII, 2011)

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. However, the impact on the climate is considered to be imperceptible 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. Therefore, the impact of construction of the proposed development is likely to be negative, short-term and imperceptible with respect to human health.

11.5.2 Operational Phase Local 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, CO, benzene, PM_{10} and $PM_{2.5}$.

Traffic flow information was obtained from OCSC (the consulting engineers on this project) on 10/10/2019 and has been used to model pollutant levels under various traffic scenarios and under sufficient spatial resolution to assess whether any significant air quality impact on sensitive receptors may occur.

Cumulative effects have been assessed, as recommended in the EU Directive on EIA (Council Directive 97/11/EC) and using the methodology of the UK DEFRA (2016, 2018). Firstly, background concentrations (EPA, 2019b) have been included in the modelling study. These background concentrations are year-specific and account for non-localised sources of the pollutants of concern. Appropriate background levels were selected based on the available monitoring data provided by the EPA (EPA, 2019b) (see Section 11.3.3). The modelling scenarios include for the cumulative impact of other developments in the vicinity of the proposed development, where such information is available.

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 CO, benzene, NO_2, PM_{10} and $PM_{2.5}$ for the baseline, 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 impact, to be determined.

The receptors modelled represent the worst-case locations close to the proposed development and were chosen due to their close proximity (within 200 m) to the road links impacted by proposed development. The worst case traffic data which satisfied the assessment criteria detailed in Section 11.2.3 is shown in Table 11.5.

Road Name	**Speed (kmh)**	**% HGV**	**Base**	**Do Nothing**	**Do Something**	**Do Nothing**	**Do Something**
			2019	**2023**		**2038**	
Blackthorne Drive N	50	10.0%	9,352	10,822	12,256	12,295	13,697
Blackthorne Drive S	50	10.9%	12,575	13,275	15,214	15,082	16,981
Carmanhall Road W	30	14.4%	10,064	10,622	14,439	12,056	15,747
Blackthorne Road N	50	10.3%	11,590	12,242	16,677	13,960	18,354

Table 11.5: Traffic Data used in Modelling Assessment

Four sensitive receptors (R1 – R4) in the vicinity of the proposed development have been assessed and are detailed in Figure 11.2.

