

## **9. AIR, DUST AND CLIMATIC FACTORS**

### **9.1 Air, Dust and Climatic factors**

TMS Environment Ltd prepared this section of the Environmental Impact Assessment Report (EIAR). It considers the potential air quality and climate impacts associated with the proposed development. Impacts of site operations are considered by taking account of the existing baseline, the projected impacts and compliance with relevant standards.

The subject lands are located to the north of Celbridge town centre in County Kildare. The proposed development for which planning permission is sought in this application comprises a residential development of approximately 372 residential units, a childcare facility and associated and ancillary infrastructure and open space provision.

### **9.2 Air Quality Impact Assessment**

#### **9.2.1 Assessment Methodology**

The assessment follows a well-established scheme involving identification and characterisation of the air quality impacts that must be addressed, characterisation of the receiving environment to benchmark the existing situation, quantitative prediction of air quality impacts and assessment of the impacts against recognised Air Quality Standards and Guidelines. From this assessment comes a definition of the Management Plans and environmental solutions that are required to ensure that all aspects of the impacts of the development proposal through Construction and Operation Phases are managed and controlled to protect human health, the environment and amenity.

The EPA Revised Draft Guidelines on the Information to be Contained in Environmental Impact Statements were published in May 2017. These draft Guidelines take account of the revised EIA Directive (2014/52/EU) and are considered in this assessment. Impacts are described in the draft Guidance in terms of quality, significance, magnitude, probability, duration and type. A description of the significance of effects is presented in Table 9.1, and Table 9.2 presents the description of the duration of effects as shown in the Draft Guidelines.

In addition to considering the above guidance, the general approach adopted for the air quality impact assessment is summarised as follows.

- (i) Describe the existing baseline air quality at the site and in the vicinity of receptors – addressed in Section 9.3.3;
- (ii) Describe the potential impacts of the development on air quality – addressed in Section 9.4;
- (iii) Identify appropriate criteria against which to assess the significance of the impacts associated with the proposed development – addressed in Section 9.2.2;
- (iv) Propose mitigation and avoidance measures where required.
- (v) Identify and assess all cumulative impacts with potential to impact upon the receiving environment.

**Table 9.1 Describing the Significance of Effects**

<b>“Significance” is a concept that can have different meaning for different topics – in the absence of specific definitions for different topics the following definitions may be useful.</b>	
Imperceptible	An effect capable of measurement but without significant consequences.
Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant Effects	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound Effects	An effect which obliterates sensitive characteristics.

**Table 9.2 Describing the Duration of Effects**

<b>‘Duration’ is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful.</b>	
Momentary Effects	Effects lasting from seconds to minutes.
Brief Effects	Effects lasting less than a day.
Temporary Effects	Effects lasting less than a year.
Short-term Effects	Effects lasting one to seven years.
Medium-term Effects	Effects lasting seven to fifteen years.
Long-term Effects	Effects lasting fifteen to sixty years.
Permanent Effects	Effects lasting over sixty years.
Reversible Effects	Effects that can be undone, for example through remediation or restoration.

## Climate

The potential climate impact of the proposed Project is assessed by comparing the total emissions of Greenhouse Gases (GHG) with those that would occur if the site was left as it is. The Climate Action and Low-Carbon Development Act 2015, which provides for new arrangements aimed at achieving transition to a low-carbon, climate-resilient and environmentally sustainable economy by 2050, requires that the applicant considers and reduces its carbon footprint in all aspects of the proposed development. This assessment provides information on how the proposed project considers this objective in the selection of the preferred approaches for the proposed development.

The principal GHG emissions associated with the proposed development are methane and carbon dioxide (CO<sub>2</sub>). For the purposes of this assessment the proposed development is compared with a *Do Nothing* scenario and evaluated. Therefore, 2 scenarios have been assessed as follows:

- Scenario 1 – Do Nothing, in this scenario, there will be no development at the site; and
- Scenario 2 – Do Something (proposed Project), in this scenario the proposed development is assessed.

The assessment estimates the total GHG emissions from direct and indirect activities associated with the proposed Project. Overall emissions over the lifetime of the project are considered. The assessment is presented in terms of relative GHG emissions from the various sources and while there are some uncertainties, the assessment allows a reliable comparison of the Climate Impact of the proposed project relative to the Do Nothing scenario.

### 9.2.2 Impact Assessment Criteria

The assessment of impact significance is based on a comparison of predicted impacts with air quality standards and guidelines, and consideration of the magnitude and duration of the potential impact.

Air Quality Standards in Ireland have been defined to ensure compliance with EC Directives; they are developed at different levels for different purposes. European legislation on air quality has been framed in terms of two categories, limit values and guide values. Limit values are concentrations that cannot be exceeded and are based on WHO guidelines for the protection of human health. Guide values are set as a long-term precautionary measure for the protection of human health and the environment. The WHO guidelines differ from EU air quality standards in that they are primarily set to protect public health from the effects of air pollution, whereas Air Quality Standards are recommended by governments, and other factors such as socio-economic factors, may be considered in setting the standards.

The Clean Air for Europe (CAFE) Directive (Council Directive 2008/50/EC) is an amalgamation of the Air Quality Framework Directive and its subsequent daughter Directives and sets out limit and target values for named air quality parameters. The fourth daughter Directive (European Parliament 2004) also sets out limit values to be met for certain air quality parameters. The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). The 4th Daughter Directive was transposed by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. no. 58 of 2009).

The air quality standards and guidelines referenced in this report are summarised in Table 9.3. The Clean Air for Europe (CAFE) Directive (Council Directive 2008/50/EC) was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). This Directive and the Irish Regulations

set out the main standards against which the potential impact of the development on air quality are assessed.

