
Dublin Airport Air Quality Monitoring Annual Report 2023

Sustainability Department



Dublin Airport Air Quality Monitoring Annual Report 2023



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Glossary

Abbreviation Definition

EPA	Environmental Protection Agency
NO	Nitrogen Oxide
NO ₂	Nitrogen Dioxide
NO _x	Oxides of Nitrogen
PM ₁₀	Airborne Particulate Matter, particle size less than 10 micron.
PM _{2.5}	Airborne Particulate Matter, particle size less than 2.5 micron.
AQIH	Air Quality Index for Health
The Regulations	Ambient Air Quality Standards Regulations 2011

Version Control

Issue No.:	Prepared by:	Reviewed by:	Date:
SUS_HLE_AQM_REP_23002	Sustainability Project Officer	Sustainability Department	March 2024

Executive Summary

daa undertakes a programme of air quality monitoring at Dublin Airport (DAP) and in surrounding communities. Monitoring is undertaken using a stationary continuous air monitoring station located within the DAP boundary. Air quality is also monitored at 11 locations within and outside the airport boundary using passive diffusion tube sampling.

This report provides an overview of the results of air quality monitoring undertaken by daa at DAP in 2023. Air monitoring locations are listed in Table 2 and presented as Figure 1 of this report.

The Ambient Air Quality Standards Regulations 2011 (the Regulations), S.I. No. 180 of 2011, implement EU Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe. The Regulations are referred to in this report for comparison purposes only. There is no requirement under the Regulations for individual companies or operators to carry out air monitoring. In Ireland, compliance with the Regulations is the responsibility of the Environmental Protection Agency (EPA), which is deemed to be the competent authority for the purpose of Directive 2008/50/EC. The EPA is required to submit an annual Air Quality report to the Minister of the Environment, Climate and Communications and to the European Commission. The latest EPA Report entitled "Air Quality in Ireland 2022" was published in September 2023 and is available on the [EPA website](#). The 2023 report will be published in 2024.

Data collected from all of the daa monitoring locations presented in this report were within the limit values mandated in the 2011 Regulations. The results of the NO₂ and PM₁₀ concentrations for 2023, using the online analyser indicate concentrations are below the relevant annual limit value of 40µg/m³ and within the allowed criteria of short-term limit values. The results of the PM_{2.5} concentrations using the online analyser indicate concentrations for 2023 are well below the relevant annual limit value of 20µg/m³. The highest NO₂ concentrations were recorded at the Dublin Airport bus depot which experiences significant vehicular activity. daa will continue to closely monitor trends in air quality monitoring results at this location. We will be able to make a comparison of the 2023 PM_{2.5} data in next year's annual report.

In collaboration with the EPA, Dublin Airport's continuous air monitoring station can be viewed live on the EPA website: <https://airquality.ie/>. This further demonstrates daa's commitment to work with regulators and communities to ensure that there is transparency about air quality information at the airport.

1.0 Introduction

1.1 Background

Dublin Airport (DAP) is located approximately 10km north of Dublin city. The areas to the west of the airport are predominantly rural in nature. The airport is surrounded by Swords Village to the north and Santry to the south. The airport is bounded on two sides by the busiest motorways in the country: the M1 and the M50. The M1 motorway is approximately 1km east of the current location of the airport's onsite air quality monitoring station and the M50 motorway is approximately 2.5km south of the monitoring location.

1.2 Purpose

The purpose of this report is to present an overview of the results of air quality monitoring conducted onsite at DAP and at 11 monitoring locations in the vicinity of the airport in 2023. The Ambient Air Quality Standards Regulations 2011, S.I. No. 180 of 2011 (the Regulations), implement EU Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe. This report compares the data collected during the daa monitoring programme with limit values contained in the Regulations to assess air quality at each monitoring location. From Q3 2023, WHO AQGs and interim targets outlined in the Clean Air Strategy for Ireland are also presented in this report. Interim and final WHO target values for NO₂, PM_{2.5}, and PM₁₀ are presented in Table 1.

