AIR QUALITY ASSESSMENT OF TRAFFIC EMISSIONS ASSOCIATED WITH MAYESTON HOUSING FOR FINGAL COUNTY COUNCIL, MAYESTON, DUBLIN 11

Technical Report Prepared For

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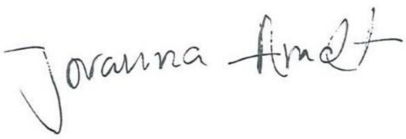
Signature		
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EXECUTIVE SUMMARY

This report presents the assessment of air quality impacts as a result of the proposed Mayeston Housing development in Mayeston,Dublin 11 during the construction and operational stages.

An assessment of the likely potential dust related impacts as a result of construction activities was undertaken and used to inform a series of mitigation measures. The likely potential impacts to air quality from construction traffic emissions associated with the construction phase of the proposed development were also assessed.

During the operational phase, the likely potential air quality impacts associated with additional traffic generated by the proposed development have been assessed.

Assessment Summary

Existing Air Quality

Annual mean concentrations of NO_2 are below the relevant national air quality limit value objective at all modelled receptors. The highest concentration modelled is 31.6 $\mu g/m^3$ at receptor May6, near the northern boundary of the proposed development with the M50. Annual mean PM_{10} and $PM_{2.5}$ concentrations are below the relevant national air quality limit value objective in 2022 for all modelled receptors. In summary there are no existing air quality concerns at Mayeston.

Construction Stage

Provided the mitigation measures outlined in Appendix I are implemented throughout the construction phase of the development, dust impacts at nearby sensitive receptors will be short-term and imperceptible. There are no significant impacts on air quality predicted from construction traffic emissions.

Operational Stage

There are no significant impacts expected as a result of the operational phase of the proposed development.

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1.0 INTRODUCTION

This report presents the assessment of air quality impacts as a result of the proposed Mayeston Housing development in Mayeston, Dublin 11 during the construction and operational stages.

An assessment of the likely potential dust related impacts as a result of construction activities was undertaken and used to inform a series of mitigation measures. The impacts to air quality from construction traffic emissions associated with the construction phase of the proposed development were also assessed.

During the operational phase, the likely potential air quality impacts associated with additional traffic generated by the proposed development have been assessed.

The proposed development relates to a site of c.1.35ha. located within existing residential development referred to as Mayeston, Poppintree, Dublin 11. The site is located north of St Margaret's Road and is bound by the M50 motorway to the north, Mayeston Green and Silloge Green to the east, Mayeston Downs to the south, and to the west by public open space.

The proposed development will include for the provision of 119 no. apartment units consisting of 39 one-bedroom apartments, 68 no. two-bedroom apartments and 12 no. 3-bedroom apartments ranging from 3-6 no. storeys and will also include for car parking, cycle parking, pedestrian and cycle links, storage, services and plant areas. Landscaping will include for high quality private open space, communal amenity areas and public open space provision.

2.0 ASSESSMENT CRITERIA

2.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air 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. The applicable standards in Ireland include the Air Quality Standards Regulations 2022, which incorporate EU Directive 2008/50/EC (see Table 1). The ambient air quality standards applicable for NO_2, PM_{10} and $PM_{2.5}$ are outlined in this Directive.

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. These standards have been used in the current assessment to determine the potential impact of NO_2, PM_{10} and $PM_{2.5}$ emissions from the proposed development on ambient air quality.

Table 1. Air Quality Standards

Pollutant	Regulation Note 1	Limit Type	Value Note 2
Nitrogen Dioxide (NO_2)	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 μg/m^3
		Annual limit for protection of human health	40 μg/m^3
Particulate Matter	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 μg/m^3 PM_{10}

Pollutant	Regulation Note 1	Limit Type	Value Note 2
(as PM_{10})		Annual limit for protection of human health	40 µg/m³ PM_{10}
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health	25 µg/m³ $PM_{2.5}$

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

Note 2 µg/m³ (micrograms per cubic metre)

2.2 Dust Deposition Guidelines

The concern from a health perspective is focused on particles of dust which are less than 10 microns and the EU ambient air quality standards outlined in Section 2.1 have set ambient air quality limit values for PM_{10} and $PM_{2.5}$.

With regard 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.

However, guidelines for dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust)(1) sets a maximum permissible emission level for dust deposition of 350 mg/m²/day averaged over a one year period at any receptors outside the site boundary. Recommendations from the Department of the Environment, Heritage & Local Government(2) apply the Bergerhoff limit of 350 mg/m²/day to the site boundary of quarries. This limit value can be implemented with regard to dust impacts from the construction of the proposed development.

3.0 ASSESSMENT METHODOLOGY

3.1 Existing Baseline

The air quality screening assessment has considered the screening criteria in the TII guidance *Air Quality Assessment of Specified Infrastructure Projects – PE-ENV-01106(3)*. The screening criteria is used to assess if there is a likely potential impact at nearby sensitive receptors as a result of the proposed development.