In addition to the Air Quality Standards Regulations and the Directive Standards, it is also appropriate to consider the World Health Organisation (WHO) Guidelines. These guidelines were developed by the WHO to provide appropriate air quality targets worldwide, based on the latest health information available. The air quality guidelines for particulate matter (PM<sub>10</sub>), nitrogen dioxide and sulphur dioxide, and PM<sub>2.5</sub> are considered in this report (WHO, 2005; updated in 2008). While the WHO Guidelines are not mandatory, they represent current informed opinion on the levels to which we should be aspiring in order to minimise adverse health impacts of air pollution. The WHO guidelines referenced in this report are summarised in Table 9.4.

There are no national or European Union air quality standards with which dust deposition can be compared. However, a figure of 350 mg/m<sup>2</sup>-day based on the German Standard TA Luft Regulations is commonly applied by Local Authorities and the EPA (Environmental Protection Agency) to ensure that no nuisance effects will result from specified industrial activities.

**Table 9.3 Air Quality Standards Regulations 2011 (based on EU Clean Air For Europe [CAFE] Directive 2008/50/EC)**

Pollutant	EU Regulation	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	None	200 µg/m <sup>3</sup> NO <sub>2</sub>
		Annual limit for protection of human health	None	40 µg/m <sup>3</sup> NO <sub>2</sub>
		Annual limit for protection of vegetation	None	30 µg/m <sup>3</sup> NO + NO <sub>2</sub>
Sulphur Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	150 µg/m <sup>3</sup>	350 µg/m <sup>3</sup>
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 µg/m <sup>3</sup>
		Annual & Winter limit for the protection of human health and ecosystems	None	20 µg/m <sup>3</sup>
Particulate Matter	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50%	50 µg/m <sup>3</sup>

Pollutant	EU Regulation	Limit Type	Margin of Tolerance	Value
(as PM <sub>10</sub> )		Annual limit for protection of human health	20%	40 µg/m <sup>3</sup>
Particulate Matter (as PM <sub>2.5</sub> )	2008/50/EC	Annual limit for protection of human health (Stage 1)	20% from June 2008. Decreasing linearly to 0% by 2015	25 µg/m <sup>3</sup>
		Annual limit for protection of human health (Stage 2)	None To be achieved by 2020	20 µg/m <sup>3</sup>
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	60%	10 mg/m <sup>3</sup> (8.6 ppm)
Benzene	2008/50/EC	Annual limit for protection of human health	0% by 2010	5 µg/m <sup>3</sup>

NOTE: The Air Quality Standards Regulations 2011 (SI 180 of 2011) transposed EU Directive 2008/50/EC (CAFE) into Irish law.

**Table 9.4 WHO Air Quality Standards**

Pollutant	Limit Type	Value
Nitrogen Dioxide	Hourly limit for protection of human health	200 µg/m <sup>3</sup>
	Annual limit for protection of human health	40 µg/m <sup>3</sup>
Sulphur Dioxide	Daily limit for protection of human health	20 µg/m <sup>3</sup>
	10-minute limit for protection of human health	500 µg/m <sup>3</sup>
Particulate matter (as PM <sub>10</sub> )	24-hour limit for protection of human health	50 µg/m <sup>3</sup>
	Annual limit for protection of human health	20 µg/m <sup>3</sup>
Particulate matter (as PM <sub>2.5</sub> )	24-hour limit for protection of human health	25 µg/m <sup>3</sup>
	Annual limit for protection of human health	10 µg/m <sup>3</sup>

## 9.3 Receiving Environment

### 9.3.1 Meteorological conditions

The magnitude of potential impacts of the proposed development on air and climate will largely be influenced by the local meteorological conditions, in particular by wind speed and direction and by precipitation rates. An evaluation of the climatic conditions at the site is therefore useful for an assessment of the type required for this study.

Met Éireann operate a Synoptic Network of weather stations at Belmullet, Malin Head, Rosslare (closed since 2008), Johnstown Castle, Birr, Clones, Kilkenny and Mullingar while the Aviation Division of Met Éireann maintains observing stations at Shannon Airport, Knock Airport, Casement Aerodrome, Dublin Airport and Cork Airport. There is no continuous meteorological monitoring on the subject site but the general guidance on selection of meteorological data for air quality impact assessments is to choose representative data, recently acquired, which best represents conditions at the site. At least three years of recently acquired data is preferred. Comprehensive monitoring data is available for Casement Aerodrome (approximately 8.5km southeast of the subject site) which would be indicative of the meteorological conditions that are experienced at the site. Therefore, for the purpose of obtaining reliable information about the climatological conditions at the site of the proposed development, a full set of meteorological data for the period 2013 – 2015 recorded at Casement Aerodrome was analysed. This is considered an appropriate data set for the study because of the close proximity of the station to the site and the similarity in topography in the immediate area of both Casement Aerodrome and the site of the proposed development.

Wind speed and direction in particular is important in determining how emissions associated with the activity are dispersed. The prevailing wind direction determines which areas are most significantly affected by the emissions from the activity and wind speed determines in part the effectiveness of the dispersion of the emissions.

The windroses for Casement Aerodrome are presented in Figure 9.1 for each of the years 2013 – 2015. The dominant wind direction for Casement Aerodrome is from the southwest quadrant. The wind speed is below 5.14m/s for just under 50% of the time. The average long-term wind speed over the period 1985 – 2010 is 5.5m/s.