Pollutant	Averaging time	unit	EU limit value	WHO interim targets (IT)				
				IT1	IT2	IT3 (2026)	IT4 (2030)	AQG level (2040)
NO ₂	Annual	µg/m ³	40	40	30	20	-	10
PM ₁₀	Annual	µg/m ³	40	70	50	30	20	15
PM _{2.5}	Annual	µg/m ³	20	35	25	15	10	5

Table 1 WHO Air Quality Guideline (AQG) and Interim Targets

The Regulations and the Clean Air Strategy for Ireland are referred to in this report for comparison and reference purposes only. There is no requirement under the Regulations that companies or operators shall carry out air quality monitoring. In Ireland, compliance with the Regulations is the responsibility of the Environmental Protection Agency (EPA), which is deemed to be the competent authority.

A range of parameters are recorded at DAP's continuous on-site monitoring station as follows:

- Sulphur dioxide (SO₂);
- Oxides of nitrogen NO_x (NO and NO₂);
- Carbon monoxide (CO);
- Ozone (O₃);
- Particulate Matter (PM₁₀).
- Particulate Matter (PM_{2.5})

Diffusion tube samplers located in communities surrounding the airport monitor the following parameters:

- Sulphur dioxide
- Nitrogen Dioxide (NO₂);
- Benzene;
- Ethylbenzene;
- m- and p-Xylene;
- o-Xylene;
- Toluene;
- Ozone.

The results of air quality monitoring for all of the above parameters are reviewed by daa on a continuous basis.

To date and in line with air quality reporting at many airports, daa has focussed reporting on the most important parameters:

- Nitrogen Dioxide (NO₂) and Particulate Matter (PM₁₀) at the DAP automatic station; and
- Nitrogen Dioxide (NO₂) and Benzene using diffusion tubes at 11 offsite locations.

From 2023 daa is also reporting Particulate Matter (PM_{2.5}) at the DAP automatic station.

2.0 Monitoring Locations

A list of the ambient air quality sampling locations is presented in Table . Sampling locations are presented in Figure .

Ref	Location	Method	Parameters
On-site	Dublin Airport	Continuous analyser	NO₂ PM₁₀ PM_{2.5}
A1	Forrest Little Golf Club	Passive Tubes	NO₂ Benzene
A2	Kilreesk Lane, St. Margaret's	Passive Tubes	
A3	Ridgewood Estate West, Swords	Passive Tubes	
A4	St. Margaret's School and Parish House	Passive Tubes	
A5	Fire Station, Huntstown, Dublin Airport	Passive Tubes	
A6	Southern Boundary Fence, Dublin Airport	Passive Tubes	
A7	Western Boundary Fence, Dublin Airport	Passive Tubes	
A8	St. Nicholas of Myra School, Malahide Road	Passive Tubes	
A9	Naomh Mearnóg GAA Club, Portmarnock.	Passive Tubes	
A10	Oscar Papa Site, Portmarnock.	Passive Tubes	
A11	Airport Bus Depot	Passive Tubes	