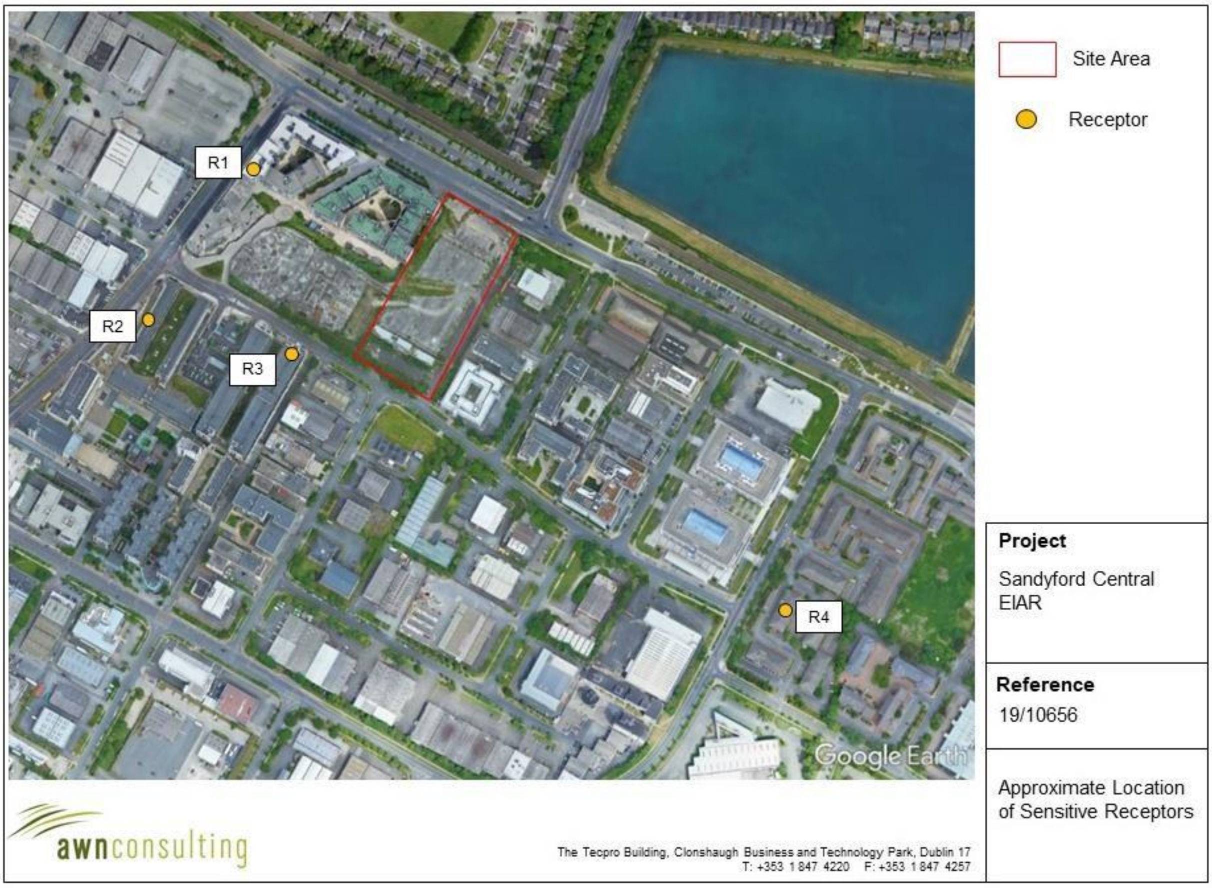

Figure 11.2: Approximate Location of Sensitive Receptors Used in Modelling Assessment.

Modelling Assessment

Transport Infrastructure Ireland *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes* (TII, 2011) detail a methodology for determining air quality impact significance criteria for road schemes and has been adopted for this assessment, as is best practice. 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.

NO_2

The results of the assessment of the impact of the proposed development on NO_2 in the opening year 2023 and design year 2038 are shown Table 11.6 for the Highways Agency IAN 170/12 and Table 11.7 using the UK Department for Environment, Food and Rural Affairs technique respectively. The annual average concentration is within the limit value of 40 µg/m^3 at all worst-case receptors using both techniques. Levels of NO_2 are 66% of the annual limit value in 2021 using the more conservative IAN technique, while concentrations are 64.8% of the annual limit value in 2023 using the UK Department for Environment, Food and Rural Affairs technique. Similarly low levels are predicted in 2038 with concentrations of NO_2 reaching at most 63% using the IAN technique and 65% using the DEFRA technique. The hourly limit value for NO_2 is 200 µg/m^3 and is expressed as a 99.8th 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 using either technique in 2023 or 2038 (Table11.8).

The impact of the proposed development on annual mean NO_2 levels can be assessed relative to "Do Nothing (DN)" levels in 2023 and 2038. Relative to baseline levels, some small to medium increases in pollutant levels are predicted as a result of the proposed development. With regard to impacts at individual receptors, the greatest impact on NO_2 concentrations will be an increase of 5.6% of the annual limit value at Receptor 3 (R3). Thus, using the assessment criteria outlined in Appendix 11.2 (Tables A11.2.1 – A11.2.2), the impact of the proposed development in terms of NO_2 is negligible. Therefore, the overall impact of NO_2 concentrations as a result of the proposed development is long-term and imperceptible at all of the receptors assessed.

PM_{10}

The results of the modelled impact of the proposed development for PM_{10} in the opening year 2023 and design year 2038 are shown in Table 11.9. Predicted annual average concentrations at the worst-case receptor in the region of the development are at most 41% of the limit value of 40 µg/m^3 in 2023 and 2038. It is predicted that the worst case receptors will not experience any exceedances of the 50 µg/m^3 24-hour mean value with or without the proposed development in place, 35 exceedances are permitted per year.