### 9.3.2 Influences on Ambient Air Quality

The existing activities at and in the vicinity of the site have the potential to exert an influence on ambient air quality by release of emissions to atmosphere as follows:

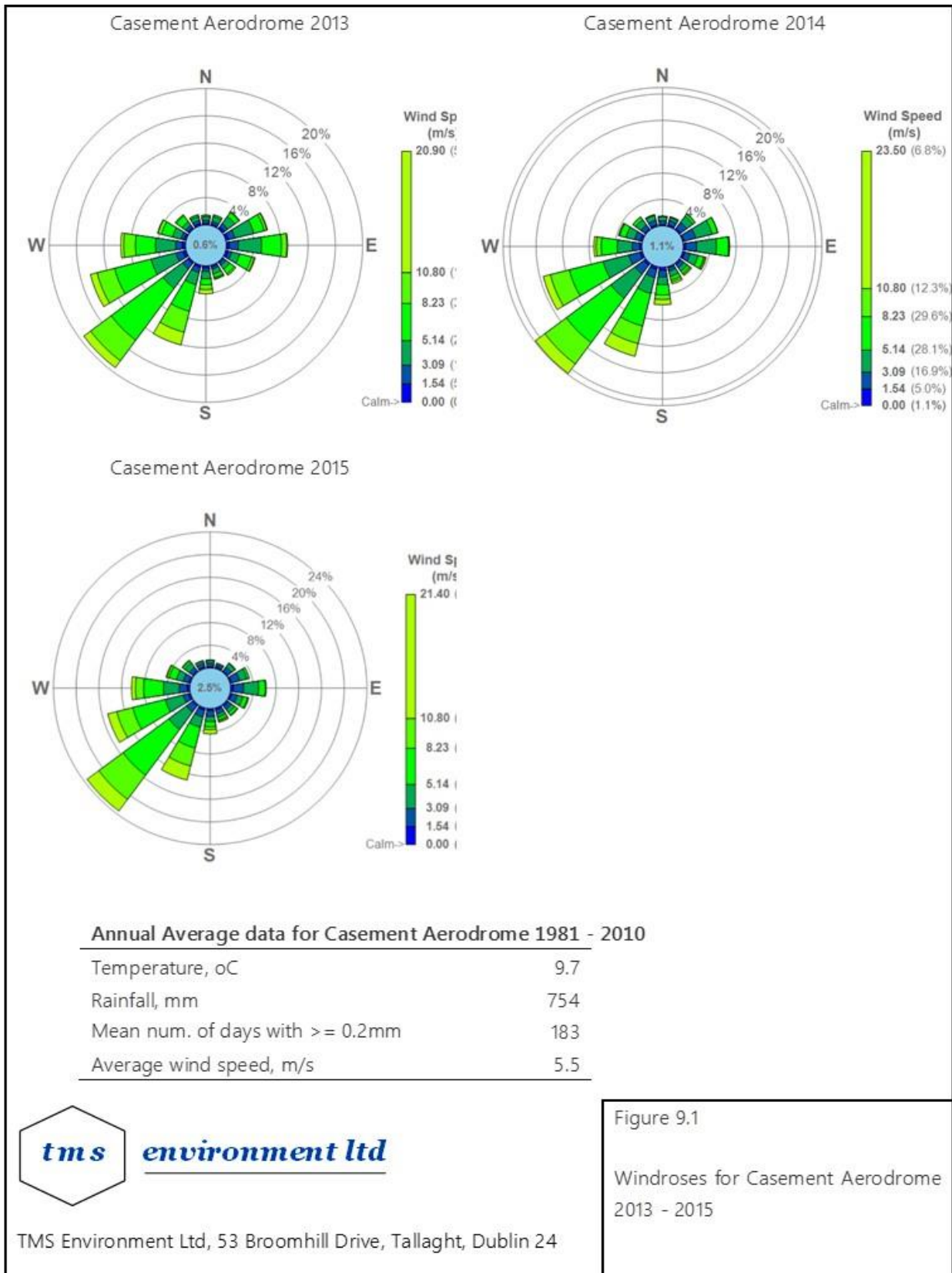
- emissions of fine particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO) from domestic, commercial and industrial heating;
- emissions of particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), SO<sub>2</sub>, NO<sub>x</sub>, CO and benzene from traffic on adjoining roads;

Overall, the contribution of heating systems to air quality in the area is considered to be a dominating influence on air quality in the immediate vicinity of the site.

The main substances which are of interest in terms of existing air quality are sulphur dioxide, nitrogen oxides, particulate dusts including PM<sub>10</sub> and PM<sub>2.5</sub> which could originate from combustion sources and traffic. There are no new substances expected to be present in emissions released from the proposed development. A description of existing levels of the various substances in ambient air is required to

allow completion of the evaluation of air quality impacts associated with the development and is presented in the following section.

**Figure 9.1 Windroses for Casement Aerodrome 2013-2015**



### 9.3.3 Existing Ambient Air Quality

The site is located in agricultural fields immediately north of the town of Celbridge. Crodaun residential estate is located to the east of the site. The M4 Business Park is located to the north of the site and there is a large post primary school located to the west of the site.

The dominant influences on air quality in the area are emissions from commercial energy and heating sources, domestic heating and traffic. Emissions from heating sources are expected to be the principal contributors to ambient air quality in the vicinity of the site.

The main substances which are of interest in terms of existing air quality are sulphur dioxide, nitrogen oxides (nitric oxide, NO and nitrogen dioxide NO<sub>2</sub>, collectively referred to as NO<sub>x</sub>), fine particulate matter including PM<sub>10</sub> and PM<sub>2.5</sub> which could originate from combustion sources, traffic and the existing commercial activities in the area. Carbon monoxide is also potentially of interest, and benzene may also be of interest from traffic sources. There are no significant new substances expected to be present in emissions released from the proposed development relative to the existing situation.