Table 2 Community Ambient Air Quality Monitoring Locations

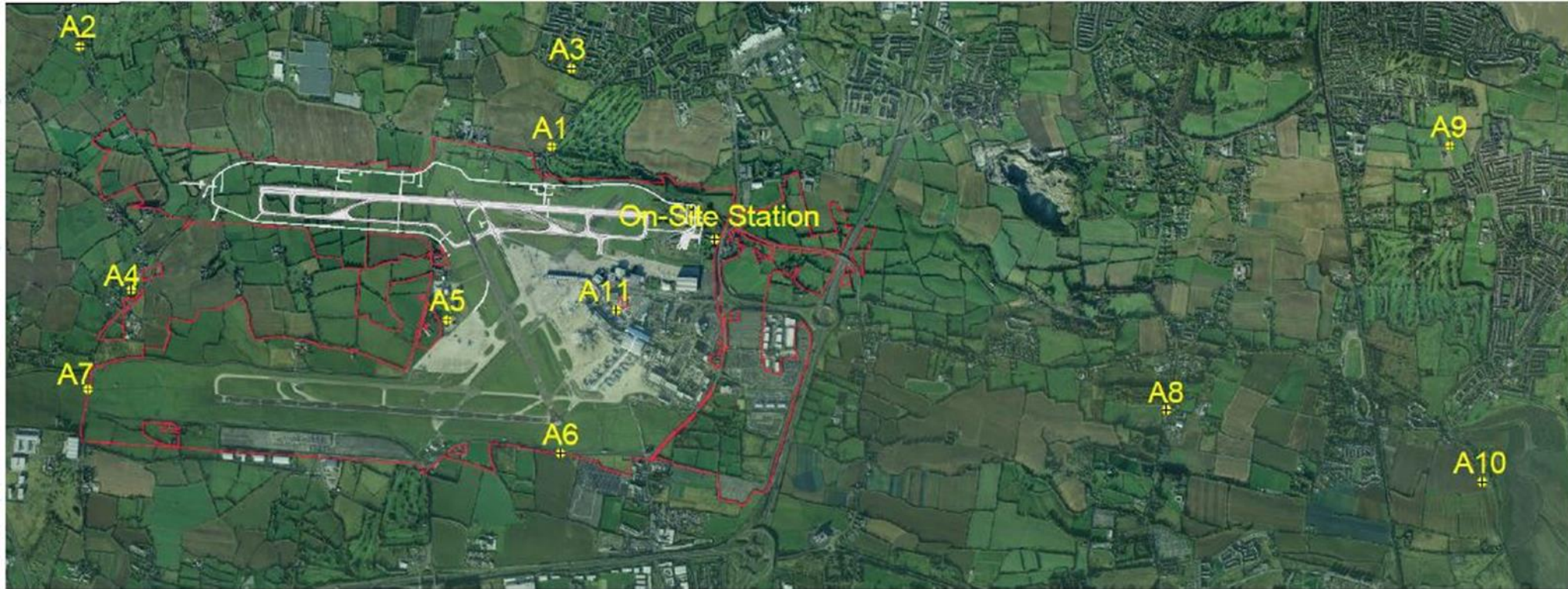


Figure 1 Air Quality Monitoring Locations

3.0 Parameters and Sampling Methodology

3.1 Offsite Passive Sampling

3.1.1 Nitrogen Dioxide (NO₂) and Benzene (C₆H₆)

daa has installed a network of passive diffusion tube samplers in areas surrounding the airport. Monitoring locations are shown on Figure 1 and listed in Table 1. The diffusion tubes are exposed for approximately 4-week intervals and record monthly mean concentrations. The tubes are analysed using UV Spectrophotometry at a UKAS (United Kingdom Accreditation Service) accredited laboratory. Results are expressed in µg/m³ (micrograms per cubic metre). Monthly mean concentrations have been averaged to give an annual mean, presented in Figure 2, which can be compared with limit values.

3.2 Onsite Sampling

3.2.1 Equipment Calibration

An external expert service provider undertakes routine servicing of the DAP air quality monitoring equipment. Additionally, the monitoring station undergoes a full service twice yearly. During routine visits, air filters are replaced, and the instruments are calibrated to EPA gas standards. The technician also inspects the functionality of the station and sampling system. An emergency call-out service is also offered by the service provider as and when required. The calibration process takes approximately 24 hours and data collection resumes after this 24-hour period. The dates of calibration and maintenance of the air monitoring equipment in 2023 were as follows:

- 18th January
- 11th April
- 30th May
- 28th June
- 18th July
- 2nd -3rd August
- 11th – 13th September
- 27th September
- 6th November
- 11th December

In 2023, due to down times of the monitoring equipment during calibration and equipment malfunction approximately 89% of NO₂ data and 90% of PM₁₀ and PM_{2.5} was captured.

3.2.2 Nitrogen Dioxide (NO₂)

Onsite monitoring of NO₂ is carried out on a continuous basis at the continuous airport monitoring station. Measurement of NO₂ is carried out using a Horiba APNA-370 ambient NO_x monitor which employs a crossflow modulated chemiluminescence method. The results are expressed in µg/m³.