Relative to baseline levels, there is a small increase in PM_{10} levels predicted at receptor R3. Changes in concentrations at all other receptors modelled are imperceptible. Receptor R3 will experience an increase of at most 1.02% of the annual limit value. Increases at all other receptors are lower. Thus, the magnitude of the changes in air quality are negligible at all receptors based on the criteria outlined in Appendix 11.2 (Tables A11.2.1 – A11.2.3). Therefore, the overall impact of PM_{10} concentrations as a result of the proposed development is long-term and imperceptible.

$PM_{2.5}$

The results of the modelled impact of the proposed development for $PM_{2.5}$ are shown in Table 11.10. Predicted annual average concentrations in the region of the proposed development are 46% of the limit value of 25 µg/m^3 in 2023 and 2038 at the worst-case receptor.

Relative to baseline levels, some imperceptible to small increases in $PM_{2.5}$ levels at the worst- case receptors are predicted as a result of the proposed development. None of the receptors

assessed will experience an increase in concentrations of over 1.1% of the limit value. Therefore, using the assessment criteria outlined in Appendix 11.2 (Tables A11.2.1 – A11.2.2), the impact of the proposed development with regard to $PM_{2.5}$ is negligible at all of the receptors assessed. Overall, the impact of increased $PM_{2.5}$ concentrations as a result of the proposed development is long-term and imperceptible.

CO and Benzene

The results of the modelled impact of CO and benzene are shown in Table 11.11 and Table 11.12 respectively. Predicted pollutant concentrations with the proposed development in place are below the ambient standards at all locations. Levels of CO are 29% of the limit value of 10 mg/m^3 in 2023 with levels of benzene reaching 21.7% of the limit value of 5 µg/m^3. Similarly low levels are predicted for the design year of 2038 with concentrations of CO reaching at most 30% and concentrations of benzene reaching 21.9%.

Relative to baseline levels, some imperceptible increases in pollutant levels at the worst-case receptors are predicted as a result of the proposed development. The greatest impact on CO and benzene concentrations will be an increase of 1.1% of the CO limit and 0.46% of the Benzene limit value at Receptor R3. Thus, using the assessment criteria for NO_2 and PM_{10} outlined in Appendix 11.2 and applying these criteria to CO and benzene, the impact of the proposed development in terms of CO and benzene is negligible, long-term and imperceptible.

Summary of Local Air Quality Modelling Assessment

Levels of traffic-derived air pollutants associated with the proposed development will not exceed the ambient air quality standards either with or without the proposed development in place. Using the assessment criteria outlined in Appendix 11.2, Table A11.2.1 – A11.2.3, the impact of the development in terms of PM_{10}, $PM_{2.5}$, CO, NO_2 and benzene is negligible. While the development will have a negative impact due to the increase in pollutant concentrations, these increases are imperceptible and will not cause a significant impact to the local environment. Overall the impact on air quality as a result of traffic increases associated with the proposed development are long-term in duration, localised negative in terms of quality and imperceptible in terms of significance.

Regional Air Quality Impact

The regional impact of the proposed development on emissions of NO_X and VOCs has been assessed using the procedures of Transport Infrastructure Ireland (TII, 2011) and the UK Department for Environment, Food and Rural Affairs (UK DEFRA, 2016). The results (see Table 11.13) show that the likely impact of the proposed development on Ireland's obligations under the Targets set out by Directive EU 2016/2284 "*On the reduction of national emissions of certain atmospheric pollutants and amending Directive 2003/35/EC*" are imperceptible and long-term. For the opening year 2023, the predicted impact of the changes in AADT is to increase NO_x levels by 0.00101% of the NO_x emissions ceiling and increase VOC levels by

0.00036% of the VOC emissions ceiling to be complied with from 2020. Similarly low impacts are predicted for the design year of 2038 with changes in AADT predicted to increase NO_x levels by 0.00159% of the NO_x emissions ceiling and increase VOC levels by 0.00038% of the VOC emissions ceiling to be complied with from 2030.