Particulate matter is made up of tiny particles in the atmosphere that can be solid or liquid and is produced by a wide variety of natural and manmade sources. Particulate matter includes dust, dirt, soot, smoke and tiny particles of pollutants. Particulate matter of 10 micrometers in aerodynamic diameter or less are also referred to as PM<sub>10</sub> or more strictly, particles which pass through a size selective inlet with a 50% efficiency cut-off at 10 µm aerodynamic diameter. Similarly, PM<sub>2.5</sub> refers to particulate matter of 2.5 micrometers or less in aerodynamic diameter. In the past domestic coal burning was a major source of particulate matter in Irish cities during winter months. Levels of particles have decreased significantly since then following the introduction of abatement strategies including Special Control Areas and other Regulations regarding the use, marketing, sale and distribution of certain fuels. The significance of particulate matter is predominantly related to human health and respiratory effects.

Nitrogen oxides (NO<sub>x</sub>, which is the sum of NO and NO<sub>2</sub>), are generated primarily by combustion processes. The main anthropogenic sources are mobile combustion sources (road, air and traffic) and stationary combustion sources (including industrial combustion). The main source of nitrogen oxides in the vicinity of the site is traffic. The significance is health-related for nitrogen dioxide (NO<sub>2</sub>) and ecological for nitrogen oxides (NO<sub>x</sub>).

Sulphur dioxide also originates from combustion but predominantly from heating sources and not traffic. The trend in ambient SO<sub>2</sub> concentrations in Ireland is very clearly downward and this pollutant is not a matter for concern in Ireland. This reduction can be attributed to fuel switching from high-sulphur fuels, such as coal and oil, to natural gas and to decreases in the sulphur content of oil.

Carbon Monoxide (CO) is a colourless and odourless gas, formed when carbon in fuel is not burned completely. It is a component of motor-vehicle exhaust, which accounts for most of the CO emissions nationwide. Consequently, CO concentrations are generally higher in areas with heavy traffic congestion.

A description of existing levels of the various substances in ambient air is required to allow completion of the evaluation of air quality impacts associated with the development. The available data from the National Ambient Air Quality Network is a reliable data set for consideration in this study.

The Environmental Protection Agency (EPA) and local authorities maintain and operate a number of ambient air quality monitoring stations throughout Ireland in order to implement EU Directives and to assess the country's compliance with national air quality standards. Ireland's small population and generally good air quality means that a relatively small number of monitoring stations are sufficient



across the country for the purposes of implementing the EU Air Directives. For ambient air quality management and monitoring in Ireland, four zones, A, B, C and D are defined in the Air Quality Standards (AQS) Regulations (S.I. No. 180 of 2011) and are defined as follows:

- Zone A: Dublin Conurbation.
- Zone B: Cork Conurbation.
- Zone C: 24 cities and large towns. Includes Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Dundalk, Navan, Newbridge, Mullingar, Letterkenny, Celbridge and Balbriggan, Portlaoise, Greystones and Leixlip.
- Zone D: Rural Ireland, i.e. the remainder of the State excluding Zones A, B & C.

The subject site is considered to be located in Zone C and is considered a large town site for assessment purposes. Air Quality Data from representative air monitoring stations in Zone C are therefore considered representative of air quality at the subject site. The EPA publishes Ambient Air Quality Reports every year which details the air quality in each of the four zones. The most recent report, published by the EPA in 2019, is the Air Quality in Ireland 2018 – Indicators of Air Quality, which contains monitoring data collected during 2018. Best practice requires that an average of at least three years of recent monitoring data is used for assessments of this type so data for 2016 to 2018 has been reviewed.

The EPA maintains monitoring stations in a number of large towns including Portlaoise, Kilkenny, Ennis, Bray and Galway to monitor large town background air quality. Other monitoring stations have operated at various times and some new stations have been added to the network, but long-term data is available for the above stations.

Data from the Air Quality Monitoring Annual reports for 2016, 2017 and 2018 was reviewed and a summary of the data for representative stations for the three most recent years is presented for each parameter of interest in Table 9.5.