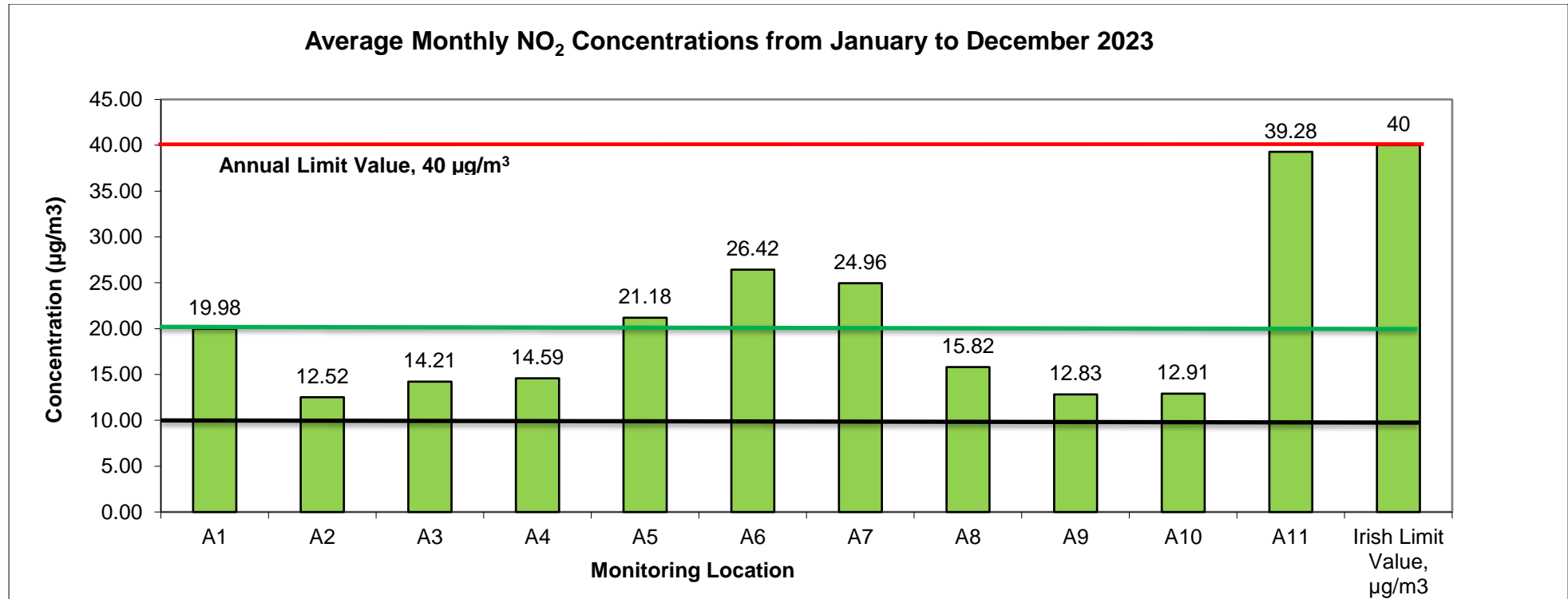
3.2.3 Particulate Matter (PM₁₀) and (PM_{2.5})

PM₁₀ and PM_{2.5} are defined as airborne particulate matter with an aerodynamic diameter equal to or less than 10µm and 2.5µm respectively. PM₁₀ and PM_{2.5} are monitored on a continuous basis at the airport monitoring station. The PM₁₀ and PM_{2.5} instruments automatically measure and record airborne particulate concentration levels using the principle of beta ray attenuation. The sampler monitors the PM₁₀ and PM_{2.5} content of air by drawing a measured volume of air through a chamber containing a pre-conditioned and pre-weighed filter in accordance with the internationally accepted US EPA protocol for PM₁₀ and PM_{2.5} sampling. The results are expressed in µg/m³.

4.0 Monitoring Results

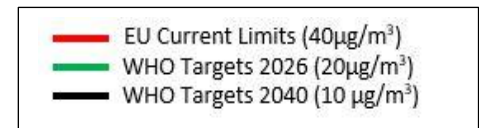
4.1 Offsite NO₂ Monitoring Results

Error! Reference source not found. presents the annual mean NO₂ concentration for each location based on the monthly passive tube sampling. The Regulations mandate an annual mean limit value of 40 µg/m³ for NO₂. The WHO AQGs by 2040 outlines interim targets (2026) towards achieving final AQG levels to be met by 2040, which are included in the graph below. As can be seen from Figure 2, the mean NO₂ levels including at the bus depot sampling point, A11, are below the annual limit, as specified in the Regulations. The monthly average NO₂ at A11 during 2023 was calculated at 39.28 µg/m³. The high level of NO₂ is related to the volume of vehicular traffic at this location. The NO₂ analysis result for June 2023 at this location is excluded from the below graph. The laboratory completing analysis of the diffusion tubes reported that the tube contained water and the result may be compromised. As the very low NO₂ level recorded in this sample was likely erroneous and an outlier, it is not deemed representative of the air quality in the area during this period and is excluded from reporting.



