Appendix 7-1: Landside Air Quality Modelling Methodology

Appendix 7-1 Landside Air Quality Modelling Methodology

Introduction

This appendix sets out the detailed methodology behind the assessment of the following landside sources:

- Operational phase road traffic emissions
- Operational phase car park emissions
- Operational phase energy centre emissions

The contribution of these sources to pollutant concentrations and deposition rates at nearby air quality sensitive receptors has been predicted using the Advanced Dispersion Modelling System (ADMS) Roads (version 5.1.0), published by Cambridge Environmental Research Consultants (CERC). The ADMS suite of modelling software is a nationally recognised tool for the assessment of air quality impacts that has undergone extensive validation by CERC and by organisations independent of CERC.

The assessment methodology is informed by relevant air quality guidance, including that published by Transport Infrastructure Ireland (TII)[1], the UK Department for Environment, Food & Rural Affairs[2], CERC[3].

The scenarios considered in the quantification of the landside contributions are described below:

- Current receiving environment with a passenger capacity of 36.4 mppa in 2025 –for the verification of the air quality road traffic emissions dispersion model;
- Future Receiving Environment with a passenger capacity of 32 mppa in 2029 – the Permitted Operation in 2029 against which the Proposed Order is compared; and
- Proposed Order with a passenger capacity of 40 mppa in 2029.

Emissions Data

Road Traffic Emissions

Traffic data for the operational phase scenarios was supplied by the Project transport consultant. The traffic data included links for the main road network surrounding the airport, including R132 Swords Road, R108, M1 (junction 1 to junction 3) and M50 (junction 3 to junction 5). Data was also provided for more distant road links, including the M1 north of the airport, towards Drogheda, and the and M50 west of the airport, towards Clondalkin.

The traffic data was converted into emissions data for the pollutants nitrogen oxides (NO_X) and fine particulate matter (PM_{10} and $PM_{2.5}$) using the current version of the Road Emissions Model (REM) (v1.1.4) published by Transport Infrastructure Ireland (TII)[4], assuming a default fleet mix for Ireland. The traffic data was converted to emissions data for ammonia (NH_3) using the latest version of the AQC CREAM tool[5], assuming a default fleet mix for Northern Ireland, in the absence of an Ireland specific fleet.

[1] Transport Infrastructure Ireland (2025), Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Document, PE-ENV-01106.
[2] Department for Environment, Food and Rural Affairs UK (2022); Local Air Quality Management Technical Guidance (TG22).
[3] Cambridge Environmental Research Consultants (CERC) (2019). Modelling Car Parks. Available at: CERC > Software .support > User Area > Helpdesk notes.
[4] Transport Infrastructure Ireland (2025), TII Road Emissions Model (REM): Model Development Report, GE-ENV-01107.
[5] Air Quality Consultants (2025). Calculator for Road Emissions of Ammonia CREAM v2a. Available at: Air Quality Consultants - Air Quality Reports, Resources & Tools (aqconsultants.co.uk)

Both the TII REM tool and the CREAM tool project emissions data forward to represent future years, based on the anticipated evolution of the vehicle fleet.

Car Park Emissions

In the current absence of car park usage data for the Principal Assessment, the assessment of car park emissions makes use of data provided for a previous assessment of expansion at Dublin Airport[6] to estimate the car park emissions for the Principal Assessment scenarios.

To obtain car park emissions that are representative of the scenarios required of the Principal Assessment, traffic flow data was extracted for the road links included in the Permitted Operation 2029 dataset (32 mppa) that are on the approach to and from the Airport car parks. Traffic data for the same links were also extracted from the equivalent dataset used to inform the Operational Application. While the Operational Application[6] relates to a separate project and application, the equivalent dataset represents the same capacity as the Permitted Operation and is therefore comparable to the scenarios in this assessment. The extracted link data from both datasets were compared to determine the proportional difference in AADT flow between the two datasets on roads used to access Airport car parks. The factor of this difference in flows on the same road links approaching the car parks was then used to project the car park emissions calculated for the future receiving environment of the Operational Application and this factored value was used to represent the Permitted Operation of the Principal Assessment.

Car park emissions for the previous assessment[6] were calculated using traffic data for the access and egress points of the main Airport car parks provided for that assessment as 24-hour AADT flow. This data was used to calculate car park emissions rates using the equation provided in Cambridge Environmental Research Consultant's (CERC) Guidance Note 54 – Modelling car parks[3]:

$$Emission\ rate\ (g/m^2/s) = \frac{(EF\ x\ D\ x\ M) + (CS\ x\ \frac{M}{2})}{60\ x\ 60\ x\ 24\ x\ CP}$$

Where EF = Emission factor (k/km)
D = Average distance travelled (km)
CS = Cold start emission factor (g/trip)
M = Vehicle movements (/day)
CP = Car park area (m^2)

The emissions factors needed to inform that formula were calculated using DEFRA's Emission Factor Toolkit[7] (v14.1), assuming a default fleet mix for Northern Ireland, to obtain emission factors as g/km. This step could not be done using the TII Roads Emissions Modelling (REM) tool, because it does not provide emissions in the appropriate units of measurement. The breakdown of fleet in Northern Ireland is likely to be comparable to that of Ireland. In other sections of the TII guidance[1], it is recommended to use conditions for the Northern Ireland Local Authority area of Armagh, Banbridge and Craigavon to represent conditions in Ireland.

The emissions calculated were then modelled following the guidance set out in the UK Department for Environment, Food & Rural Affairs (Defra) Local Air Quality Management guidance (LAQM.TG(22))[2].

Car park emissions for the Proposed Operation (40 mppa in 2029) scenario were calculated using the proportional change in AADT from the Permitted Operation (32 mppa 2029) on each road link used to access the Airport car parks. This approach will likely over-estimate the impact of emissions from car park sources, as not all additional traffic on the approach roads will use the car parks accessed from that road.

The car park emissions data is summarised in Table 1.

[6] Dublin Airport Authority (2024). Environmental Report (ER) for the Dublin Airport Operational Application Annex C: Air Quality Assessment
[7] Department for Environment, Food and Rural Affairs (2026). Emissions Factor Toolkit v14.1.

Table 1: Car Park Emissions Data

Car Park	Location	Pollutant	EF (g/km)	D (km)1	CS (g/trip)[2]	CP (m^2)	Emission rate ($g/m^2/s$)	Notes
2025 Current State of the Environment								
Car Park 1.1	Holiday Blue Long Stay	NO_x	5786	2.1	0.2	118737.7	6.7E-07	
Car Park 1.2	Holiday Blue Long Stay	NO_x	5786	1.4	0.2	77706.8	7.0E-07	
Car Park 2	Swords Road Parking	NO_x	9061	1.8	0.2	154023.3	1.2E-06	
Car Park 3	Corballis Park Parking	NO_x	967.5	0.4	0.2	10256.9	6.8E-07	
Car Park 4	Express Red Long Term Parking	NO_x	1796.2	2.3	0.2	130427.1	3.6E-07	
Car Park 5	Aer Lingus Staff Car Park	NO_x	595	0.8	0.2	18838.8	7.2E-07	
Car Park 6	Corballis Road North Parking	NO_x	397.4	0.8	0.2	11199.1	4.0E-07	
Car Park 7.1	T1 Parking	NO_x	810.7	0.8	0.2	17052.9	5.5E-07	level 1 - 3
Car Park 7.2	T1 Parking	NO_x	810.7	0.3	0.2	5312.5	9.8E-07	level 4 - 6
Car Park 8	DAA Parking	NO_x	854.1	0.6	0.2	7903.4	1.0E-06	
Car Park 9.1	T2 Parking	NO_x	802.2	0.5	0.2	12994.9	5.4E-07	level 1 - 4
Car Park 9.2	T2 Parking	NO_x	802.2	0.4	0.2	8457.1	6.7E-07	level 5 - 7
Car Park 10	Corballis Drive Parking	NO_x	1367.2	0.3	0.2	4337.5	2.0E-06	
Car Park 11	Staff Parking	NO_x	6336	0.6	0.2	20397	2.4E-06	
Car Park 12	Express Green Long Term Parking	NO_x	8867.1	1	0.2	58997.2	1.7E-06	
Car Park 13	Hire Car Parking	NO_x	1181.7	0.8	0.2	44107.2	3.2E-07	
Car Park 14	Dublin North Stockhole Parking	NO_x	269.3	0.8	0.2	37036.4	8.4E-08	
Car Park 15	Toberbunny Parking	NO_x	335.2	1	0.2	42785.5	9.5E-08	
Car Park 1.1	Holiday Blue Long Stay	PM_{10}	138	2.1	0	118737.7	1.6E-08	
Car Park 1.2	Holiday Blue Long Stay	PM_{10}	138	1.4	0	77706.8	1.7E-08	
Car Park 2	Swords Road Parking	PM_{10}	191.8	1.8	0	154023.3	2.7E-08	
Car Park 3	Corballis Park Parking	PM_{10}	105.8	0.4	0	10256.9	6.0E-08	
Car Park 4	Express Red Long Term Parking	PM_{10}	78.5	2.3	0	130427.1	1.6E-08	
Car Park 5	Aer Lingus Staff Car Park	PM_{10}	65.1	0.8	0	18838.8	6.9E-08	
Car Park 6	Corballis Road North Parking	PM_{10}	43.5	0.8	0	11199.1	3.8E-08	