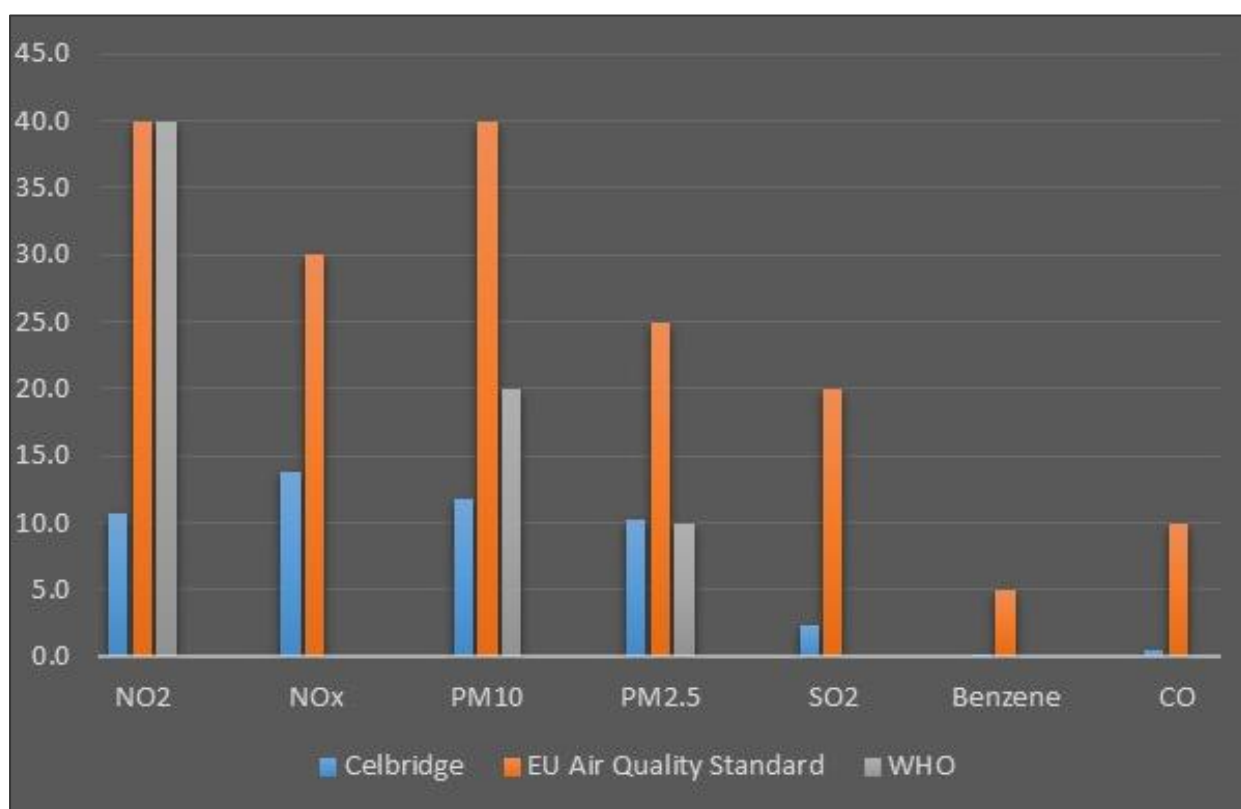
The approach taken is to take the average of the three most recent years (2016 – 2018) for each of the designated large town stations detailed above and the averages of the values for the stations are reported in Table 9.5. This is the data set which is used in the assessment of the potential impact of the proposed development on air quality. A graphical presentation comparing the data with the relevant Air Quality Standards (discussed further in Section 9.3 below) is presented in Figure 9.2.

It is noted from the data that existing ambient air quality is good for all health-related pollutants. All concentration levels are well within the EU Standards for all parameters of interest.

**Table 9.5 Summary baseline air quality data (2016 - 2018)**

Data set	Parameter and averaging interval		Concentration $\mu\text{g}/\text{m}^3$
Large town background	Nitrogen dioxide NO <sub>2</sub>	<i>Annual Mean, <math>\mu\text{g}/\text{m}^3</math></i>	10.6
Large town background	Nitrogen oxides, NO <sub>x</sub>	<i>Annual Mean, <math>\mu\text{g}/\text{m}^3</math></i>	13.8
Large town background	Particulate Matter PM <sub>10</sub>	<i>Annual Mean, <math>\mu\text{g}/\text{m}^3</math></i>	11.7
Large town background	Particulate Matter PM <sub>2.5</sub>	<i>Annual Mean, <math>\mu\text{g}/\text{m}^3</math></i>	10.5
Large town background	Sulphur dioxide, SO <sub>2</sub>	<i>Annual Mean, <math>\mu\text{g}/\text{m}^3</math></i>	2.3
Large town background	Carbon Monoxide CO	<i>Annual Mean 8-hour, <math>\text{mg}/\text{m}^3</math></i>	0.42
Large town background	Benzene	<i>Annual Mean, <math>\mu\text{g}/\text{m}^3</math></i>	0.15

NOTE: Data summarised from the EPA Annual Ambient Air Quality Monitoring Reports 2016 to 2018

**Figure 9.2 Comparison of baseline air quality data with Air Quality Standards**

## **9.4 Air Quality Impact Identification**

### **9.4.1 Existing Activities**

The existing activity at the site of the proposed development has the potential to exert an influence on air quality by release of emissions associated with the activity as follows:

- emissions of particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), Sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and carbon monoxide CO from heating sources in the area;
- emissions of particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), SO<sub>2</sub>, NO<sub>x</sub>, CO from traffic

The magnitude of the emissions from the existing activity is small relative to the dominant influence on air quality in the surrounding area which is traffic from the adjoining road network.

### **9.4.2 Characteristics of the Proposed Development and Impact Identification of Proposed Activities**

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 of the development – i.e. the construction phase, and the operational phase.

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

#### **9.4.2.1 Construction Impacts**

The potential air quality impacts during Construction are summarised as follows:

- a) Dust emissions associated with demolition and ground works

The most significant of the potential air quality impacts associated with the construction site is dust. Dust can be generated as a result of disturbance of materials, as a result of wind blowing across exposed surfaces and as a result of construction vehicle movements across exposed surfaces.

There are three potential impacts on air quality of the dust / particulate matter emissions. Dust deposition on surfaces is the main potential impact associated with the larger particles, nuisance effects such as reduced visibility could be associated with excessively high levels of suspended particulate matter and respiratory effects could occur as a result of excessive levels of fine particles such as PM<sub>10</sub> and PM<sub>2.5</sub>.

Dust emissions associated with the Construction Phase of the proposed development are expected to be predominantly in the 10 – 75µm particle size range so these particles, because of their size, will generally be deposited within 100m of the emission source. Only under exceptional meteorological conditions would the dusts be carried further downwind. The majority of the dust associated with construction activity is in the 10 – 75µm particle size range.