*A11 is the bus depot

Figure 1: 2023 Average NO₂ Concentrations by location



4.2 Offsite Benzene (C₆H₆) Monitoring Results

Figure 3 presents the mean Benzene concentration for each location, based on the monthly passive tube sampling in 2023. The Regulations mandate an annual mean limit value of 5 µg/m³ for Benzene. As can be seen from Figure 3, the annual mean values were well below the limit value of 5 µg/m³ and less than 1 µg/m³ at all monitoring locations.

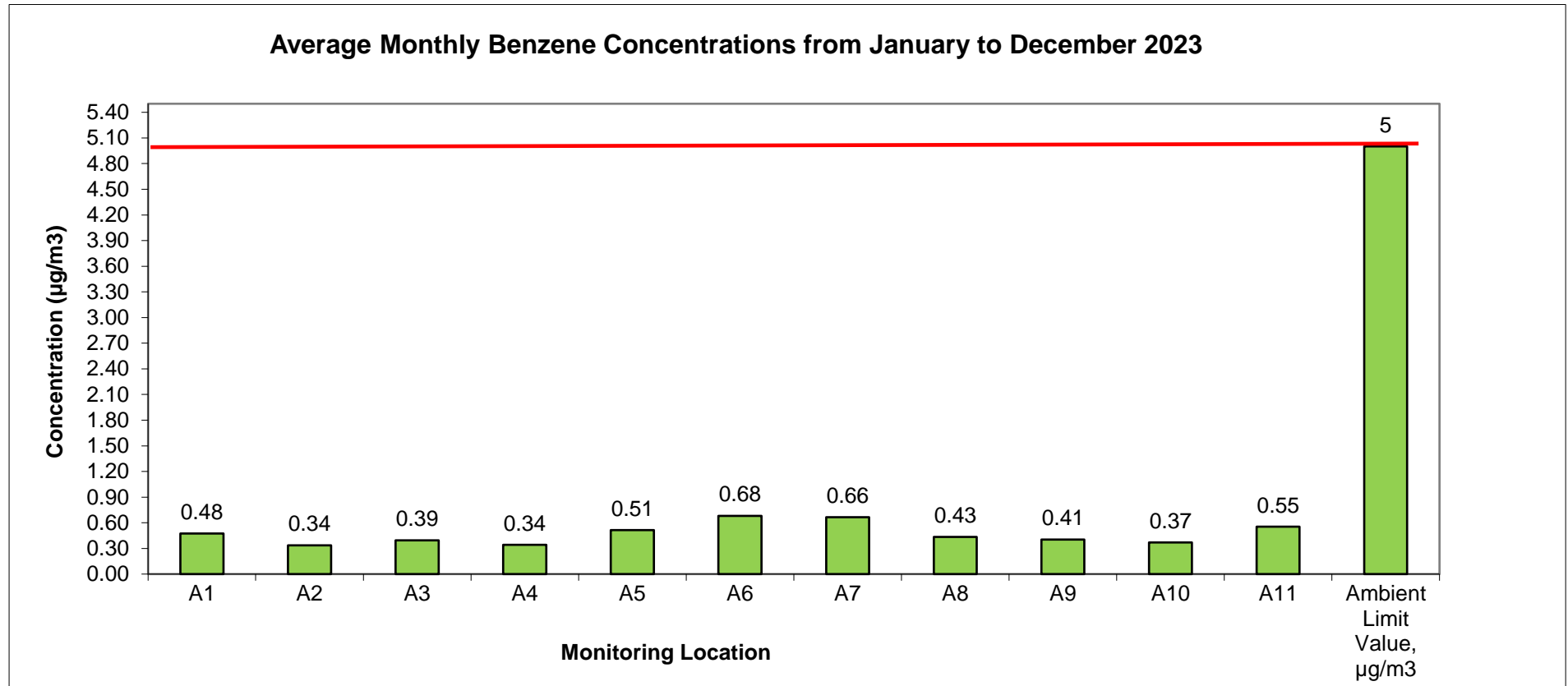


Figure 2: 2023 Average Monthly Benzene (C₆H₆) Concentrations by location

4.3 On-site Airport Monitoring Station Results: Daily Average NO₂

NO₂ concentrations are measured at the automatic station at DAP. Figure 4 presents the daily average NO₂ concentrations measured during 2023. The equivalent daily average was calculated as 21 µg/m³.