3.1.1 *Atmospheric Dispersion Modelling Systems (ADMS) -Roads Dispersion Model*

Vehicle-derived air emissions for the Mayeston residential area surrounding the proposed development were modelled using the detailed ADMS-Roads dispersion model (Version 5.0.1) which has been developed by Cambridge Environmental Research Consultants (CERC)(3). The model is a steady-state Gaussian plume model used to assess ambient pollutant concentrations associated with road sources.

As part of the screening exercise, the ADMS-Roads dispersion model (Version 5.0.1) has been used to predict the ground level concentrations (GLC) of NO_2 and PM_{10}/$PM_{2.5}$ in the vicinity of the impacted areas for the baseline year of 2022.

The modelling incorporated the following features:

- Hourly-sequenced meteorological information for Dublin Airport in 2022 has been used in the model (see Figure 1)(6). The selection of the appropriate meteorological data has followed the guidance issued by the LAQM (TG22)(7)

A primary requirement is that the data used should have a data capture of greater than 90% for all parameters; and

- Specific air sensitive receptors (ASRs) were also mapped into the model. Receptor heights were input at 1.5m to represent breathing height. Concentrations were reported for each ASR modelled for all modelling scenarios.

The ADMS-Roads model input parameters selected are summarised in Table 2.

Table 2. Summary of the ADMS-Roads Model Input Parameters

Parameter	Description	Input Value
Coordinate System	Spatial data in ADMS-Roads is linked to a Cartesian coordinate system, measured in meters.	Universal Transverse Mercator (UTM, Zone 29 North) Coordinate system was used.
Pollutants	A range of preset pollutants can be selected in ADMS-Roads for modelling.	NO_X, PM_{10} and $PM_{2.5}$ were specifically modelled.
Road Source Emissions	Road sources emissions can be entered manually or calculated from traffic flow data.	Road emissions have been calculated from traffic flow data.
Road Emission Factors	TII REM online tool was used.	TII REM online tool with the Intermediate Case fleet data was used.
Traffic Speed	ADMS-Roads can adjust pollutant emission factors to take account of traffic speed.	Average traffic speed specific to each link, as advised by traffic consultant, has been used in the model.
Meteorological Data	ADMS-Roads requires hourly meteorological data from a suitable meteorological station for a full year.	2022 data from Dublin Airport has been used in the model.
Surface Roughness	The model requires a representative surface roughness value for both the modelling domain and the meteorological station.	A value of 0.5 m has been selected for the modelling domain with a value of 0.2 m selected for Dublin Airport.
Complex Terrain	Where terrain exceeds 1;10, terrain effects may be modelled	Flat terrain has been used in the modelling domain.

Road traffic emission rates for NO_X, PM_{10} and $PM_{2.5}$ were generated using the TII Road Emissions Model (REM) online calculator tool(4), and are derived using traffic data for the Mayeston area provided by the traffic consultant and obtained from the TII Traffic Data website(9) for a traffic count location M50 Between Jn05 N02/M50 and Jn04 Ballymun). The TII REM tool incorporates emission factors from the COPERT V database.

The following inputs are required for the REM tool: receptor locations, light duty vehicle (LDV) annual average daily traffic movements (AADT), annual average daily heavy duty vehicles (HDV AADT), annual average traffic speeds, road link lengths, road type, project county location and pollutant background concentrations. The Default fleet mix option was selected along with the Intermediate Case fleet data base selection, as per TII Guidance(4). The Intermediate Case assumes a linear interpolation between the Business as Usual case – where current trends in vehicle ownership continue and the Climate Action Plan (CAP) case – where adoption of low emission light duty vehicles occurs. The TII REM uses county-based Irish fleet composition for different road types, for different European emission standards from pre-Euro to Euro 6/VI with scaling factors to reflect improvements in fuel quality, retrofitting, and technology conversions. The TII REM also includes emission factors for PM_{10} emissions associated with brake and tyre wear[(4)].

3.1.2 *Model Verification*

Model verification investigates the level of agreement between modelled and measured concentrations. Difference between modelled and measured pollutant concentrations can arise due to uncertainties in or limitations to the model input data (such as traffic data and meteorological data), uncertainties in monitoring data and inherent modelling limitations. As outlined in LAQM.TG22[(7)], an adjustment to the modelled results is usually required in order to ensure that the final concentrations presented are representative of monitoring information in the area.

A verification study was undertaken using traffic data for the Mayeston area provided by the traffic consultant and obtained from the TII Traffic Data website[(9)] for a traffic count location M50 Between Jn05 N02/M50 and Jn04 Ballymun. The study compared the ambient NO_2 monitored concentration at the TII diffusion tube location AQ4[(10)] on St. Margaret's Road with the ADMS-Roads model output at this location.

Background data was based on NO_2 levels at EPA suburban monitoring locations for between 2018-2022[(11)], discussed further in Section 4.2.1.