Suspended particulate matter (SPM) may also be released and this matter may remain suspended in the air. The main effect would be on visibility but this type of material could also be a respiratory nuisance if present at excessive levels. Emissions of dust in the form of fine particulate matter, PM<sub>10</sub> and PM<sub>2.5</sub>, may also occur, primarily as a result of materials handling and storage since the dominant particle size of the main construction materials is in the lower size ranges. There may also be some emissions of particles in these size ranges from the general site activities.

#### b) Construction transport emissions

Emissions of dust raised by vehicle movement on the roads near the site and also on site are considered under the general construction phase emissions in section (a) above. Emissions from the construction vehicles as a result of fuel combustion are considered here. The emissions include PM<sub>10</sub> and PM<sub>2.5</sub>, NO<sub>2</sub> and NO<sub>x</sub> and CO and benzene.

#### c) Aspergillus emissions from earthmoving activity

There is concern about a fungal disease, "invasive Aspergillosis" which may be contracted as result of disturbance of materials that release fungal spores into the atmosphere. Fungal spores (the Aspergillus moulds) are found everywhere but are of particular concern when large scale demolition, excavation and earth-moving activity takes place.

### 9.4.2.2 Operational Impacts

The most significant potential impacts remain the same as those associated with existing activities at and in the vicinity of the site - emissions of particulate matter and combustion gases such as CO, SO<sub>2</sub> and NO<sub>2</sub> from heating and traffic.

Sulphur dioxide emissions originate from the sulphur in the fuel used in the combustion process. Since natural gas (heating) is the fuel to be used sulphur dioxide emissions will be negligible. Nitrogen oxides are present in the emission stream as a result of the combustion process. Much of the emissions are in the form of nitrogen oxide (NO) which is expected to be substantially oxidised to nitrogen dioxide in the atmosphere. Nitrogen oxide emissions from boilers using natural gas as fuel are significantly lower than the emissions associated with other fuels.

Particulate matter and carbon monoxide may also arise from the combustion process in the emission stream but only in minor amounts. Again, natural gas is a very clean fuel and particulate emissions from the boilers are predicted to be very low.

There is the potential for a number of greenhouse gas emissions to atmosphere from the boilers which may give rise to CO<sub>2</sub> emissions. However, the level of emissions will be insignificant compared to national greenhouse gas emissions, and the levels will be the same as the existing situation.

### 9.4.2.3 Traffic Impacts

The principal substances that are associated with transport activity are particulate matter, nitrogen oxides and carbon monoxide. Dust emissions associated with construction traffic is also possible.

### 9.4.3 Do Nothing Impact

There will be no change in air quality impacts if no change takes place. In the absence of the development proposal, the air quality is unlikely to change.

## 9.5 Air Quality Impact Assessment

### 9.5.1 Existing Activities

Section 9.3.3 describes the existing air quality at and in the vicinity of the site. The data supports the conclusion that heating and traffic emissions are the dominant influence on air quality in the area. The

existing air quality complies with the Air Quality Standards and indicates that existing activities are not exerting an unacceptable effect on air quality.

### 9.5.2 Construction Phase Impacts

Guidance on assessment of dust from demolition and construction was published in 2014 by the Institute of Air Quality Management (IAQM). This Guidance describes a five-step approach to the assessment which is summarised as follows.

- (i) Screen the development to determine if there is a requirement for a more detailed assessment.
- (ii) Assess the risk of dust impacts for each of the four activities (demolition, earthworks, construction and construction traffic) and take account of the scale and nature of the works, and the sensitivity of the area.
- (iii) Determine the site-specific mitigation for each potential activity.
- (iv) Examine the residual effects and determine whether or not these are significant.
- (v) Prepare the dust assessment report.

This approach has been applied to the development at the proposed site and is summarised below. A detailed assessment is required when there are human receptors within 350m of the boundary of the site and since the closest human receptors to the site boundary are within this distance, a detailed assessment is required. There are no European or designated sites within 50m of the site boundary, which is the threshold distance for ecological sensitivity, so there are no significant construction impacts predicted for ecological sites. The Guidance advises that most projects will require a detailed assessment as the approach adopted is conservative.

The risk of dust being emitted in sufficient quantities to cause a nuisance or health impacts is evaluated by considering the scale of the works programme. The IAQM Guidance Note gives advice on classifying the magnitude of the potential dust impacts and using the advice and information derived from the Construction and Demolition Plan for the site, the magnitude of the dust emissions is estimated as shown in Table 9.6.

**Table 9.6 Assessment of Magnitude of dust emissions for Construction Programme**

Activity	Magnitude of Dust Emission	Sensitivity of receptors and surrounding areas		
		Dust Soiling	Human Health	Ecological
Demolition	Low	Medium	Low	Low
Excavations	Medium	Medium	Low	Low
Construction	Low to Medium	Medium	Low	Low
Construction Traffic	Low	Medium	Low	Low

The proposed development consists predominantly of a construction programme as there is just one agricultural building on the site that is to be demolished. Excavation work is required as the site is a greenfield site with by far the majority of excavated materials being soils (grassed topsoil, topsoil and

subsoil). The Construction programme is significant and therefore significant emissions could be expected.

The significance of the dust emissions and impacts is evaluated in terms of the sensitivity of the receptors in the area that could be affected by the emissions. In general, receptors located close to the construction site boundary are considered high sensitivity with sensitivity decreasing with increasing distance from the source reflecting the exponential decrease in dust levels as distance increases. The highest receptor sensitivity in the immediate vicinity of the proposed site is medium and is low for the vast majority of the construction activity.

The potential air quality impact arises from emissions of particulate matter and may result in deposition of dust around the site and tracked out onto the roads in the vicinity of the site. The magnitude of the potential emissions associated with Construction is assessed as medium using the above criteria. The Construction Phase Environmental Management Plan will include a specific Dust Minimisation Plan which will ensure that dust impacts are prevented or minimised during the Construction Phase of the development.