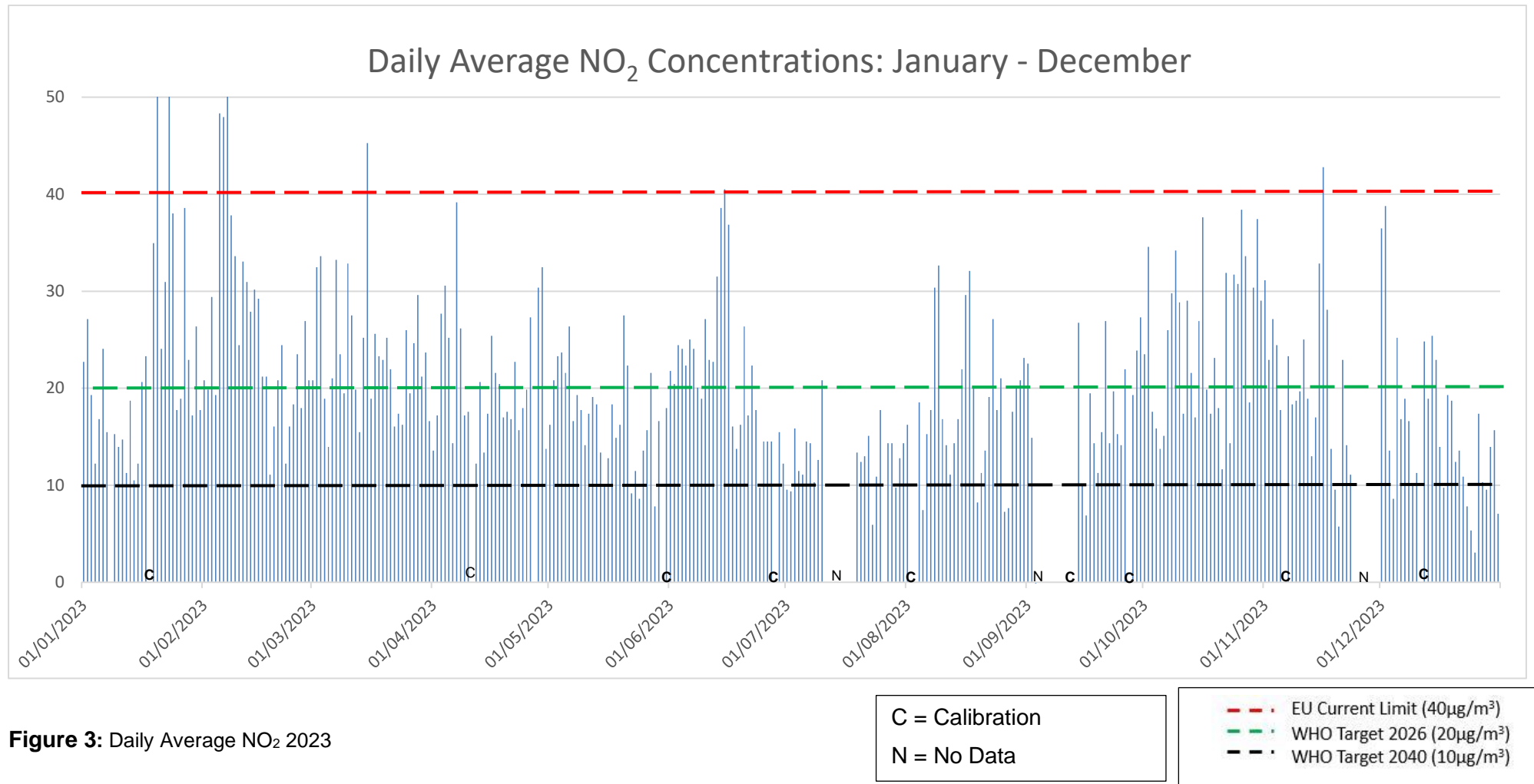


Figure 3: Daily Average NO₂ 2023

C = Calibration	--- EU Current Limit (40µg/m ³)
N = No Data	--- WHO Target 2026 (20µg/m ³)
	--- WHO Target 2040 (10µg/m ³)

4.4 On-site Airport Monitoring Station Results: Daily Average PM₁₀

Daily average PM₁₀ concentrations recorded at the automatic station in DAP in 2023 are presented in Figure 5. The average PM₁₀ was calculated as 12 µg/m³.