The first step of model verification, in line with LAQM.TG22, is to consider the performance of the model, prior to any adjustment, by comparing modelled and measured road NO_X contribution at the TII diffusion tube location. In line with LAQM.TG22, the model adjustment was based on NO_X rather than NO_2 with the NO_2 diffusion tube data first converted to NO_X using the NO_X to NO_2 Calculator[(12)]. Additionally, the adjustment was applied to the road source contribution only rather than total NO_X, again in line with LAQM.TG22.

The comparison is shown in Table 3. This shows that the unadjusted model slightly over predicts total NO_2 concentrations by around 18% and is within the target 4 µg/m^3 of the air quality standard (10% of 40 µg/m^3), with a root mean square error (RMSE) of 3.86 µg/m^3. Application of a model adjustment factor is therefore not required, and unadjusted model results are reported in Section 4.3.

Table 3. Diffusion Tube Monitoring Data Used for Model Verification

Diffusion Tube	Modelled NO_X Concentration (µg/m^3)	Modelled NO_2 Concentration (µg/m^3)	Monitored NO_X Concentration (µg/m^3)	Monitored NO_2 Concentration (µg/m^3)	Difference [(modelled–monitored)/(monitored) *100]	Adjust-ment Factor
TII AQ4	11.6	25.1	4.1	21.2	18.2	0.357

3.2 Construction Phase

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

Construction phase traffic also has the potential to impact air quality. The TII guidance PE-ENV-01106[3] states that road links meeting one or more of the below criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment.

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- Daily average speed change by 10 kph or more;
- Peak hour speed will change by 20 kph or more; or
- A change in carriageway alignment by 5m or greater.

The construction stage traffic does not meet the above scoping criteria. Therefore, a detailed air quality modelling assessment has been scoped out as there is no potential for significant impacts to air quality during construction as a result of traffic emissions.

3.3 Operational Phase

Operational phase traffic also has the potential to impact air quality. The TII guidance PE-ENV-01106[3] states that road links meeting one or more of the criteria outlined in Section 3.2 can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment.
The operational phase traffic does not meet the TII scoping criteria. Therefore, a detailed air quality modelling assessment has been scoped out as there is no potential for significant impacts to air quality during operation as a result of traffic emissions.

4.0 BASELINE ENVIRONMENT

4.1 Meteorological Conditions

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds, when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ to 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 proposed development is approx. 2 km south of Dublin Airport. The Dublin Airport meteorological station collects meteorological data in the correct format for the purposes of this assessment and has a data collection of greater than 90%. Long-term hourly observations at Dublin Airport meteorological station provide an indication of the prevailing wind conditions for the region (see Figure 1). Results indicate that the prevailing wind direction is from south to westerly in direction over the period 2018 to 2022.