Using the alternative assessment approach outlined in the Draft Guidelines on Environmental Impact Assessment as outlined in Section 9.3.1, the significance of potential dust emissions during construction is summarised in Table 9.7.

**Table 9.7 Assessment of Significance of Dust Emissions for Construction Programme**

Activity	Significance of Dust Emission	Duration of Dust Emission
Demolition	Imperceptible	Temporary
Excavations	Slight	Temporary
Construction	Not Significant	Temporary
Construction Traffic	Not significant	Temporary

This assessment shows that the most significant potential impacts are those associated with excavation work and construction traffic both of which are very dependent on weather conditions. Damp weather and low wind speeds will reduce the level of impact experienced at the receptor locations. There will be a temporary, slight impact on the closest receptors during the excavation programme and a temporary, not significant impact on the closest receptors during the construction works. Construction traffic impacts will be slight and experienced in the short-term. In an overall context, there will be no lasting impact and the temporary impacts can be effectively managed by means of a Construction Management Plan incorporating the mitigation measures outlined in Section 9.6.

As noted above, there is concern about a fungal disease, "invasive Aspergillosis" which may be contracted as result of disturbance of materials that release fungal spores into the atmosphere. This is a disease which is detrimental to persons with suppressed immune systems, such as hospital patients. The "*National Guidelines for the prevention of Nosocomial Invasive Aspergillosis during construction/renovation activities*" deals specifically with construction works occurring within or adjacent to hospitals. The report states that the fungal spores responsible for invasive Aspergillosis can originate from a number of sources such as construction, demolition, renovation, disturbance of soil, removal of

fibrous insulation material, removal of suspended ceiling tiles and from poorly maintained air ventilation systems. The potential sources of the fungal spores associated with invasive Aspergillosis, as detailed above, are related to the occurrence of these operations either within or in very close proximity to the hospital buildings.

Fungal spores (the *Aspergillus* moulds) are found everywhere but are of particular concern when large scale demolition, excavation and earth-moving activity takes place and especially in close proximity to areas where vulnerable individuals are located. The dispersion of spores (or indeed dust or any other substance) which are released at a particular location depends on a significant number of factors which include the rate and temperature of the release, the release height, the wind speed, rainfall, wind direction, topography, local meteorological conditions, the nature of the substances released, the potential for physical or chemical interactions and the concentrations of the substances released and other factors. The dispersion of fungal spores will depend on all of the above factors and this dispersion is evaluated by considering the factors noted above and the distances from the source at which the predicted impacts are to be assessed. In the first instance, the key factors are the concentration of the spores released and the distance to sensitive receptors. Dispersion of fungal spores released as a result of any activity is a function of time and distance and would be completely dispersed i.e. no measurable concentration at approximately 250m from the source of the release.

The National Guidelines report referred to above notes that the fundamental requirement in respect of eliminating *Aspergillus* infection from construction works is first to minimise the dust generated during construction and second to prevent dust infiltration into patient care areas. All Construction Works will be carried out in a way that minimises dust emissions and in accordance with the requirements of the National Guidelines.

Raw materials required for the construction will be delivered to the sites using conventional Heavy Goods Vehicles (HGVs) and any wastes requiring removal from the site will be removed using HGVs.

The principal substances that are emitted from the vehicles are fine particulate matter, nitrogen oxides and carbon monoxide. Dust and particulate matter impacts associated with the passage of vehicles on roads has already been assessed as part of the dust and particulate matter impacts. The level of traffic movements has been reviewed in the context of potential contributions to air quality in the area. Potential emissions from traffic using the local road network linking onto the M4 were taken into consideration in this assessment. Using the guidance from the National Roads Authority (NRA) "Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, NRA 2011" it was concluded that the additional transport will not generate significant emissions in terms of local air quality and no measurable change in air quality relative to the existing situation is predicted.

### **9.5.3 Operation Phase Impacts**

The only predicted air quality impacts associated with operation of the development are emissions to atmosphere from heating sources and traffic associated with the development. The change in traffic movements will have no quantifiable impact on air quality. There are no adverse impacts on ambient air quality predicted as a result of the Operation Phase of the proposed development.

### **9.5.4 Climate Impact**

The principal GHG emissions associated with construction are carbon dioxide from transport and machinery utilised in construction. For the *Do Nothing* Scenario, if the proposed development does not

proceed then the emissions of GHGs in the area are projected to remain the same with some relatively minor increases as activity in the area develops. However, GHG emissions will still occur somewhere because the residential accommodation must be provided to cater for existing and future needs.

Although the overall impact of each of the potential scenarios assessed would be the same, opportunities for minimisation of GHG emissions during construction will arise and will be required to ensure that the overall objectives of enhanced energy efficiency and minimisation of GHG emission are achieved.

The operation of the proposed development will result in indirect emissions of GHGs including carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) resulting from energy generation required for space heating and road traffic.

The CO<sub>2</sub> released due to energy usage is directly reduced by enhancing the energy efficiency of the proposed development. In this respect, the selection of natural gas as the heating source is the optimum strategy. The proposed design considers these factors and contributes to the overall objective of minimising GHG emissions.

Due to the size and nature of the development, greenhouse gas emissions resulting from the development will be imperceptible in the national context. There will therefore be no adverse impacts on climate and no significant contribution to Irelands greenhouse gas budget.

The size and nature of the development and the nature and volume of emissions will lead to an imperceptible change in atmospheric conditions. There will be no change to the heat balance in the immediate area.