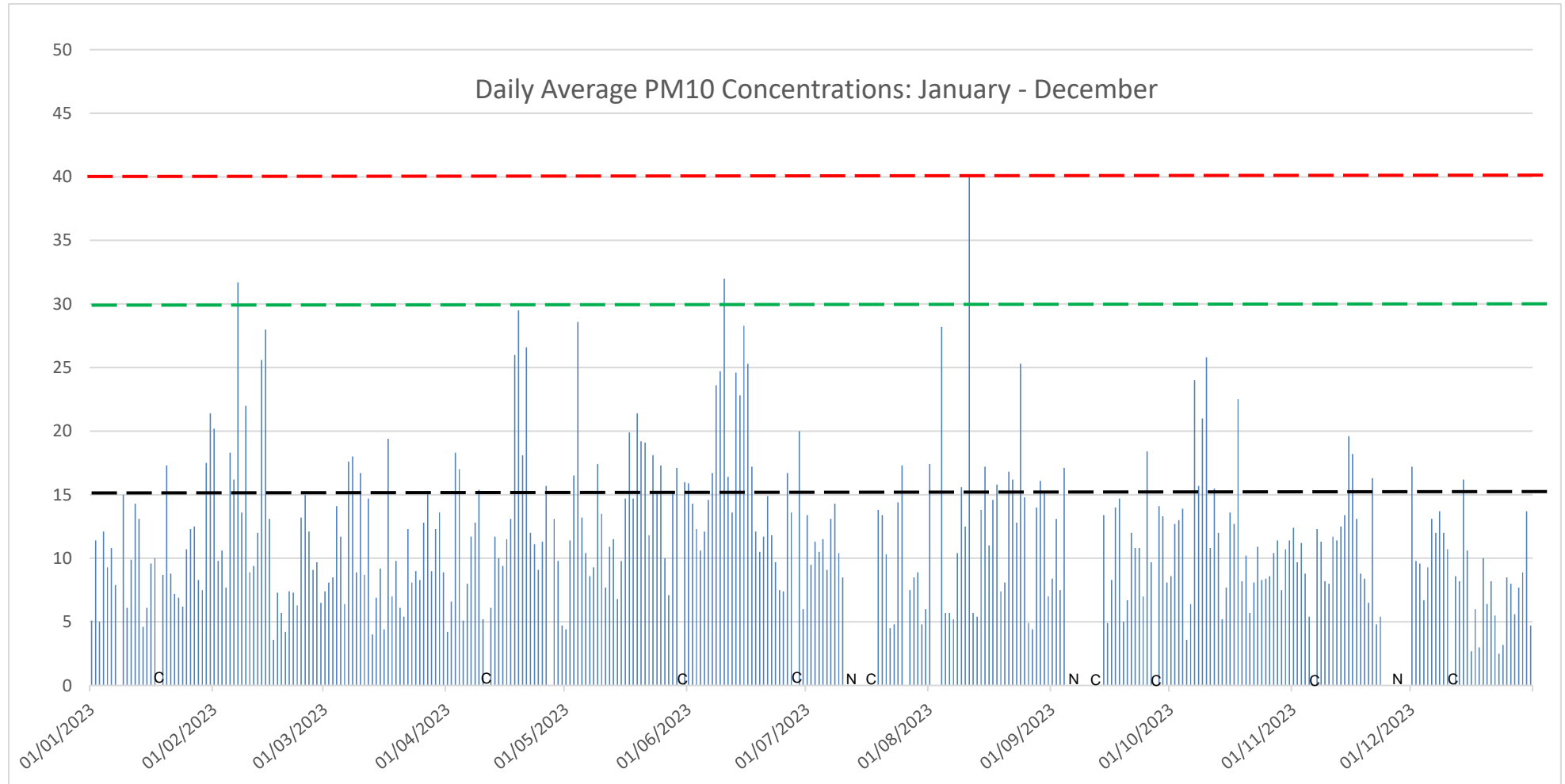


Figure 4: Daily Average PM₁₀ 2023

C = Calibration	— — — EU Current Limit (40 µg/m ³)
N = No Data	— — — WHO Target 2026 (30 µg/m ³)
	— — — WHO Target 2040 (15 µg/m ³)

4.5 On-site Airport Monitoring Station Results: PM₁₀

Daily average PM₁₀ concentrations recorded at the automatic station in DAP in 2023 are presented in Figure 5. The mean PM₁₀ was calculated as 12 µg/m³. The Regulations set a 24-hour PM₁₀ limit value of 50 µg/m³, and an annual mean limit value of 40 µg/m³ as shown in Table 3.