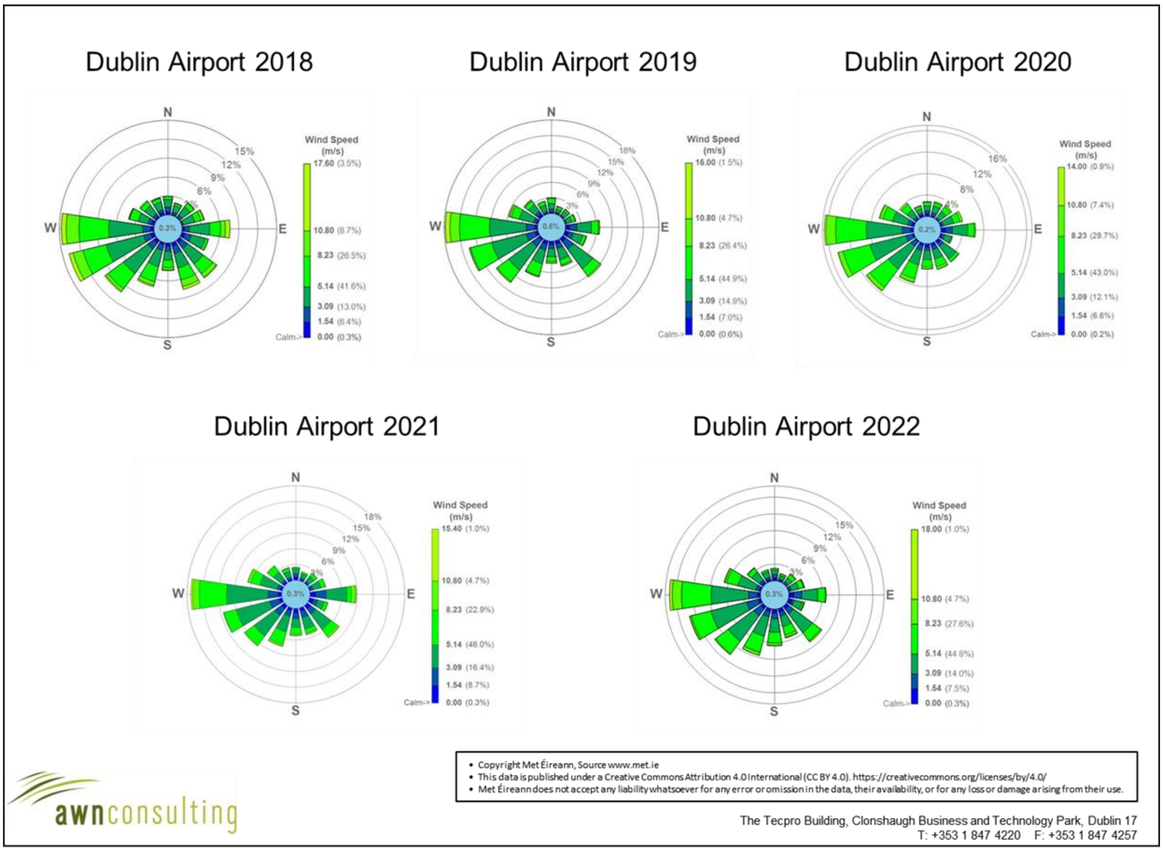

Figure 1. Dublin Airport Meteorological Station Windrose 2018 to 2022[6]

4.2 Background Concentrations Of Pollutants

4.2.1 _NO_2_

Air quality monitoring programmes have been undertaken in recent years by the EPA and Local Authorities[11]. The most recent annual report on air quality "*Air Quality in Ireland 2022*" [11], details the range and scope of monitoring undertaken throughout Ireland. As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes[11]. 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, Mayeston, Co. Dublin is categorised as Zone A[11].

In 2020 the EPA reported[11] that Ireland was compliant with EU legal limits at all locations, however this was largely due to the reduction in traffic due to Covid-19 restrictions. The EPA report details the effect that the Covid-19 restrictions had on stations, which included reductions of up to 50% at some monitoring stations which have traffic as a dominant source. The report also notes that CSO figures show that while traffic volumes are still slightly below 2019 levels, they have significantly increased since 2020 levels. 2020 concentrations are therefore predicted to be an exceptional year and not consistent with long-term trends. For this reason, they have been reported in the baseline section but not included in the long-term trend analysis.

With regard to NO_2, continuous monitoring data from the EPA[11], at urban and suburban Zone A background locations in Dublin Airport, Rathmines, Dún Laoghaire, Ballyfermot and Swords and show that current levels of NO_2 are below both the annual and 1-hour limit values, with annual average levels ranging from 12 - 20 µg/m^3 in 2022 (see Table 4). Sufficient data is available for the station in Rathmines, Dún Laoghaire, Swords and Ballyfermot to observe long-term trends over the period 2018 – 2022[11], with annual average results ranging from 11 – 22 µg/m^3. Based on these results, an estimate of the current background NO_2 concentration in the region of proposed development is 19 µg/m^3.

Table 4. Annual Mean and 99.8th Percentile 1-Hour NO_2 Concentrations In Zone A Locations (µg/m^3)

Station	Averaging Period	Year				
		2018	2019	2020	2021	2022
Dublin Airport	Annual Mean NO_2 (µg/m^3)	-	-	23	19	20
	99.8th%ile 1-hr NO_2 (µg/m^3)	-	-	89	96	-
Rathmines	Annual Mean NO_2 (µg/m^3)	20	22	13	14	14
	99.8th%ile 1-hr NO_2 (µg/m^3)	87	102	81	69	-
Dún Laoghaire	Annual Mean NO_2 (µg/m^3)	19	15	14	16	16
	99.8th%ile 1-hr NO_2 (µg/m^3)	91	91	78	73	-
Ballyfermot	Annual Mean NO_2 (µg/m^3)	17	20	12	13	13
	99.8th%ile 1-hr NO_2 (µg/m^3)	101	101	83	73	-
Swords	Annual Mean NO_2 (µg/m^3)	16	15	11	11	12
	99.8th%ile 1-hr NO_2 (µg/m^3)	85	80	65	63	-

Note 1 Annual average limit value of 40 µg/m^3 and hourly limit value of 200 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022)

Note 2 Hourly data for 2022 not available

4.2.2 *PM_{10}*

Continuous PM_{10} monitoring carried out at the urban and suburban background locations of Rathmines, Dún Laoghaire, Ballyfermot, St. Anne's Park, Dublin Airport, Finglas, Marino and Clonskeagh showed annual mean concentrations ranging from 11–15 µg/m^3 in 2022 (see Table 5), with at most 9 exceedances (in Rathmines) of the daily limit value of 50 µg/m^3 (35 exceedances are permitted per year) [11]. Sufficient data is available for Rathmines, Dún Laoghaire and Ballyfermot to observe trends over the period 2018 – 2022. Average annual mean PM_{10} concentrations ranged from 10 – 16 µg/m^3 over the period of 2018 – 2022, suggesting an upper average concentration of no more than 16 µg/m^3. Based on these results, a conservative estimate of the background PM_{10} concentration in the region of the proposed development is 16 µg/m^3.