Car Park	Location	Pollutant	EF (g/km)	D (km)1	CS (g/trip)[2]	CP (m^2)	Emission rate ($g/m^2/s$)	Notes
Car Park 7.1	T1 Parking	PM_{10}	88.7	0.8	0	17052.9	5.2E-08	level 1 - 3
Car Park 7.2	T1 Parking	PM_{10}	88.7	0.3	0	5312.5	8.3E-08	level 4 - 6
Car Park 8	DAA Parking	PM_{10}	93.4	0.6	0	7903.4	9.6E-08	
Car Park 9.1	T2 Parking	PM_{10}	87.7	0.5	0	12994.9	4.9E-08	level 1 - 4
Car Park 9.2	T2 Parking	PM_{10}	87.7	0.4	0	8457.1	5.9E-08	level 5 - 7
Car Park 10	Corballis Drive Parking	PM_{10}	149.5	0.3	0	4337.5	1.7E-07	
Car Park 11	Staff Parking	PM_{10}	223.7	0.6	0	20397	9.0E-08	
Car Park 12	Express Green Long Term Parking	PM_{10}	203.9	1	0	58997.2	4.0E-08	
Car Park 13	Hire Car Parking	PM_{10}	129.2	0.8	0	44107.2	3.1E-08	
Car Park 14	Dublin North Stockhole Parking	PM_{10}	29.5	0.8	0	37036.4	8.0E-09	
Car Park 15	Toberbunny Parking	PM_{10}	23.6	1	0	42785.5	6.5E-09	
Car Park 1.1	Holiday Blue Long Stay	$PM_{2.5}$	73.8	2.1	0	118737.7	9.0E-09	
Car Park 1.2	Holiday Blue Long Stay	$PM_{2.5}$	73.8	1.4	0	77706.8	9.7E-09	
Car Park 2	Swords Road Parking	$PM_{2.5}$	103.1	1.8	0	154023.3	1.5E-08	
Car Park 3	Corballis Park Parking	$PM_{2.5}$	55.2	0.4	0	10256.9	3.8E-08	
Car Park 4	Express Red Long Term Parking	$PM_{2.5}$	41.4	2.3	0	130427.1	8.8E-09	
Car Park 5	Aer Lingus Staff Car Park	$PM_{2.5}$	33.9	0.8	0	18838.8	4.0E-08	
Car Park 6	Corballis Road North Parking	$PM_{2.5}$	22.7	0.8	0	11199.1	2.3E-08	
Car Park 7.1	T1 Parking	$PM_{2.5}$	46.2	0.8	0	17052.9	3.1E-08	level 1 - 3
Car Park 7.2	T1 Parking	$PM_{2.5}$	46.2	0.3	0	5312.5	5.5E-08	level 4 - 6
Car Park 8	DAA Parking	$PM_{2.5}$	48.7	0.6	0	7903.4	5.8E-08	
Car Park 9.1	T2 Parking	$PM_{2.5}$	45.8	0.5	0	12994.9	3.0E-08	level 1 - 4
Car Park 9.2	T2 Parking	$PM_{2.5}$	45.8	0.4	0	8457.1	3.8E-08	level 5 - 7
Car Park 10	Corballis Drive Parking	$PM_{2.5}$	78	0.3	0	4337.5	1.1E-07	
Car Park 11	Staff Parking	$PM_{2.5}$	118.4	0.6	0	20397	5.3E-08	
Car Park 12	Express Green Long Term Parking	$PM_{2.5}$	109.3	1	0	58997.2	2.3E-08	
Car Park 13	Hire Car Parking	$PM_{2.5}$	67.4	0.8	0	44107.2	1.8E-08	

Car Park	Location	Pollutant	EF (g/km)	D (km)1	CS (g/trip)[2]	CP (m^2)	Emission rate ($g/m^2/s$)	Notes
Car Park 14	Dublin North Stockhole Parking	$PM_{2.5}$	15.4	0.8	0	37036.4	4.7E-09	
Car Park 15	Toberbunny Parking	$PM_{2.5}$	12.3	1	0	42785.5	3.7E-09	
Car Park 1.1	Holiday Blue Long Stay	NH_3	91.5	2.1	0	118737.7	1.1E-08	
Car Park 1.2	Holiday Blue Long Stay	NH_3	91.5	1.4	0	77706.8	1.2E-08	
Car Park 2	Swords Road Parking	NH_3	131.6	1.8	0	154023.3	1.9E-08	
Car Park 3	Corballis Park Parking	NH_3	55.1	0.4	0	10256.9	3.5E-08	
Car Park 4	Express Red Long Term Parking	NH_3	45.6	2.3	0	130427.1	9.4E-09	
Car Park 5	Aer Lingus Staff Car Park	NH_3	33.9	0.8	0	18838.8	3.8E-08	
Car Park 6	Corballis Road North Parking	NH_3	22.6	0.8	0	11199.1	2.1E-08	
Car Park 7.1	T1 Parking	NH_3	46.2	0.8	0	17052.9	2.9E-08	level 1 - 3
Car Park 7.2	T1 Parking	NH_3	46.2	0.3	0	5312.5	4.9E-08	level 4 - 6
Car Park 8	DAA Parking	NH_3	48.7	0.6	0	7903.4	5.4E-08	
Car Park 9.1	T2 Parking	NH_3	45.7	0.5	0	12994.9	2.8E-08	level 1 - 4
Car Park 9.2	T2 Parking	NH_3	45.7	0.4	0	8457.1	3.4E-08	level 5 - 7
Car Park 10	Corballis Drive Parking	NH_3	77.9	0.3	0	4337.5	1.0E-07	
Car Park 11	Staff Parking	NH_3	135.1	0.6	0	20397	5.6E-08	
Car Park 12	Express Green Long Term Parking	NH_3	136.6	1	0	58997.2	2.7E-08	
Car Park 13	Hire Car Parking	NH_3	67.3	0.8	0	44107.2	1.7E-08	
Car Park 14	Dublin North Stockhole Parking	NH_3	15.3	0.8	0	37036.4	4.5E-09	
Car Park 15	Toberbunny Parking	NH_3	12.8	1	0	42785.5	3.7E-09	
2029 Permitted Operation								
Car Park 1.1	Holiday Blue Long Stay	NO_x	5786	2.1	0.2	118737.7	6.8E-07	
Car Park 1.2	Holiday Blue Long Stay	NO_x	5786	1.4	0.2	77706.8	7.2E-07	
Car Park 2	Swords Road Parking	NO_x	9061	1.8	0.2	154023.3	1.3E-06	
Car Park 3	Corballis Park Parking	NO_x	967.5	0.4	0.2	10256.9	6.7E-07	
Car Park 4	Express Red Long Term Parking	NO_x	1796.2	2.3	0.2	130427.1	3.6E-07	
Car Park 5	Aer Lingus Staff Car Park	NO_x	595	0.8	0.2	18838.8	7.4E-07	