#### **9.5.5 Unplanned Events**

There is no meaningful potential for unplanned events to cause a significant adverse impact on the air climate in the area.

#### **9.5.6 Do Nothing Impact**

There will be no change in air quality impacts if no change takes place. In the absence of the development proposal, the air quality is unlikely to change.

### **9.6 Human Health Impacts**

Air Quality Standards (AQS) are set to protect vulnerable people, such as those with respiratory illnesses, the old and infirm. Hence, the human health impact assessment has relied on compliance with the AQS to determine whether significant impacts will arise on human health or not.

The air quality impact assessment notes that dust and particulate matter are the primary sources of construction related impacts for all of the Proposed Project elements. A short-term Slight adverse impact is predicted for the closest receptors during the Construction Phase with potential short-term impacts from traffic on the surrounding roads within approximately 50m of the proposed Project site. There will be no lasting impact, and the short-term impact will be managed by means of an effective Construction Environmental Management Plan (CEMP) incorporating the mitigation measures outlined in Section 9.7 of this EIAR. The CEMP will include a specific Dust Minimisation Plan which will ensure that dust impacts are prevented or minimised during the Construction Phase of the Proposed Project.



The predicted impact on air quality is short term and not significant hence the potential human health impact during construction is imperceptible.

There will be no significant emissions to atmosphere during the Operation Phase and the impact has been assessed as imperceptible. Therefore, the potential human health impact during Operation is imperceptible.

## **9.7 Cumulative Impacts**

The assessment has been conducted with regard to other locations within the vicinity of the proposed development that may contribute to a potential cumulative environmental impact alongside the proposed development. Operational traffic data reviewed for the opening and design years includes the future baseline traffic levels in addition to the added traffic from the future residential development.

Additional residential developments may also be proposed in the future, in the vicinity of the future residential development, which would add further additional vehicles to the local road network. However, as the traffic impact for the future residential development has an imperceptible impact on air quality, it is unlikely that other future residential 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.

## **9.8 Mitigation Measures**

### **9.8.1 Construction Phase Mitigation Measures**

A Dust Management Plan will be formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions. The principal objective of the Plan is to ensure that dust emissions do not cause significant nuisance at receptors in the vicinity of the site. The most important features of the Dust Management Plan are summarised as follows:

- A designated Site Agent will be assigned overall responsibility for Dust Management;
- The design of the site and Construction programme considers dust impact management and chooses design approaches to minimise dust emissions;
- An effective training programme for site personnel will be implemented for the duration of the Construction Programme;
- A strategy for ensuring effective communication with the local community will be developed and implemented;
- A programme of dust minimisation and control measures will be implemented and regularly reviewed;
- A monitoring programme will be implemented.

The design of the construction programme and the location and layout of the construction compound and the storage of materials will be carefully planned to ensure that air quality impacts are minimised. The following is a summary of the main mitigation features of the project and the specific mitigation

measures which will be employed in order to minimise emissions from the activity and the associated impacts of such emissions.

- Activities with potential for significant emissions will wherever possible be located at a position as far as possible removed from the nearest residential and commercial receptors;
- The areas on site which vehicles will be travelling on will generally be hard-surfaced or compressed ground thus significantly reducing the potential for dust emissions from the vehicles;
- The construction compound area will have hard standing areas to minimise windblown dust generation.
- In order to minimise the potential for wind-generated emissions from material storage bays, these bays will be oriented away from the dominant wind direction to minimise the effects of wind on release of dust and particulate.
- The relatively coarse particle size (10 – 75µm) associated with the activity means that the particles will generally be deposited close to the emission source and will not travel significant distances away from the site.
- Fixed and mobile water sprays will be used to control dust emissions from material stockpiles and road and yard surfaces as necessary in dry and/or windy weather.
- A daily inspection programme will be formulated and implemented in order to ensure that dust control measures are inspected to verify effective operation and management.
- A dust deposition monitoring programme will be implemented at the site boundaries for the duration of the construction phase in order to verify the continued compliance with relevant standards and limits.

### **9.8.2 Operation Phase Mitigation Measures**

No additional mitigation measures are required as the operational phase of the proposed infrastructure development and future residential development are predicted to have an imperceptible impact on ambient air quality and climate.

## **9.9 Predicted Residual Impacts**

This section describes the predicted impact of the proposed development following the implementation of the remedial and mitigation measures discussed above in Section 9.8.

### **9.9.1 Construction Phase**

If the dust minimisation measures are implemented, fugitive emissions of dust from construction of the development will have a short-term and imperceptible impact on nearby receptors.

### **9.9.2 Operational Phase**

Impacts to air quality and climate during the operational phase of the proposed development are deemed long-term and imperceptible.

### 9.10 Interactions

The main interactions with air quality are in relation to human beings and biodiversity (flora and fauna). The impact of air quality on human beings living in the area of the proposed development has been addressed above for both the construction and operational phase of the proposed development. The impact assessment shows that the air quality impacts that will be experienced by human beings in the vicinity of the proposed development are all within the prescribed criteria. This interaction is described as **Negative** and quantified as **Not Significant** for the construction phase and **Neutral** for the operational phase.

In relation to the interaction of emissions to atmosphere from the proposed development with biodiversity, the emissions released from the development will not have a significant adverse impact on the local birdlife and wildlife. This interaction is described as **Neutral**.

### 9.11 Monitoring

Monitoring of construction dust deposition at nearby sensitive receptors (residential dwellings) 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<sup>2</sup>\*day) during the monitoring period between 28 - 32 days.

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

### 9.12 References

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First General Administrative Regulation Pertaining the Federal Emission Control Act. TA Luft Technical Instructions on Air Quality Control.