Table 5. Annual Mean and 24-Hour Mean PM_{10} Concentrations In Zone A Locations (µg/m^3)

Station	Averaging Period	Year				
		2018	2019	2020	2021	2022
Rathmines	Annual Mean PM_{10} (µg/m^3)	15	15	11	12	15
	24-hr Mean > 50 µg/m^3 (days)	2	9	2	0	4
Dún Laoghaire	Annual Mean PM_{10} (µg/m^3)	13	12	12	11	12
	24-hr Mean > 50 µg/m^3 (days)	0	2	0	0	1
Ballyfermot	Annual Mean PM_{10} (µg/m^3)	16	14	12	12	13
	24-hr Mean > 50 µg/m^3 (days)	0	7	2	0	1
St. Anne's Park	Annual Mean PM_{10} (µg/m^3)	11	12	11	11	13
	24-hr Mean > 50 µg/m^3 (days)	0	1	0	0	1
Dubin Airport	Annual Mean PM_{10} (µg/m^3)	-	-	13	11	12
	24-hr Mean > 50 µg/m^3 (days)	-	-	0	0	1

Station	Averaging Period	Year				
		2018	2019	2020	2021	2022
Finglas	Annual Mean PM_{10} (µg/m^3)	11	13	12	12	12
	24-hr Mean > 50 µg/m^3 (days)	1	2	0	0	1
Marino	Annual Mean PM_{10} (µg/m^3)	12	14	13	12	14
	24-hr Mean > 50 µg/m^3 (days)	0	4	0	0	3
Clonskeagh	Annual Mean PM_{10} (µg/m^3)	-	-	-	11	11
	24-hr Mean > 50 µg/m^3 (days)	-	-	-	0	1

Note 1 Annual average limit value of 40 µg/m^3 and hourly limit value of 200 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022)

4.2.3 *$PM_{2.5}$*

Continuous $PM_{2.5}$ monitoring carried out at the Zone A urban and suburban background locations of Rathmines, Dún Laoghaire, Ballyfermot, St. Anne's Park, Dublin Airport, Finglas, Marino and Clonskeagh showed annual mean concentrations ranging from 7 – 9 µg/m^3 in 2022 (see Table 6). Sufficient data is available for Rathmines, Finglas and Marino to observe trends over the period 2018 – 2022. Average annual mean PM_{10} concentrations ranged from 6 – 10 µg/m^3 over the period of 2018 – 2021, suggesting an upper average concentration of no more than 10 µg/m^3. Based on this information, a conservative estimate of the background $PM_{2.5}$ concentration in the region of the proposed development is 10 µg/m^3.

Table 6. Annual Mean $PM_{2.5}$ Concentrations In Zone A Locations (µg/m^3)

Station	Averaging Period	Year				
		2018	2019	2020	2021	2022
Rathmines	Annual Mean $PM_{2.5}$ (µg/m^3)	9.0	10.0	8.0	9.3	7.5
Dún Laoghaire	Annual Mean $PM_{2.5}$ (µg/m^3)	-	10.0	8.0	7.5	7.8
Ballyfermot	Annual Mean $PM_{2.5}$ (µg/m^3)	-	10.0	8.0	7.8	7.5
St. Anne's Park	Annual Mean $PM_{2.5}$ (µg/m^3)	-	8.0	7.0	6.9	7.8
Dubin Airport	Annual Mean $PM_{2.5}$ (µg/m^3)	-	-	6.0	6.4	6.7
Finglas	Annual Mean $PM_{2.5}$ (µg/m^3)	8.0	9.0	7.0	7.5	7.3
Marino	Annual Mean $PM_{2.5}$ (µg/m^3)	6.0	9.0	8.0	7.9	8.9
Clonskeagh	Annual Mean $PM_{2.5}$ (µg/m^3)	-	-	-	6.9	7.0

Note 1 Annual average limit value of 25 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 739 of 2022)

4.3 Sensitivity of the Receiving Environment

The site is locatedin the Mayeston residential area in Poppintree,Dublin 11, approx. 35 m south of the M50 between Junction 4 and Junction 5. The land surrounding the site is residential to the south and west, commercial to the east and agricultural to the north beyond the M50 (see Figure 2). There are a number of large residential estates located further to the south and west.

Site boundary

Modelled Proposed Sensitive Receptors

Modelled Existing Sensitive Receptors

Air Quality Monitoring Location

Background Mapping from Google Earth

N

Project

Mayeston Downs Air Quality Assessment

Reference

JA/227501.0663AR01

Modelled Air Quality Receptors In The Vicinity Of Proposed Development

awnconsulting

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Figure 2. Modelled Air Quality Receptors In The Vicinity Of Proposed Development

4.3.1 *Construction Dust*

In line with the UK Institute of Air Quality Management (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction*'[13] prior to assessing the impact of dust from a proposed development the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time. Commercial properties and places of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity.