Car Park	Location	Pollutant	EF (g/km)	D (km)1	CS (g/trip)[2]	CP (m^2)	Emission rate ($g/m^2/s$)	Notes
Car Park 6	Corballis Road North Parking	NO_x	397.4	0.8	0.2	11199.1	4.0E-07	
Car Park 7.1	T1 Parking	NO_x	810.7	0.8	0.2	17052.9	5.4E-07	level 1 - 3
Car Park 7.2	T1 Parking	NO_x	810.7	0.3	0.2	5312.5	9.6E-07	level 4 - 6
Car Park 8	DAA Parking	NO_x	854.1	0.6	0.2	7903.4	1.0E-06	
Car Park 9.1	T2 Parking	NO_x	802.2	0.5	0.2	12994.9	5.3E-07	level 1 - 4
Car Park 9.2	T2 Parking	NO_x	802.2	0.4	0.2	8457.1	6.6E-07	level 5 - 7
Car Park 10	Corballis Drive Parking	NO_x	1367.2	0.3	0.2	4337.5	1.9E-06	
Car Park 11	Staff Parking	NO_x	6336	0.6	0.2	20397	2.4E-06	
Car Park 12	Express Green Long Term Parking	NO_x	8867.1	1	0.2	58997.2	1.6E-06	
Car Park 13	Hire Car Parking	NO_x	1181.7	0.8	0.2	44107.2	3.2E-07	
Car Park 14	Dublin North Stockhole Parking	NO_x	269.3	0.8	0.2	37036.4	8.2E-08	
Car Park 15	Toberbunny Parking	NO_x	335.2	1	0.2	42785.5	9.3E-08	
Car Park 1.1	Holiday Blue Long Stay	PM_{10}	138	2.1	0	118737.7	1.7E-08	
Car Park 1.2	Holiday Blue Long Stay	PM_{10}	138	1.4	0	77706.8	1.8E-08	
Car Park 2	Swords Road Parking	PM_{10}	191.8	1.8	0	154023.3	2.8E-08	
Car Park 3	Corballis Park Parking	PM_{10}	105.8	0.4	0	10256.9	5.9E-08	
Car Park 4	Express Red Long Term Parking	PM_{10}	78.5	2.3	0	130427.1	1.6E-08	
Car Park 5	Aer Lingus Staff Car Park	PM_{10}	65.1	0.8	0	18838.8	7.1E-08	
Car Park 6	Corballis Road North Parking	PM_{10}	43.5	0.8	0	11199.1	3.8E-08	
Car Park 7.1	T1 Parking	PM_{10}	88.7	0.8	0	17052.9	5.1E-08	level 1 - 3
Car Park 7.2	T1 Parking	PM_{10}	88.7	0.3	0	5312.5	8.1E-08	level 4 - 6
Car Park 8	DAA Parking	PM_{10}	93.4	0.6	0	7903.4	9.4E-08	
Car Park 9.1	T2 Parking	PM_{10}	87.7	0.5	0	12994.9	4.8E-08	level 1 - 4
Car Park 9.2	T2 Parking	PM_{10}	87.7	0.4	0	8457.1	5.8E-08	level 5 - 7
Car Park 10	Corballis Drive Parking	PM_{10}	149.5	0.3	0	4337.5	1.6E-07	
Car Park 11	Staff Parking	PM_{10}	223.7	0.6	0	20397	8.8E-08	
Car Park 12	Express Green Long Term Parking	PM_{10}	203.9	1	0	58997.2	3.9E-08	

Car Park	Location	Pollutant	EF (g/km)	D (km)1	CS (g/trip)[2]	CP (m^2)	Emission rate ($g/m^2/s$)	Notes
Car Park 13	Hire Car Parking	PM_{10}	129.2	0.8	0	44107.2	3.1E-08	
Car Park 14	Dublin North Stockhole Parking	PM_{10}	29.5	0.8	0	37036.4	7.9E-09	
Car Park 15	Toberbunny Parking	PM_{10}	23.6	1	0	42785.5	6.3E-09	
Car Park 1.1	Holiday Blue Long Stay	$PM_{2.5}$	73.8	2.1	0	118737.7	9.2E-09	
Car Park 1.2	Holiday Blue Long Stay	$PM_{2.5}$	73.8	1.4	0	77706.8	9.9E-09	
Car Park 2	Swords Road Parking	$PM_{2.5}$	103.1	1.8	0	154023.3	1.6E-08	
Car Park 3	Corballis Park Parking	$PM_{2.5}$	55.2	0.4	0	10256.9	3.8E-08	
Car Park 4	Express Red Long Term Parking	$PM_{2.5}$	41.4	2.3	0	130427.1	8.6E-09	
Car Park 5	Aer Lingus Staff Car Park	$PM_{2.5}$	33.9	0.8	0	18838.8	4.2E-08	
Car Park 6	Corballis Road North Parking	$PM_{2.5}$	22.7	0.8	0	11199.1	2.2E-08	
Car Park 7.1	T1 Parking	$PM_{2.5}$	46.2	0.8	0	17052.9	3.0E-08	level 1 - 3
Car Park 7.2	T1 Parking	$PM_{2.5}$	46.2	0.3	0	5312.5	5.4E-08	level 4 - 6
Car Park 8	DAA Parking	$PM_{2.5}$	48.7	0.6	0	7903.4	5.7E-08	
Car Park 9.1	T2 Parking	$PM_{2.5}$	45.8	0.5	0	12994.9	3.0E-08	level 1 - 4
Car Park 9.2	T2 Parking	$PM_{2.5}$	45.8	0.4	0	8457.1	3.7E-08	level 5 - 7
Car Park 10	Corballis Drive Parking	$PM_{2.5}$	78	0.3	0	4337.5	1.1E-07	
Car Park 11	Staff Parking	$PM_{2.5}$	118.4	0.6	0	20397	5.2E-08	
Car Park 12	Express Green Long Term Parking	$PM_{2.5}$	109.3	1	0	58997.2	2.3E-08	
Car Park 13	Hire Car Parking	$PM_{2.5}$	67.4	0.8	0	44107.2	1.8E-08	
Car Park 14	Dublin North Stockhole Parking	$PM_{2.5}$	15.4	0.8	0	37036.4	4.6E-09	
Car Park 15	Toberbunny Parking	$PM_{2.5}$	12.3	1	0	42785.5	3.7E-09	
Car Park 1.1	Holiday Blue Long Stay	NH_3	91.5	2.1	0	118737.7	1.1E-08	
Car Park 1.2	Holiday Blue Long Stay	NH_3	91.5	1.4	0	77706.8	1.2E-08	
Car Park 2	Swords Road Parking	NH_3	131.6	1.8	0	154023.3	2.0E-08	
Car Park 3	Corballis Park Parking	NH_3	55.1	0.4	0	10256.9	3.4E-08	
Car Park 4	Express Red Long Term Parking	NH_3	45.6	2.3	0	130427.1	9.3E-09	
Car Park 5	Aer Lingus Staff Car Park	NH_3	33.9	0.8	0	18838.8	4.0E-08	

Car Park	Location	Pollutant	EF (g/km)	D (km)1	CS (g/trip)[2]	CP (m^2)	Emission rate ($g/m^2/s$)	Notes
Car Park 6	Corballis Road North Parking	NH_3	22.6	0.8	0	11199.1	2.1E-08	
Car Park 7.1	T1 Parking	NH_3	46.2	0.8	0	17052.9	2.9E-08	level 1 - 3
Car Park 7.2	T1 Parking	NH_3	46.2	0.3	0	5312.5	4.8E-08	level 4 - 6
Car Park 8	DAA Parking	NH_3	48.7	0.6	0	7903.4	5.3E-08	
Car Park 9.1	T2 Parking	NH_3	45.7	0.5	0	12994.9	2.8E-08	level 1 - 4
Car Park 9.2	T2 Parking	NH_3	45.7	0.4	0	8457.1	3.4E-08	level 5 - 7
Car Park 10	Corballis Drive Parking	NH_3	77.9	0.3	0	4337.5	9.8E-08	
Car Park 11	Staff Parking	NH_3	135.1	0.6	0	20397	5.5E-08	
Car Park 12	Express Green Long Term Parking	NH_3	136.6	1	0	58997.2	2.7E-08	
Car Park 13	Hire Car Parking	NH_3	67.3	0.8	0	44107.2	1.7E-08	
Car Park 14	Dublin North Stockhole Parking	NH_3	15.3	0.8	0	37036.4	4.4E-09	
Car Park 15	Toberbunny Parking	NH_3	12.8	1	0	42785.5	3.6E-09	
2029 Proposed Operation								
Car Park 1.1	Holiday Blue Long Stay	NO_x	6035.5	2.1	0.2	118737.7		
Car Park 1.2	Holiday Blue Long Stay	NO_x	6035.5	1.4	0.2	77706.8	7.4E-07	
Car Park 2	Swords Road Parking	NO_x	9441	1.8	0.2	154023.3	7.8E-07	
Car Park 3	Corballis Park Parking	NO_x	967.5	0.4	0.2	10256.9	1.3E-06	
Car Park 4	Express Red Long Term Parking	NO_x	8638.3	2.3	0.2	130427.1	7.3E-07	
Car Park 5	Aer Lingus Staff Car Park	NO_x	595	0.8	0.2	18838.8	3.9E-07	
Car Park 6	Corballis Road North Parking	NO_x	397.4	0.8	0.2	11199.1	7.8E-07	
Car Park 7.1	T1 Parking	NO_x	872.6	0.8	0.2	17052.9	4.3E-07	level 1 - 3
Car Park 7.2	T1 Parking	NO_x	872.6	0.3	0.2	5312.5	5.9E-07	level 4 - 6
Car Park 8	DAA Parking	NO_x	851.3	0.6	0.2	7903.4	1.0E-06	
Car Park 9.1	T2 Parking	NO_x	871.5	0.5	0.2	12994.9	1.1E-06	level 1 - 4
Car Park 9.2	T2 Parking	NO_x	871.5	0.4	0.2	8457.1	5.8E-07	level 5 - 7
Car Park 10	Corballis Drive Parking	NO_x	1367.2	0.3	0.2	4337.5	7.2E-07	
Car Park 11	Staff Parking	NO_x	6267.3	0.6	0.2	20397	2.1E-06	