Therefore, the likely overall magnitude of the changes on air quality in the operational stage is negative, imperceptible and long-term.

Climate

The impact of the proposed development on emissions of CO_2 impacting climate were also assessed using the Design Manual for Roads and Bridges screening model (see Table 11.13). The results show that the impact of the proposed development in the opening year 2023 will be to increase CO_2 emissions by 0.00094% of Ireland's EU 2020 Target. Emissions of CO_2 are predicted to increase by 0.00090% in 2038. Thus, the impact of the proposed development on national greenhouse gas emissions will be insignificant in terms of Ireland's obligations under the EU 2020 Target (EU, 2017).

Therefore, the likely overall magnitude of the changes on climate in the operational stage is negative, imperceptible and long-term.

Human Health

Air dispersion modelling of operational traffic emissions was undertaken to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of human health. As demonstrated by the modelling results, emissions as a result of the proposed development are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant impact on human health.

Receptor	Impact Opening Year 2023					Impact Design Year 2038				
	DN	DS	DS-DN	Magnitude	Description	DN	DS	DS-DN	Magnitude	Description
R1	22.5	23.2	0.64	Small	Negligible Increase	21.9	22.5	0.56	Small	Negligible Increase
R2	21.6	22.2	0.54	Small	Negligible Increase	20.9	21.1	0.19	Imperceptible	Negligible Increase
R3	24.1	26.4	2.25	Medium	Negligible Increase	23.6	25.3	1.73	Small	Negligible Increase
R4	20.8	21.7	0.87	Small	Negligible Increase	20.1	20.6	0.54	Small	Negligible Increase

Table 11.6: Annual Mean NO_2 Concentrations (µg/m³) (using IAN 170/12 V3 Long Term NO_2 Trend Projections)

Receptor	Impact Opening Year 2023					Impact Design Year 2038				
	DN	DS	DS-DN	Magnitude	Description	DN	DS	DS-DN	Magnitude	Description
R1	22.2	22.8	0.63	Small	Negligible Increase	22.6	23.2	0.58	Small	Negligible Increase
R2	21.3	21.8	0.53	Small	Negligible Increase	21.6	21.8	0.20	Imperceptible	Negligible Increase
R3	23.7	25.9	2.21	Medium	Negligible Increase	24.2	26.0	1.77	Small	Negligible Increase
R4	20.5	21.3	0.86	Small	Negligible Increase	20.8	21.3	0.56	Small	Negligible Increase

Table 11.7: Annual Mean NO_2 Concentrations (µg/m³) (using Defra's Technical Guidance)

Receptor	IAN 170/12 V3 Long Term NO_2 Trend Projections Technique				Defra's Technical Guidance Technique			
	Opening Year 2023		Design Year 2038		Opening Year 2023		Design Year 2038	
	DN	DS	DN	DS	DN	DS	DN	DS
R1	78.9	81.2	76.8	78.7	78.9	81.2	76.8	78.7
R2	75.7	77.6	73.3	74	75.7	77.6	73.3	74
R3	84.5	92.3	82.7	88.7	84.5	92.3	82.7	88.7
R4	72.8	75.9	70.3	72.2	72.8	75.9	70.3	72.2

Table 11.8: 1 Hour 99.8^{th}%ile NO_2 Concentrations (µg/m³)

Receptor	Impact Opening Year 2023					Impact Design Year 2038				
	DN	DS	DS-DN	Magnitude	Description	DN	DS	DS-DN	Magnitude	Description
R1	15.7	15.8	0.11	Imperceptible	Negligible Increase	15.8	15.9	0.11	Imperceptible	Negligible Increase
R2	15.5	15.6	0.09	Imperceptible	Negligible Increase	15.6	15.6	0.04	Imperceptible	Negligible Increase
R3	16.0	16.4	0.41	Small	Negligible Increase	16.1	16.5	0.35	Imperceptible	Negligible Increase
R4	15.4	15.5	0.15	Imperceptible	Negligible Increase	15.4	15.5	0.10	Imperceptible	Negligible Increase