In terms of receptor sensitivity to dust soiling, there are between 10 and 100 residential properties within 20 m of the proposed development site. These are considered high sensitivity receptors in terms of dust soiling. Therefore, the overall sensitivity of the area to dust soiling impacts is considered high based on the IAQM criteria outlined in Table 7.

Table 7. Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	<u>High</u>	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean PM_{10} concentration, receptor sensitivity based on type (residential receptors are classified as high sensitivity) and the number of receptors affected within various distance bands from the construction works. A conservative estimate of the current annual mean PM_{10} concentration in the vicinity of the proposed development 16 µg/m^3 and there are between 10 and 100 number of high sensitivity residential properties within 20 m of the proposed site area. Based on the IAQM criteria outlined in Table 8, the worst case sensitivity of the area to human health is considered to be low.

Table 8. Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from source (m)			
			<20	<50	<100	<350
High	< 24 µg/m^3	>100	Medium	Low	Low	Low
		10-100	<u>Low</u>	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	< 24 µg/m^3	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	< 24 µg/m^3	>1	Low	Low	Low	Low

Consideration has also been given to the IAQM document '*A guide to the assessment of air quality on designated conservation sites 2020*'[(14)] with respect to ecologically sensitive receptors.

Dust deposition impacts on ecology can occur due to chemical or physical effects. This includes reduction in photosynthesis due to smothering from dust on the plants and chemical changes such as acidity to soils. Often impacts will be reversible once the works are completed, and dust deposition ceases. Designated sites within 50 m of the boundary of the site or within 50 m of the route used by construction vehicles on public highways up to a distance of 250 m from a construction site entrance can be affected according to the IAQM guidance[(13)]. There are no ecologically sensitive sites within 50m of the site boundary, therefore no significant impacts are predicted.

4.3.2 *Existing Baseline Traffic*

Specific receptors within the proposed development were modelled to determine the impact of existing traffic from the M50 and the surrounding area on the residential apartment units in the proposed development. In addition, the impact of existing traffic was also modelled at specific existing sensitive residential receptors within the surrounding Mayeston area. There are no air quality sensitive designated habitats within 200 m of the proposed development. Details of receptor location and type are given in Table 9.

4.4 Existing Modelled Baseline Scenario

In the Existing Baseline Scenario, the current air quality environment experienced within the study area has been modelled. The Existing Baseline Scenario has been modelled using AMDS-Roads for the representative baseline year of 2022, to establish baseline concentrations at receptors within the proposed development study area. The receptors modelled are detailed in Table 9. Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24-hour PM_{10} limit value objective, at selected worst-case existing and proposed air quality sensitive receptors in the 2022 Existing Baseline scenario are listed in Table 9.

Table 9. Existing Baseline Scenario Pollutant Results

Existing Baseline 2022						
Receptor	**Receptor Co-ordinates (UTM, 29N)**	**Location**	**Annual Mean Conc. (µg/m³)**			**No of PM_{10} days > 50 µg/m³**
			NO_2	**PM_{10}**	**$PM_{2.5}$**	
May1	680439,5921060	Mayeston Downs	26.2	18.4	12.5	2
May2	680472,5921064	Mayeston Downs	26.3	18.4	12.5	2
May3	680493,5921067	Mayeston Downs	26.3	18.4	12.5	2
May4	680508,5921068	Mayeston Downs	26.3	18.4	12.5	2
May5	680564,5921078	Mayeston Downs	26.7	18.6	12.6	2
May6	680593,5921082	Mayeston Downs	26.7	18.6	12.6	2
May7	680565,5921063	Mayeston Downs	25.2	18.0	12.3	2
May8	680502,5921018	Mayeston Downs	23.1	17.3	11.8	1
May9	680499,5920984	Mayeston Downs	22.3	17.0	11.6	1
May10	680465,5920988	Mayeston Downs	22.3	17.1	11.7	1
May11	680444,5920987	Mayeston Downs	22.4	17.1	11.7	1
R1	680455,5920963	Mayeston Downs	22.5	16.9	11.6	1
R2	680501,5920952	Mayeston Downs	22.0	16.8	11.5	1