Car Park	Location	Pollutant	EF (g/km)	D (km)1	CS (g/trip)[2]	CP (m^2)	Emission rate ($g/m^2/s$)	Notes
Car Park 12	Express Green Long Term Parking	NO_x	9309.3	1	0.2	58997.2	2.6E-06	
Car Park 13	Hire Car Parking	NO_x	1181.2	0.8	0.2	44107.2	1.8E-06	
Car Park 14	Dublin North Stockhole Parking	NO_x	269.3	0.8	0.2	37036.4	3.5E-07	
Car Park 15	Toberbunny Parking	NO_x	8638.3	1	0.2	42785.5	9.0E-08	
Car Park 1.1	Holiday Blue Long Stay	PM_{10}	141.3	2.1	0	118737.7	1.0E-07	
Car Park 1.2	Holiday Blue Long Stay	PM_{10}	141.3	1.4	0	77706.8	1.8E-08	
Car Park 2	Swords Road Parking	PM_{10}	196	1.8	0	154023.3	1.9E-08	
Car Park 3	Corballis Park Parking	PM_{10}	105.8	0.4	0	10256.9	2.9E-08	
Car Park 4	Express Red Long Term Parking	PM_{10}	311.4	2.3	0	130427.1	6.4E-08	
Car Park 5	Aer Lingus Staff Car Park	PM_{10}	65.1	0.8	0	18838.8	1.7E-08	
Car Park 6	Corballis Road North Parking	PM_{10}	43.5	0.8	0	11199.1	7.5E-08	
Car Park 7.1	T1 Parking	PM_{10}	95.4	0.8	0	17052.9	4.1E-08	level 1 - 3
Car Park 7.2	T1 Parking	PM_{10}	95.4	0.3	0	5312.5	5.6E-08	level 4 - 6
Car Park 8	DAA Parking	PM_{10}	93.1	0.6	0	7903.4	8.8E-08	
Car Park 9.1	T2 Parking	PM_{10}	95.3	0.5	0	12994.9	1.0E-07	level 1 - 4
Car Park 9.2	T2 Parking	PM_{10}	95.3	0.4	0	8457.1	5.3E-08	level 5 - 7
Car Park 10	Corballis Drive Parking	PM_{10}	149.5	0.3	0	4337.5	6.3E-08	
Car Park 11	Staff Parking	PM_{10}	222.9	0.6	0	20397	1.8E-07	
Car Park 12	Express Green Long Term Parking	PM_{10}	208.8	1	0	58997.2	9.6E-08	
Car Park 13	Hire Car Parking	PM_{10}	129.2	0.8	0	44107.2	4.3E-08	
Car Park 14	Dublin North Stockhole Parking	PM_{10}	29.5	0.8	0	37036.4	3.3E-08	
Car Park 15	Toberbunny Parking	PM_{10}	311.4	1	0	42785.5	8.6E-09	
Car Park 1.1	Holiday Blue Long Stay	$PM_{2.5}$	75.7	2.1	0	118737.7	6.9E-09	
Car Park 1.2	Holiday Blue Long Stay	$PM_{2.5}$	75.7	1.4	0	77706.8	9.9E-09	
Car Park 2	Swords Road Parking	$PM_{2.5}$	105.4	1.8	0	154023.3	1.1E-08	
Car Park 3	Corballis Park Parking	$PM_{2.5}$	55.2	0.4	0	10256.9	1.6E-08	
Car Park 4	Express Red Long Term Parking	$PM_{2.5}$	164.8	2.3	0	130427.1	4.1E-08	

Car Park	Location	Pollutant	EF (g/km)	D (km)1	CS (g/trip)[2]	CP (m^2)	Emission rate ($g/m^2/s$)	Notes
Car Park 5	Aer Lingus Staff Car Park	$PM_{2.5}$	33.9	0.8	0	18838.8	9.4E-09	
Car Park 6	Corballis Road North Parking	$PM_{2.5}$	22.7	0.8	0	11199.1	4.4E-08	
Car Park 7.1	T1 Parking	$PM_{2.5}$	49.8	0.8	0	17052.9	2.4E-08	level 1 - 3
Car Park 7.2	T1 Parking	$PM_{2.5}$	49.8	0.3	0	5312.5	3.3E-08	level 4 - 6
Car Park 8	DAA Parking	$PM_{2.5}$	48.5	0.6	0	7903.4	5.9E-08	
Car Park 9.1	T2 Parking	$PM_{2.5}$	49.7	0.5	0	12994.9	6.2E-08	level 1 - 4
Car Park 9.2	T2 Parking	$PM_{2.5}$	49.7	0.4	0	8457.1	3.3E-08	level 5 - 7
Car Park 10	Corballis Drive Parking	$PM_{2.5}$	78	0.3	0	4337.5	4.1E-08	
Car Park 11	Staff Parking	$PM_{2.5}$	118	0.6	0	20397	1.2E-07	
Car Park 12	Express Green Long Term Parking	$PM_{2.5}$	111.9	1	0	58997.2	5.7E-08	
Car Park 13	Hire Car Parking	$PM_{2.5}$	67.4	0.8	0	44107.2	2.5E-08	
Car Park 14	Dublin North Stockhole Parking	$PM_{2.5}$	15.4	0.8	0	37036.4	2.0E-08	
Car Park 15	Toberbunny Parking	$PM_{2.5}$	164.8	1	0	42785.5	5.1E-09	
Car Park 1.1	Holiday Blue Long Stay	NH_3	94.2	2.1	0	118737.7	4.0E-09	
Car Park 1.2	Holiday Blue Long Stay	NH_3	94.2	1.4	0	77706.8	1.2E-08	
Car Park 2	Swords Road Parking	NH_3	135.3	1.8	0	154023.3	1.3E-08	
Car Park 3	Corballis Park Parking	NH_3	55.1	0.4	0	10256.9	2.0E-08	
Car Park 4	Express Red Long Term Parking	NH_3	187.4	2.3	0	130427.1	3.8E-08	
Car Park 5	Aer Lingus Staff Car Park	NH_3	33.9	0.8	0	18838.8	1.0E-08	
Car Park 6	Corballis Road North Parking	NH_3	22.6	0.8	0	11199.1	4.2E-08	
Car Park 7.1	T1 Parking	NH_3	49.7	0.8	0	17052.9	2.3E-08	level 1 - 3
Car Park 7.2	T1 Parking	NH_3	49.7	0.3	0	5312.5	3.1E-08	level 4 - 6
Car Park 8	DAA Parking	NH_3	48.5	0.6	0	7903.4	5.3E-08	
Car Park 9.1	T2 Parking	NH_3	49.7	0.5	0	12994.9	5.8E-08	level 1 - 4
Car Park 9.2	T2 Parking	NH_3	49.7	0.4	0	8457.1	3.0E-08	level 5 - 7
Car Park 10	Corballis Drive Parking	NH_3	77.9	0.3	0	4337.5	3.7E-08	
Car Park 11	Staff Parking	NH_3	134.5	0.6	0	20397	1.1E-07	

Car Park	Location	Pollutant	EF (g/km)	D (km)1	CS (g/trip)[2]	CP (m^2)	Emission rate ($g/m^2/s$)	Notes
Car Park 12	Express Green Long Term Parking	NH_3	140.8	1	0	58997.2	6.0E-08	
Car Park 13	Hire Car Parking	NH_3	67.3	0.8	0	44107.2	2.9E-08	
Car Park 14	Dublin North Stockhole Parking	NH_3	15.3	0.8	0	37036.4	1.9E-08	
Car Park 15	Toberbunny Parking	NH_3	187.4	1	0	42785.5	4.8E-09	

Energy Centre Emissions

Dublin Airport contains two main energy centres (one for each terminal) that contain a combination of Combined Heat and Power plant units and boiler units. The emissions from the operation of the energy plant within the energy centres will contribute to the pollutant concentrations experienced at receptors in the locality of the Airport.

The assessment of energy plant emissions has followed a methodology consistent with the air quality assessment that informed the previous assessments of Dublin Airport[6,8,9]. Whilst the energy plant emissions assessment is limited by the detail of data available to inform it, the assessment conservatively utilises the known maximum load of the plant installed at the energy centres, known hours of operation and recognised international emissions factors published by the European Environment Agency. It is considered that the method to quantify the contribution from energy centre emissions is proportionate, given the limited contribution from the energy centre sources, relative to the other emissions sources modelled.