Table 11.9: Annual Mean PM_{10} Concentrations (μg/m^3)

Receptor	Impact Opening Year 2023					Impact Design Year 2038				
	DN	DS	DS-DN	Magnitude	Description	DN	DS	DS-DN	Magnitude	Description
R1	11.0	11.0	0.08	Imperceptible	Negligible Increase	11.0	11.1	0.08	Imperceptible	Negligible Increase
R2	10.8	10.9	0.06	Imperceptible	Negligible Increase	10.9	10.9	0.03	Imperceptible	Negligible Increase
R3	11.2	11.5	0.29	Small	Negligible Increase	11.3	11.5	0.24	Imperceptible	Negligible Increase
R4	10.8	10.9	0.10	Imperceptible	Negligible Increase	10.8	10.9	0.07	Imperceptible	Negligible Increase

Table 11.10: Annual Mean $PM_{2.5}$ Concentrations (μg/m^3)

Receptor	Impact Opening Year 2023					Impact Design Year 2038				
	DN	DS	DS-DN	Magnitude	Description	DN	DS	DS-DN	Magnitude	Description
R1	2.73	2.76	0.030	Imperceptible	Negligible Increase	2.76	2.79	0.030	Imperceptible	Negligible Increase
R2	2.68	2.70	0.024	Imperceptible	Negligible Increase	2.70	2.71	0.010	Imperceptible	Negligible Increase
R3	2.81	2.92	0.112	Imperceptible	Negligible Increase	2.85	2.95	0.095	Imperceptible	Negligible Increase
R4	2.64	2.68	0.040	Imperceptible	Negligible Increase	2.66	2.69	0.027	Imperceptible	Negligible Increase

Table 11.11: Maximum 8-hour CO Concentrations (mg/m^3)

Receptor	Impact Opening Year 2023					Impact Design Year 2038				
	DN	DS	DS-DN	Magnitude	Description	DN	DS	DS-DN	Magnitude	Description
R1	1.05	1.06	0.007	Imperceptible	Negligible Increase	1.06	1.06	0.006	Imperceptible	Negligible Increase
R2	1.04	1.04	0.006	Imperceptible	Negligible Increase	1.04	1.05	0.005	Imperceptible	Negligible Increase
R3	1.06	1.09	0.023	Imperceptible	Negligible Increase	1.07	1.09	0.022	Imperceptible	Negligible Increase
R4	1.03	1.04	0.011	Imperceptible	Negligible Increase	1.04	1.05	0.011	Imperceptible	Negligible Increase

Table 11.12: Annual Mean Benzene Concentrations (μg/m^3)

Year	Scenario	VOC	NO_X	CO_2
		(kg/annum)	(kg/annum)	(tonnes/annum)
2023	Do Nothing	1,016	3,684	1,819
	Do Something	1,222	4,359	2,175
2038	Do Nothing	1,157	4,172	2,073
	Do Something	1,355	4,818	2,416
Increment in 2023		205.8 kg	674.4 kg	356 Tonnes
Increment in 2038		197.9 kg	645.8 kg	343 Tonnes
Emission Ceiling (kilo Tonnes) 2020 [Notes 1,2]		**56.9**	**66.9**	**37,943**
Emission Ceiling (kilo Tonnes) 2030 [Notes 1,2]		**51.5**	**40.2**	**37,943**
Impact in 2023 (%)		0.00036 %	0.00101 %	0.00094 %
Impact in 2038 (%)		0.00038 %	0.00159 %	0.0009 %

Note 1 Targets under Directive EU 2016/2284 "*On the reduction of national emissions of certain atmospheric pollutants and amending Directive 2003/35/EC*"