Existing Baseline 2022						
Receptor	**Receptor Co-ordinates (UTM, 29N)**	**Location**	**Annual Mean Conc. ($\mu g/m^3$)**			**No of PM_{10} days > 50 $\mu g/m^3$**
			NO_2	**PM_{10}**	**$PM_{2.5}$**	
R3	680431,5920963	Mayeston Boulevard	21.6	16.9	11.6	1
R4	680372,5920964	Mayeston Boulevard	22.0	17.0	11.6	1
R5	680352,5920962	Mayeston Boulevard	22.3	17.0	11.6	1
R6	680294,5920963	Mayeston Boulevard	22.2	17.0	11.7	1
R7	680256,5921039	Mayeston Lawn	22.5	18.5	12.5	2
R8	680224,5921035	Mayeston Lawn	26.6	18.5	12.6	2
R9	680218,5920978	Mayeston Drive	26.6	17.3	11.8	1
R10	680271,5920967	Mayeston Boulevard	26.6	17.1	11.7	1
R11	680202,5920993	Mayeston Drive	26.8	17.5	11.9	1
R12	680220,5921001	Mayeston Drive	23.1	17.6	12.0	1
R13	680203,5921033	Mayeston Lawn	22.5	18.5	12.6	2
R14	680163,5921028	Mayeston Lawn	23.7	18.5	12.6	2
R15	680154,5920937	Mayeston Lawn	24.1	16.9	11.6	1
R16	680131,5920958	Creston Avenue	26.7	17.1	11.7	1
R17	680121,5921021	Creston Avenue	26.7	18.4	12.5	2
R18	680527,5921041	Mayeston Green	22.1	17.6	12.0	1
R19	680517,5920975	Mayeston Green	22.5	16.9	11.6	1
Air Quality Limit Value Objective			**40**	**40**	**25**	**35**

In the 2022 Existing Baseline scenario, annual mean concentrations of NO_2 are below the relevant national air quality limit value objective at all modelled receptors. The TII guidance PEN-ENV-01106(3) states that the assessment must progress to detailed modelling if concentrations exceed 90% of the air quality limit (i.e. an annual mean of more than 36 $\mu g/m^3$ for NO_2 and PM_{10}) values when assessed by the screening method. The TII guidance PEN-ENV-01106(3) also states that a medium sensitivity environment includes areas that have annual mean NO_2 concentrations of 36 $\mu g/m^3$ or above combined with sensitive receptors within 50 m of the impacted roads. The highest concentration modelled is 31.6 $\mu g/m^3$ at receptor May6, near the northern boundary of the proposed development with the M50. Annual mean NO_2 concentrations did not exceed 60 $\mu g/m^3$ at any modelled receptors, indicating that exceedances of the NO_2 1-hour mean are unlikely to occur.

Annual mean PM_{10} concentrations are below the relevant national air quality limit value objective in 2022 for all modelled receptors. At all receptors, modelling of the maximum 24-hour PM_{10} concentration indicated that there is likely to be no more than three exceedances of the 50 $\mu g/m^3$ ambient limit value compared to the threshold which allows 35 daily exceedances in any one calendar year. Annual mean $PM_{2.5}$ concentrations are also below the relevant national air quality limit value objective for all modelled receptors.

In summary there are no existing air quality concerns at Mayeston.

5.0 POTENTIAL IMPACTS

5.1 Construction Stage

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. While construction dust tends to be deposited within 350 m of a construction site, the majority of the deposition occurs within the first 50 m. The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. A review of Dublin Airport meteorological data (see Section 4.1) indicates that the prevailing wind direction is westerly to southerly and wind speeds are generally moderate in nature. Dust generation is considered negligible on days where rainfall is greater than 0.2 mm. A review of historical 30 year average data for Dublin Airport indicates that on average 199.6 days per year have rainfall over 0.2 mm(6) and therefore it can be determined that over 50% of the time dust generation will be reduced.

5.1.1 *Construction Dust Assessment*

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

- Demolition;
- Earthworks;
- Construction; and
- Trackout (transport of dust and dirt from the construction site onto the public road network).

5.1.1.1 Demolition

There is no demolition required as part of the proposed development therefore this category is not relevant to the assessment.

5.1.1.2 Earthworks

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

- **Large:** Total site area > 110,000 m^2, potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds > 6 m in height;
- **Medium:** Total site area 18,000 m^2 – 110,000 m^2, moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 3 – 6 m in height;

- **Small:** Total site area < 18,000 m^2, soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height.

The site area of proposed works will be greater than 110,000 m^2. Therefore the dust emission magnitude for the proposed earthwork activities can be classified as large.

The sensitivity of the area, as determined in Section Table 10, is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 10, this results in an overall high risk of short-term dust soiling impacts and a low risk of short-term human health impacts as a result of the proposed earthworks activities.

Table 10. Risk of Dust Impacts – Earthworks

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

5.1.1.3 Construction

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

- **Large:** Total building volume > 75,000 m^3, on-site concrete batching, sandblasting;
- **Medium:** Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material (e.g. concrete), on-site concrete batching;
- **Small:** Total building volume < 12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

The dust emission magnitude for the proposed construction activities can be classified as medium as the total building volume will be between 12,000 m^3 and 75,000 m^3.

The sensitivity of the area is combined with the dust emission magnitude for each dust generating activity. As outlined in Table 11, this results in a medium risk of short-term dust soiling impacts and low risk of short-term human health impacts as a result of the proposed construction activities.

Table 11. Risk of Dust Impacts – Construction

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

5.1.1.4 Trackout

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

- **Large:** > 50 HDV (> 3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100 m;
- **Medium**: 20 - 50 HDV (> 3.5 t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 - 100 m;
- **Small:** < 20 HDV (> 3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.