The assessment has used the energy demand of each plant (provided as MWth and converted to GJ) to calculate emission rates for NO_x and fine particulate matter (PM_{10} and $PM_{2.5}$) using the g/GJ emission factors published in the EMEP/EEA air pollutant emissions inventory guidebook 2023[10]. The data was factored down to represent g/s and then factored again to represent the operational profile provided by daa. This operational profile is representative of emission factors in the Permitted Operation. Other emissions parameters required to model energy plant emissions (stack heights, stack diameters, exit velocity and emission temperature) were taken directly from the assumptions used to inform the previous assessments of the Airport (including the NRRA planning application).

To account for the impact of the Proposed Order on energy centre emissions, the factor of the increase in mppa between Permitted Operation and Proposed Operation scenarios has been applied to the profiled pollutant emission rates. This resulted in the Proposed Operation energy centres having emission rates that are 25% higher than the Permitted Operation energy centre. This is likely to overestimate the impact of energy centre emissions, as an increase in passenger numbers will not have a linear impact on increased energy demand. The energy emissions plant data is summarised in Table 2.

Table 2: Energy Centre Emissions Data

Parameter	Energy Centre 1 (Terminal 1)				Energy Centre 2 (Terminal 2)			
	Boiler 1[1]	Boiler 2[1]	CHP 2[1]	CHP 3[1]	Boiler 1[2]	Boiler 2[2]	Boiler 3[2]	CHP 4[1]
X coordinate	716784				717082			
Y coordinate	743267				743095			
Thermal Energy Demand at Operational Load (MWth)	3.5	5.4	2.95	5.9	4.0	1.9	4	4
Maximum Annual Energy (kWh)	30660000	47304000	25842000	51438720	35040000	16644000	35040000	35040000
Maximum Annual Energy (GJ)	110376	170294	93031	185179	126144	59918	126144	126144
EMEP EEA Emission Rate for NO_X (g/GJ)	74							
NOx Emission rate (g/yr)	8167824	12601786	6884309	13703275	9334656	4433962	9334656	9334656
NOx Emission rate (g/s)	0.259	0.400	0.218	0.435	0.296	0.141	0.296	0.296
Profiled NOx Emission rate (g/s) Permitted Operation	0.013	0.021	0.011	0.022	0.024	0.012	0.024	0.024
Profiled NOx Emission rate (g/s) Proposed Operation	0.016	0.026	0.014	0.028	0.030	0.015	0.030	0.030

[8] Dublin Airport Authority (2021). Dublin Airport North Runway Relevant Action Application – Chapter 7 Air Quality.
[9] Dublin Airport Authority (2023). Dublin Airport Infrastructure Application – Chapter 7 Air Quality.
[10] EMEP and EEA (2023). EMEP/EEA air quality pollutant emissions inventory guidebook 2023. Available at: https://www.eea.europa.eu/publications/emep-eea-guidebook-2023

Parameter	Energy Centre 1 (Terminal 1)				Energy Centre 2 (Terminal 2)			
	Boiler 1[1]	Boiler 2[1]	CHP 2[1]	CHP 3[1]	Boiler 1[2]	Boiler 2[2]	Boiler 3[2]	CHP 4[1]
EMEP EEA Emission Rate for PM (g/GJ)	0.78							
PM Emission rate (g/yr)	86093	132830	72564	144440	98392	46736	98392	98392
PM Emission rate (g/s)	0.003	0.004	0.002	0.005	0.003	0.001	0.003	0.003
Profiled PM Emission rate (g/s) Permitted Operation	0.00014	0.00022	0.00012	0.00024	0.00026	0.00012	0.00026	0.00026
Profiled PM Emission rate (g/s) Proposed Operation	0.00018	0.00028	0.00015	0.00030	0.00033	0.00015	0.00033	0.00033
Stack Height (m)	30[3]				39[3]			
Stack Diameter (m)	1.0[3]				2.5[3]			
Temperature (°C)	120[3]				120[3]			
Exit Velocity (m/s)	15[3]				15[3]			

[1] Operational for 2700 hours/year.
[2] Operational for 7020 hours/year.
[3] Based on assumptions made of stack emissions parameters in the air quality assessment for the North Runway Relevant Action planning application.

To maintain consistency with the quantification of impacts from the other landside and airside emissions sources considered in this assessment, the focus of energy centre emissions is to the contribution to long-term pollutant concentrations. The combined long-term concentrations of all sources are compared to defined annual mean concentrations for NO_2 and PM_{10} that are used as proxy values to represent risk of an exceedance of a short-term Air Quality Standards and EU Limit Values.

The predicted contribution of the energy centre sources to short-term pollutant concentrations is provided as a sensitivity test in Appendix 7-4.

Meteorological Data

The modelling of air quality impacts is informed by hourly sequential meteorological data from the Dublin Airport weather station for the most recent complete full calendar year. The wind rose plot of the 2025 data is provided in Plate 1. It can be seen that the prevalent winds come from the west south-west.

The Dublin Airport weather station is located within the Dublin Airport boundary, and conditions experienced there are considered representative of conditions experienced in the air quality study area.

For the modelling of road traffic emissions, it is standard practice to use meteorological data that matches the existing baseline year of the traffic data used to inform the assessment and to also match the year of monitoring data being used to inform the model verification stage.

For the modelling of energy plant emissions, it is standard practice to use meteorological data for five met years. A sensitivity test has been undertaken to determine the interannual variation in meteorological conditions and its effect on emissions is considered as a sensitivity test in Appendix 7-4.

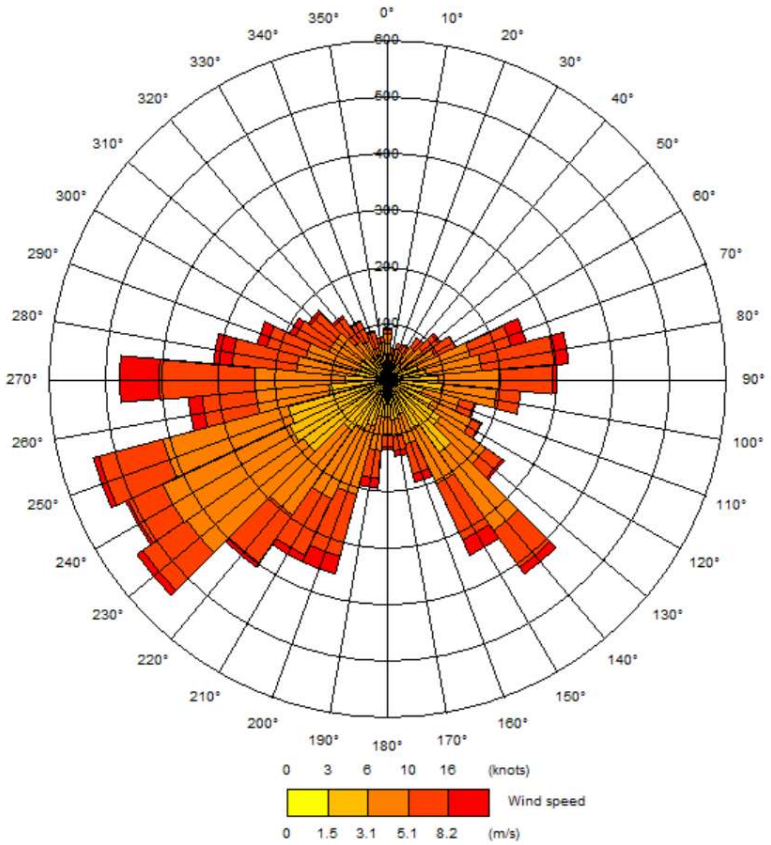


Plate 1: Wind Rose Plot

Terrain Data and Surface Roughness

It has been assumed for the purpose of dispersion modelling that the terrain in the air quality study area is flat, given the limited variation in ground level height and the absence of rapid changes in gradient.

With regards to surface roughness, the dispersion model has been set up on the basis that all land areas have a surface roughness of 1.0m. The higher value represents built-up urban areas and woodland, and will overestimate the influence of surface roughness on areas of open space, such as grassland. The default surface albedo of 0.23 and a Minimum Monin-Obukhov length of 30.0m was used.

Elevated Roads and Cuttings

For the majority of the road traffic emissions modelled study area, roads have been considered to be at ground level and at a similar height to modelled receptors.

Where a modelled road is in a cutting in reality, experience suggests that this is a precautionary approach and reduces the actual distance between receptors and the emission source. It is also precautionary in that it doesn't account for some dispersion that will occur within the cutting itself, along the line of the road carriageway, before emissions reach the receptor.