Note 2 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*

Table 11.13: Regional Air Quality and Climate Impact Assessment

11.6 Cumulative Impacts

11.6.1 Construction Phase

Should the construction phase of the proposed development coincide with the construction of any other permitted developments within 350m of the site, including the permitted Rockbrook Phase II development (SHD Ref: ABP PL06D.304405) and temporary school site (Planning ref: D18A/1210'), then there is the potential for cumulative dust impacts to the nearby sensitive receptors. The dust mitigation measures outlined in Appendix 11.3 should be applied throughout the construction phase of the proposed development, with similar mitigation measures applied for other permitted developments which will avoid significant cumulative impacts on air quality. With appropriate mitigation measures in place, the predicted cumulative impacts on air quality and climate associated with the construction phase of the proposed development are deemed short-term and not significant.

11.6.2 Operational Phase

If additional medium to large scale developments are proposed in the future, in the vicinity of the proposed development, this has the potential to add further additional vehicles to the local road network. Cumulative traffic associated with existing developments as well as proposed and permitted developments in the vicinity of the site, including the Rockbrook Phase II development and temporary school permission, has been included in the traffic data for future years used in this assessment, where such information was available. As the traffic impact for the proposed development has an imperceptible impact on air quality, it is unlikely that other future developments of similar scale would give rise to a significant impact during the construction and operational stages of those projects. Future projects of a large scale would need to conduct an EIA to ensure that no significant impacts on air quality will occur as a result of those developments.

11.7 Do Nothing Scenario

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).

11.8 Mitigation Measures

11.8.1 Construction Stage

A dust minimisation plan will be formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within 200m of the construction area. A detailed dust minimisation plan associated with a high level risk of dust impacts is outlined in Appendix 11.3. This plan draws on best practice mitigation measures from Ireland, the UK and the USA in order to ensure the highest level of mitigation possible.

In summary some of 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.
- Furthermore, any road that has the potential to give rise to fugitive dust will 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 will 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.
- Hoarding or screens shall be erected around works areas to reduce visual impact. This will also have an added benefit of preventing larger particles of dust from travelling off-site and impacting receptors.

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.

11.8.2 Operational Phase

Impacts to air quality and climate are predicted to be imperceptible for the operational phase therefore, no mitigation is required.

11.9 Predicted Impacts

11.9.1 Construction

Stage Air Quality

When the dust mitigation measures detailed in Appendix 11.3 of this report are implemented, fugitive emissions of dust and particulate matter from the site will be short-term and not significant in nature.

Climate

Based on the scale and temporary nature of the construction works and the intermittent use of equipment, the potential impact on climate change and transboundary pollution from the proposed development is deemed to be short-term and imperceptible in relation to Ireland's obligations under the EU 2020 target.

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. Unplanned events have been considered throughout this chapter. Therefore, the impact of construction of the proposed development will be short-term and imperceptible with respect to human health.

11.9.2 Operational Phase

The results of the air dispersion modelling indicate that impacts to air quality and climate are predicted to be long-term and imperceptible during the operational phase of the proposed development.

11.10 Monitoring

11.10.1 Construction Phase

Due to the close proximity of the site to a number of high sensitivity receptors, monitoring of construction dust deposition at these nearby sensitive receptors during the construction phase of the proposed development is recommended. This is to ensure the proposed mitigation measures are working satisfactorily. Monitoring 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.

11.10.2 Operational Phase

As the predicted impacts to air quality and climate will be imperceptible during the operational phase, no monitoring is proposed.

11.11 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 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 long term and neutral with respect to human beings.

Interactions between air quality and traffic 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 imperceptible.

With the appropriate mitigation measures to prevent fugitive dust emissions, it is predicted that there will be no significant interactions between air quality and soil and geology. No other significant interactions with air quality have been identified.

11.12 Difficulties Encountered

There were no difficulties encountered when compiling this assessment.

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