The dust emission magnitude for the proposed trackout can be classified as small, as at worst-case peak periods there will be less than 20 outward HDV movements per day. As outlined in Table 12, this results in a low risk of short-term dust soiling and negligible risk of short-term human health impacts as a result of the proposed trackout activities.

Table 12. Risk of Dust Impacts – Trackout

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

5.1.1.5 Summary of Dust Emission Risk

The risk of dust impacts as a result of the proposed development are summarised in Table 13 for each activity. The magnitude of risk determined is used to prescribe the level of site specific mitigation required for each activity in order to prevent significant impacts occurring.

There is a worst-case high risk of dust soiling impacts and a low risk of human health impacts associated with the proposed development. As a result dust mitigation measures appropriate for high risk sites will be implemented on site in order to ensure that no dust nuisance occurs during the earthworks, construction and trackout activities.

Table 13. Summary of Dust Impact Risk used to Define Site-Specific Mitigation

Potential Impact	Dust Emission Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	n/a	High Risk	Medium Risk	Low Risk
Human Health	n/a	Low Risk	Low Risk	Negligible Risk

When the dust mitigation measures detailed in Appendix I of this report are implemented, fugitive emissions of dust and particulate matter from the site will be negative, short-term and imperceptible in nature, posing no nuisance at nearby receptors.

5.1.2 *Construction Traffic*

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase, particularly due to the increase in HGVs accessing the site. A detailed air quality assessment has been scoped out as the construction traffic associated with the proposed development does not meet the TII assessment criteria in Section 3.2. It can therefore be determined that the construction stage traffic will have an imperceptible, neutral and short-term impact on air quality.

5.2 Operational Stage

The additional operational phase traffic associated with the proposed development does not meet the criteria for a detailed air quality assessment. Therefore, a detailed air quality modelling assessment has been scoped out as there is no potential for significant impacts to air quality during operation as a result of traffic emissions.

6.0 ASSESSMENT SUMMARY

6.1 Construction Stage

When the dust mitigation measures detailed in Appendix I of this report are implemented, fugitive emissions of dust and particulate matter from the site will be negative, short-term and imperceptible in nature. There are no significant impacts on air quality predicted from construction traffic emissions.

6.2 Operational Stage

There are no significant impacts expected as a result of the operational phase of the proposed development.

7.0 REFERENCES

(1) German VDI (2002) Technical Guidelines on Air Quality Control – TA Luft
(2) DOEHLG (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities
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(5) CERC (2023). ADMS-Roads dispersion model (Version 5.0.1)
(6) Met Éireann (2023) Met Éireann Website: www.met.ie
(7) DEFRA (2022). Part IV of the Environment Act 1995: Local Air Quality Management Technical Guidance (TG22)
(8) EMISIA (2020). COPERT 5.3.26 Software [Online] Available from https://www.emisia.com/utilities/copert/versions/
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(10) TII Monitoring Report (2023) M50 January 2022-December 2022: Bias corrected NO_2 diffusion tube data (µg/m^3). Available from https://tii.sonitussystems.com/ [Accessed: 13th October 2023]
(11) Environmental Protection Agency (2023) Air Quality in Ireland 2022 (& previous reports)
(12) DEFRA (2020) NO_X to NO_2 Calculator Version 8.1, available online from https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc
(13) IAQM (2023) Guidance on the Assessment of Dust from Demolition and Construction
(14) IAQM (2020). A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites

APPENDIX I

Dust Minimisation Plan

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 two hundred metres of the construction area.

In order to ensure mitigation of the effects of dust nuisance, a series of measures will be implemented as outlined below:

Site roads shall be regularly cleaned and maintained as appropriate, dry sweeping of large areas shall be avoided. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced roads shall be restricted to essential site traffic only. 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 using site roads shall have their speeds restricted where there is a potential for dust generation. Vehicles delivering material with dust potential to an off-site location shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust. Access gates shall be located at least 10m from receptors where possible.

Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Public roads outside the site shall be regularly inspected for cleanliness and cleaned as necessary. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. Record shall be kept of all inspections of the haul routes and any subsequent action in a site log book.

Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind. Sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods, activities such as scabbling should be avoided. Bulk cement and other fine powder materials are to be delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.

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, the procedures put in place will be strictly monitored and assessed by the contractor. In the event of dust nuisance occurring outside the site boundary, satisfactory procedures will be implemented to rectify the problem.

The Dust Minimisation Plan shall be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board shall also include head/regional office contact details. Community engagement before works commence on site shall be put in place, including a communications plan. All dust and air quality complaints shall be recorded and causes identified, along with the measures taken to reduce emissions. This complaints log shall be available for viewing by the local authority, if requested. Daily on and off site inspections shall occur for nuisance dust and compliance with the dust management plan. This shall include regular dust soiling checks of surfaces such as street furniture, windows, and cars within 100m of the site boundary. Cleaning shall be provided if necessary.