At some locations where the road is elevated well above the nearest receptors, this approach is too precautionary and results in a huge over-prediction of emissions impacts. To account for this, some sections of the modelled road network have been modelled at an elevated height, to account for the fact actual road traffic emissions are released above and further from the nearby roadside receptors considered.

The M1 viaduct over the Malahide Estuary was modelled at a height of 10m above ground level. In the absence of published information on these bridges, heights were estimated following review of online imagery.

Air Quality Sensitive Receptors

The air quality assessment has quantified the impact of emissions to air at a number of receptors located within 200m of the roads for which traffic data has been provided, and receptors located closest to airside emission sources. The receptors are not a definitive list of all air quality sensitive land use within the study area, but are selected locations considered to be representative of other sensitive land use within the study area. Each receptor therefore represents other sensitive land uses in their vicinity and collectively they represent likely worst-case sensitive exposure and impacts.

The human health sensitive and nature conservation sensitive receptors included in the air quality assessment are described in Table 3 and Table 4 respectively. Both are shown on Figure 7-1. Note that some receptors listed are more than 200m from the modelled road network. At these locations, airside emissions will be predominant contributor to impacts from the Proposed Order. Receptors are selected based on their sensitivity to the current National Air Quality Standards and the new EU Air Quality Directive Limit Values. They are intended to represent locations where members of the public are present for a period of time represented by the averaging period of the Standards and Limit Values. They are not intended to represent exposure in the workplace, for which separate Workplace Exposure Limits apply. There is no risk of any Workplace Exposure Limit being exceeded by the emissions associated with the Proposed Order as they are several orders of magnitude higher than ambient air quality standards.

Table 3: Air Quality Human Health Sensitive Receptors

Rec ID	X	Y	Z	Description	Sensitive exposure		
					Annual mean	Daily mean	Hourly mean
R001	717639	743066	1.5	Residential property on Swords Road	Yes	Yes	Yes
R002	717623	742998	1.5	Residential property on Swords Road	Yes	Yes	Yes
R003	717063	742144	1.5	Residential property on R132	Yes	Yes	Yes
R004	717444	742605	1.5	Residential property on Swords Road	Yes	Yes	Yes
R005	717087	741841	1.5	Residential property on Swords Road	Yes	Yes	Yes
R006	717823	743950	1.5	Residential property on Old Stockhole Lane	Yes	Yes	Yes
R007	717953	743865	1.5	Residential property on Old Stockhole Lane	Yes	Yes	Yes
R008	715586	742359	1.5	Residential property on Old Airport Road	Yes	Yes	Yes
R009	715482	742312	1.5	Residential property on Old Airport Road	Yes	Yes	Yes
R010	716260	744520	1.5	Residential property on Forest Road	Yes	Yes	Yes
R011	716197	744659	1.5	Residential property on Forest Road	Yes	Yes	Yes
R012	716132	744704	1.5	Residential property on Cooks Road	Yes	Yes	Yes
R013	713323	741037	1.5	Residential property on Meakstown Close	Yes	Yes	Yes
R014	715685	744775	1.5	Residential property on Cooks Road	Yes	Yes	Yes
R015	713129	741100	1.5	Residential property on Meakstown Cottages	Yes	Yes	Yes
R016	713678	741072	1.5	Residential property on Creston Avenue	Yes	Yes	Yes
R017	715272	741537	1.5	Residential property on Silloge Green	Yes	Yes	Yes
R018	715018	744828	1.5	Residential property on Forest Great	Yes	Yes	Yes
R019	713294	742493	1.5	Residential property on R108	Yes	Yes	Yes
R020	715625	741172	1.5	Residential property on Charter School Hill	Yes	Yes	Yes
R021	712599	743016	1.5	Residential property on R122	Yes	Yes	Yes
R022	712603	742330	1.5	Residential property on R122	Yes	Yes	Yes
R023	715325	743346	1.5	Residential property on R108	Yes	Yes	Yes
R033	712860	743479	1.5	Residential property on R122	Yes	Yes	Yes
R034	712975	743736	1.5	Residential property on R122	Yes	Yes	Yes

Rec ID	X	Y	Z	Description	Sensitive exposure		
					Annual mean	Daily mean	Hourly mean
R035	712767	743397	1.5	Residential property on R122	Yes	Yes	Yes
R036	713040	743889	1.5	Residential property on R122	Yes	Yes	Yes
R037	712803	744260	1.5	Residential property on Kilreesk Lane	Yes	Yes	Yes
R038	712834	744978	1.5	Residential property on R122	Yes	Yes	Yes
R039	712195	744288	1.5	Residential property on Kilreesk Lane	Yes	Yes	Yes
R040	711897	743406	1.5	Residential property on Dunsoghly Lane	Yes	Yes	Yes
R041	712622	745299	1.5	Residential property on R122	Yes	Yes	Yes
R042	711957	742972	1.5	Residential property on Newtown Cottages	Yes	Yes	Yes
R043	711747	743592	1.5	Residential property Dunsoghly Lane	Yes	Yes	Yes
R044	712076	745138	1.5	Residential property on Kilreesk Lane	Yes	Yes	Yes
R045	711140	744060	1.5	Residential property on Broughan Lane	Yes	Yes	Yes
R046	711073	744617	1.5	Residential property on Bishopswood	Yes	Yes	Yes
R047	717702	745239	1.5	Residential property on R132	Yes	Yes	Yes
R048	717782	744757	1.5	Residential property on R132	Yes	Yes	Yes
R049	718779	743196	1.5	Residential property on Stockhole Lane	Yes	Yes	Yes
R050	718601	744054	1.5	Residential property on Stockhole Lane	Yes	Yes	Yes
R051	718134	744482	1.5	Residential property on Kettles Lane	Yes	Yes	Yes
R052	718880	743477	1.5	Residential property on Stockhole Lane	Yes	Yes	Yes
R053	718702	742877	1.5	Residential property on Stockhole Lane	Yes	Yes	Yes
R054	718953	744795	1.5	Residential property on Kettles Lane	Yes	Yes	Yes
R055	718720	743335	1.5	Residential property on Stockhole Lane	Yes	Yes	Yes
R056	718834	742953	1.5	Residential property on Clonshaugh Road	Yes	Yes	Yes
R057	717652	741176	1.5	Residential property on Turnapin Lane	Yes	Yes	Yes
R058	718554	742277	1.5	Residential property on Stockhole Lane	Yes	Yes	Yes
R059	718804	744573	1.5	Residential property on Kettles Lane	Yes	Yes	Yes
R060	717512	741404	1.5	Residential property on Turnapin Cottages	Yes	Yes	Yes
R061	719130	743159	1.5	Residential property on Baskin Lane	Yes	Yes	Yes
R062	718723	742048	1.5	Residential property on Stockhole Lane	Yes	Yes	Yes
R063	718586	741581	1.5	Residential property on Clonshaugh Road	Yes	Yes	Yes
R064	719645	743092	1.5	Residential property on Baskin Lane	Yes	Yes	Yes
R065	719943	743363	1.5	Residential property on Ashgrove	Yes	Yes	Yes
R066	719971	743009	1.5	Residential property on Baskin Lane	Yes	Yes	Yes
R067	716636	745211	1.5	Ridgewood Grove	Yes	Yes	Yes
R068	717032	745120	1.5	Boroimhe Alder	Yes	Yes	Yes
R069	717372	745110	1.5	Boroimhe Beech	Yes	Yes	Yes
R070	717396	740360	1.5	Residential property on Aulden Grange	Yes	Yes	Yes
R071	717010	739467	1.5	Residential property on Lorcan Park	Yes	Yes	Yes
R072	716949	739000	1.5	Residential property on Shantalla Road	Yes	Yes	Yes
R073	717242	740375	1.5	Residential property on Oak Avenue	Yes	Yes	Yes
R074	716939	740531	1.5	Residential property on Swords Road	Yes	Yes	Yes
R075	716861	738961	1.5	Residential property on Shanrath Road	Yes	Yes	Yes
R076	716837	738710	1.5	Residential property on Swords Road	Yes	Yes	Yes

Rec ID	X	Y	Z	Description	Sensitive exposure		
					Annual mean	Daily mean	Hourly mean
R077	716705	738161	1.5	Residential property on R132	Yes	Yes	Yes
R078	707826	736513	1.5	Residential property on Diswellstown Cottages	Yes	Yes	Yes
R079	707473	734079	1.5	Residential property on Cloverhill Road	Yes	Yes	Yes
R080	707557	734784	1.5	Residential property on Heather Grove	Yes	Yes	Yes
R081	710089	739341	1.5	Residential property on Bam Lodge Grove	Yes	Yes	Yes
R082	710899	739715	1.5	Residential property on Saint Mary's Halting Site	Yes	Yes	Yes
R083	719138	745300	1.5	Residential property on Holywell Way	Yes	Yes	Yes
R084	719343	745602	1.5	Residential property on The Close	Yes	Yes	Yes
R085	719417	745917	1.5	Residential property on Waterside Place	Yes	Yes	Yes
R086	719427	746271	1.5	Residential property on Waterside View	Yes	Yes	Yes
R087	719210	747512	1.5	Residential property on Seatown Road	Yes	Yes	Yes
R088	718696	755083	1.5	Residential property near M1	Yes	Yes	Yes
R089	718330	757635	1.5	Residential property on R132	Yes	Yes	Yes
W007	716841	746220	1.5	St. Finian's Church (R.C)	No	No	Yes

Table 4: Operational Phase Nature Conservation Sensitive Receptors

Receptor ID	X	Y	Z	Description	NO_X Air Quality Standard ($\mu g/m^3$)	NH_3 Critical Level ($\mu g/m^3$)	Nitrogen Deposition Critical Load (kgN/ha/yr)
E01	718476	759898	0	Bog of the Ring pNHA	30	3	5
E02	719290	747735	0	Malahide Estuary SAC and SPA	30	3	10
E03	719283	747642	0	Malahide Estuary SAC and SPA	30	3	10
E04	716612	740056	0	Santry Demsne pNHA	30	3	10
E05	708899	738190	0	Royal Canal pNHA	30	3	10
E06	707689	736029	0	Liffey Valley pNHA	30	3	10
E07	708029	732145	0	Grand Canal pNHA	30	3	10
E08	Multiple – see Figure 7-1		0	Baldoyle Bay SAC	30	3	20
E09	Multiple – see Figure 7-1		0	Howth Head SAC	30	3	10
E10	Multiple – see Figure 7-1		0	Irelands Eye SAC	30	3	10
E11	Multiple – see Figure 7-1		0	North Dublin Bay SAC	30	3	5
E12	Multiple – see Figure 7-1		0	Malahide Estuary SAC and SPA	30	3	10

Note: SAC = Special Area of Conservation, SPA = Special Protection Area, pNHA = proposed Natural Heritage Area

Nature conservation receptors are only sensitive to annual mean pollutant standards.

Background Pollutant Concentration Data

The dispersion model predicts the contribution of pollutants from modelled emission sources at the selected air quality sensitive receptors. To report total pollutant concentrations that can be compared to relevant Air Quality Standards new EU Limit Values at those receptors, this contribution needs to be added to the background (or ambient) pollutant concentrations that are representative of those locations. Background pollutant data used in the assessment is summarised in Table 5 and Table 6.

According to TII air quality assessment guidance[1], monitored background concentrations should be used for the base year. For human health receptors, background NO_2, PM_{10} and $PM_{2.5}$ concentration data have been sourced from data available on the Environmental Protection Agency's (EPA's) air quality website[11]. For NO_2, PM_{10}, and $PM_{2.5}$ background concentrations, the EPA background monitoring location at Swords was used as being most representative of the study area.

For nature conservation receptors, background NO_X, NH_3 and nitrogen deposition rate data have been sourced from the Air Pollution Information System (APIS)[12]. APIS reports background concentration data for Ireland as a 1-year average, and current background maps are based on the year 2021.

The TII air quality guidance states that to determine future background conditions for the assessment years of a proposed scheme, projection factors should be applied to account for the continuing improvement in background pollutant concentrations over future years. These projection factors are outlined in TII guidance and allow for projection of monitored background concentrations to future assessment years, up to 2040. The projection factors are outlined in Appendix C of the TII guidance[1]. For NO_x, PM_{10}, and $PM_{2.5}$, the relevant projection factors for a Large Urban area with a realistic worst-case scenario for decarbonisation were used. The TII air quality guidance states that NO_x projection factors are also applicable to NO_2. The projection factors are outlined in Table 5 and Table 6.

As no projection factors are available for NH_3 or nitrogen deposition, APIS reported background concentrations were assumed to be the same in the assessment year of the Principal Assessment (2029) as the existing baseline year (2025). This is considered to be a precautionary approach.

The background pollutant concentration data used to inform the assessment for human health and nature conservation site sensitive receptors are presented in Table 5 and Table 6 respectively. The data presented are those described above.

Table 5: Background Pollutant Data for Human Health Sensitive Receptors

Pollutant	Projection Factor	Based on Monitoring Data in 2025	Projected Future Background Data based on the TII Projection Factors
	2025 to 2029	2025	2029
NO_2[1]	0.889	10.5	9.3
PM_{10}	0.968	11.2	10.8
$PM_{2.5}$	0.951	6.8	6.5

[11] Environmental Protection Agency (2026). Air Quality – Readings.
[12] Air Pollution Information System (2023) APIS.

Table 6: Background Pollutant Data for Nature Conservation Sensitive Receptors

Receptor ID	Description	APIS Background Concentrations based on APIS Reported Backgrounds (2025 to 2030)					
		NO_X (µg/m^3)	NH_3 (µg/m3)	Nitrogen deposition (kgN/ha/yr)	NO_X (µg/m^3)	NH_3 (µg/m3)	Nitrogen deposition (kgN/ha/yr)
		2023			2029		
E01	Bog of the Ring pNHA	5.2	2.0	6.0	4.4	2.0	6.0
E02	Malahide Estuary SAC and SPA	11.2	1.8	5.5	9.5	1.8	5.5
E03	Malahide Estuary SAC and SPA	11.2	1.8	5.5	9.5	1.8	5.5
E04	Santry Demsne pNHA	18.6	1.7	10.3	15.7	1.7	10.3
E05	Royal Canal pNHA	15.7	2.0	6.5	13.3	2.0	6.5
E06	Liffey Valley pNHA	9.5	1.8	10.3	8.0	1.8	10.3
E07	Grand Canal pNHA	13.2	2.0	10.3	11.2	2.0	10.3
E08	Baldoyle Bay SAC	9.5	1.6	5.2	8.0	1.6	5.2
E09	Howth Head SAC	7.3	1.3	4.8	6.2	1.3	4.8
E10	Irelands Eye SAC	7.3	1.3	4.9	6.2	1.3	4.9
E11	North Dublin Bay SAC[1]	9.9 - 14.1	1.4	5.3	8.3 – 12.0	1.4	5.3
E12	Malahide Estuary SAC and SPA	9.3	1.5	5.1	7.9	1.5	5.1

[1] Range provided to account for elevated NO_X in a limited number of grid squares adjacent to vessel routes to and from the Port of Dublin.

Pollutant Conversion Rates

NO_x to NO_2

Emissions of nitrogen oxides from combustion sources are dominated by nitrous oxide (NO), typically in the ratio of NO to NO_2 of 9:1. However, it is NO_2 that has specified environmental standards due to its potential impact on human health and indirect impacts on sensitive habitats.

In the ambient air, nitric oxide is oxidised to nitrogen dioxide by the ozone present, and the rate of oxidation is dependent on the relative concentrations of nitric oxide and ozone in the ambient air.

For road source and carpark emissions, the conversion of NO_X to NO_2 is calculated using the UK Department for Environment, Food and Rural Affairs. NO_x to NO_2 calculator tool[13], which assigns the conversion of that contribution based on Local Authority specific conditions. TII guidance recommends that the Armagh Banbridge and Craigavon District Council area is used to represent conditions in Ireland.

For energy centre emissions, all NO_X emitted is precautionarily assumed to be as NO_2.

[13] Department for Food, Environment and Rural Affairs (2020), NOx to NO_2 Calculator v9.1

NO_2 and NH_3 to Nitrogen Deposition

Annual mean NO_2 concentrations are converted to N deposition using the following factors as set out in EPA and UK Environment Agency guidance[14]:

- Deposition flux (as $\mu g/m^2/s$) is calculated by applying deposition velocity factors of:
  - 0.0015 m/s to the annual mean NO_2 contribution (as $\mu g/m^3$) at habitats with short vegetation (non-woodland) and a deposition velocity factor of 0.003 m/s to the annual mean NO_2 contribution (as $\mu g/m^3$) at habitats with tall vegetation (woodland).
  - 0.020 m/s to the annual mean NH_3 contribution (as $\mu g/m^3$) at habitats with short vegetation (non-woodland) and a deposition velocity factor of 0.030 m/s to annual mean NH_3 contribution (as µg/m3) at habitats with tall vegetation (woodland).
- Deposition rate (as kgN/ha/yr) is then calculated by applying unit conversion factors of:
  - 95.9 to the calculated deposition flux for NO_2 (as $\mu g/m^2/s$).
  - 260 to the calculated deposition flux for NH_3 (as $\mu g/m^2/s$).

Total nitrogen deposition is then the sum of the deposition rate calculated from NO_2 and NH_3 concentrations at any specific location.

Road Traffic Emission Model Verification

It is standard practice for the modelling of road traffic emissions to be verified by comparing modelled predictions against actual monitored concentrations following the approach recommended by TII guidance. Where existing baseline model predictions do not align well enough with monitored existing baseline concentrations, which is referred to as model bias, an adjustment factor is applied to model predictions to account for any difference. The factor is then applied to all model outputs, including those in future years.

The verification exercise used to inform this assessment is summarised in Table 7 and Table 8. The monitored data used to inform the verification exercise was gathered during the baseline survey undertaken for the Dublin Airport Infrastructure Application between June 2023 and January 2024. The monitoring data was annualised and adjusted to represent annual mean values for 2025 in line with the approach recommended by TII guidance. The monitored data is presented in Section 7.4 of Chapter 7 of the EIAR.

For the annualisation of project-specific NO_2 monitoring data, the DEFRA national bias adjustment factor of 0.81, applicable to the laboratory responsible for preparing and analysing the diffusion tubes, and annualisation factors of between 0.951 and 1.191 were used. The annualisation factors were determined by comparing period mean and annual mean concentration data gathered at EPA urban background monitors at Swords and Rathmines. The Ballyfermot, DunLaoghaire, and Blanchardstown urban background monitors had insufficient data capture during 2025 and were not used for calculating the annualisation factors.

For the projection of the EPA passive NO_2 monitoring data, it was assumed that the published data are already bias-adjusted and annualised (if required). A projection factor of 0.69 was used to project the published 2019 data up to 2025. The projection factor was determined by comparing 2019 and 2025 annual mean data gathered at the EPA urban background monitors at Rathmines and Swords. The Dun Laoghaire and Blanchardstown urban background monitors had insufficient data captures in 2025; therefore, no comparison to 2025 annual means could be made, and they were not used for calculating the projection factor.

The diffusion tubes used to inform the verification exercise provide a good representation of the study area. This includes multiple tubes located adjacent to motorways, urban areas and rural areas. Diffusion tube DT(5), EPA diffusion tube EPA3, and daa diffusion tubes A1, A4 and A7 were excluded from the verification exercise as traffic data was not available for adjacent roads.

[14] Environment Agency (2014) AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air

Table 7 shows that unadjusted modelled NO_2 concentrations are underpredicted by 42% on average across the 15 monitoring locations used. The biggest underprediction occurs at diffusion tube EPA2 (Aulden Grange).

Following the comparison of total NO_2 concentrations, the modelled road NO_x contributions are then compared to monitored road NO_X contributions. Table 7 shows that on average, the model underpredicted road NO_x by 81%. Again, the biggest underprediction is associated with diffusion tube EPA2 (Aulden Grange).

Table 7: Road Traffic Emissions Model Verification Before Adjustment

Location	X coordinate	Y coordinate	Measured Concentration in 2025 (µg/m^3)	Modelled Concentration in 2025 (µg/m^3)	Individual Performance (modelled/measured)	Combined Performance (modelled/measured)
Total NO_2 comparison before adjustment						
A6	716494	742282	19.3	12.6	0.65	
NO2 (1)	713133	741081	24.8	17.1	0.69	
NO2 (2)	713485	741056	24.9	14.9	0.60	
NO2 (3)	713781	741077	26.9	14.0	0.52	
NO2 (6)	717195	740283	22.7	12.4	0.55	
NO2 (7)	717254	740060	25.2	11.9	0.47	
NO2 (8)	717378	740357	26.9	13.0	0.48	
NO2 (9)	717674	741180	22.7	12.5	0.55	0.58
NO2 (10)	717685	741402	20.2	12.6	0.63	
NO2 (14)	719051	744968	22.7	12.8	0.56	
NO2 (15)	719182	745474	18.5	12.4	0.67	
NO2 (16)	719306	745459	21.6	12.6	0.58	
NO2 (17)	719287	747546	16.4	11.5	0.70	
EPA1	713576	741011	21.2	12.5	0.59	
EPA2	717303	740053	22.9	11.4	0.50	
Road NO_X comparison before adjustment						
A6	716494	742282	19.1	4.4	0.23	
NO2 (1)	713133	741081	32.4	14.1	0.44	
NO2 (2)	713485	741056	32.7	9.2	0.28	
NO2 (3)	713781	741077	37.8	7.4	0.20	
NO2 (6)	717195	740283	27.4	4.0	0.14	
NO2 (7)	717254	740060	33.5	2.9	0.09	
NO2 (8)	717378	740357	38.0	5.2	0.14	
NO2 (9)	717674	741180	27.2	4.2	0.16	0.19
NO2 (10)	717685	741402	21.3	4.4	0.21	
NO2 (14)	719051	744968	27.3	4.9	0.18	
NO2 (15)	719182	745474	17.4	4.1	0.23	
NO2 (16)	719306	745459	24.6	4.3	0.18	
NO2 (17)	719287	747546	12.6	2.2	0.17	
EPA1	713576	741011	23.7	4.2	0.18	
EPA2	717303	740053	27.9	2.0	0.07	

It is from the comparison of road NO_X that a verification bias-adjustment factor is calculated to bring modelled road NO_X in line with monitored values. Due to the monitoring locations being in distinctive areas where model performance differs, the adjusted model was split into six zones as shown in Table 8. The verification bias-adjustment factor for Zone 1 was 5.78, because the model under-predicted road NO_X at a location underneath the M1 viaduct across the Malahide Estuary. The verification bias-adjustment factor for Zone 2 was 6.44 because the model under-predicted road NO_X at a location downwind of an industrial/commercial area that could not be accounted for in the model. A factor of 8.35 was calculated for Zone 3 because the model under-predicted road NO_x adjacent to the Port tunnel portal. The verification bias-adjustment factor for Zone 4 was 3.27 because the model under-predicted road NO_X at locations adjacent to the M50. A factor of 5.26 was calculated for Zone 5 because the model under-predicted road NO_x at locations adjacent to the M1. The verification bias-adjustment factor for Zone 6 was 4.33 because the model under-predicted road NO_x at locations adjacent to the local roads surrounding the airport.

To demonstrate the robustness of the model, the RMSE is calculated for both unadjusted and adjusted models. Ideally, the calculated RMSE should be within 25% of the air quality objective, which equates to 4 µg/m^3. In this instance, the unadjusted model has a RMSE of 9.8 µg/m^3. After adjustment, the Zones with only one monitoring location effectively have a RMSE of 0 µg/m^3 (Zones 1, 2 and 6), and Zones 3, 4, and 5 have a RMSE of 3.4 µg/m^3, 4.1 µg/m^3 and 1.1 µg/m^3, respectively. The adjusted model is therefore considered robust.

Table 8: Road Traffic Emissions Model Verification After Adjustment

Location	X coordinate	Y coordinate	Measured Concentration in 2025 (µg/m^3)	Modelled Concentration in 2025 (µg/m^3)	Individual Performance (modelled/measured)	Combined Performance (modelled/measured)
Zone 1 – Monitoring Location Below Bridge						
NO2 (17)	719287	747546	16.4	16.4	1.0	n/a
Zone 2 – Industrial Area						
NO2 (9)	717674	741180	22.7	22.7	1.0	n/a
Zone 3 – Adjacent to Dublin Port Tunnel						
NO2 (6)	717195	740283	22.7	25.0	1.10	0.95
NO2 (7)	717254	740060	25.2	21.3	0.85	
NO2 (8)	717378	740357	26.9	28.9	1.07	
EPA2	717303	740053	22.9	18.1	0.79	
Zone 4 – M50						
NO2 (1)	713133	741081	24.8	29.9	1.21	0.93
NO2 (2)	713485	741056	24.9	23.9	0.96	
NO2 (3)	713781	741077	26.9	21.5	0.80	
NO2 (10)	717685	741402	20.2	17.3	0.86	
EPA1	713576	741011	21.2	17.0	0.80	
Zone 5 – M1						
NO2 (14)	719051	744968	22.7	22.0	0.97	1.01
NO2 (15)	719182	745474	18.5	20.2	1.09	
NO2 (16)	719306	745459	21.6	20.9	0.97	
Zone 6 – Rural Roads						
A6	716494	742282	19.3	19.3	1.00	n/a

Results

Total pollutant concentrations and deposition rates for each scenario modelled are presented in Appendix 7-3. The results presented for the pollutants NO_2, PM_{10}, $PM_{2.5}$, NO_X, NH_3 and nitrogen deposition are the combined contribution from airside and landside sources. Total pollutant concentrations are the contribution from one of or both of the airside and landside sources of emissions, plus the background contribution.