Objective	Averaging Period	Limit or Threshold Value (µg/m ³)	No. of Allowed Exceedances (Regulations 2011)	No. of Exceedances
PM ₁₀ Limit Value	24 hour	50	Not to be exceeded on more than 35 days per year	0
PM ₁₀ Limit Value	Calendar Year	40	NA	NA

Table 3 PM₁₀ Limit Values

4.6 On-Site Airport Monitoring Station Results: Daily Average PM2.5

Daily average PM_{2.5} concentrations recorded at the automatic station in DAP in 2023 are presented in Figure 6. The average PM_{2.5} was calculated as 6 µg/m³.

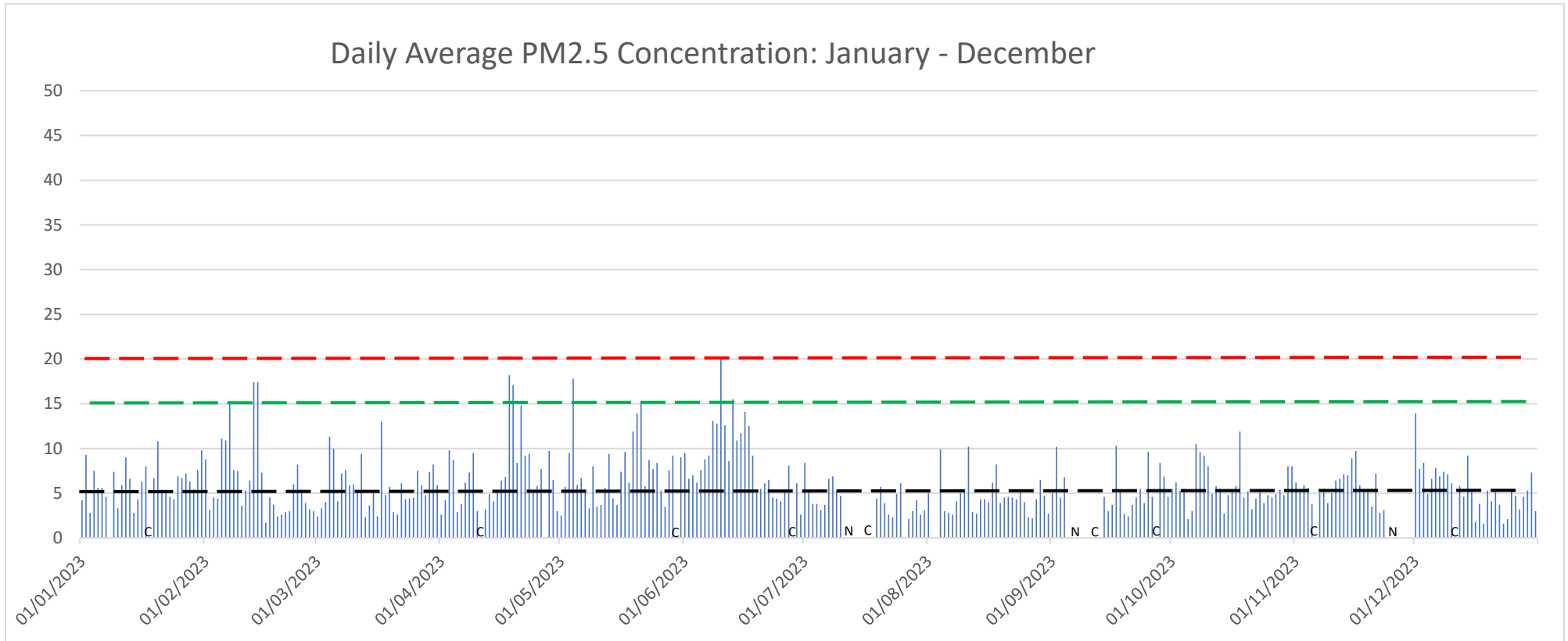


Figure 6: Daily Average PM_{2.5} 2023

C = Calibration
N = No Data

--- EU Current Limit (20 µg/m³)
--- WHO Target 2026 (15 µg/m³)
--- WHO Target 2040 (5 µg/m³)

5.0 Onsite: Annual Average NO₂ and PM₁₀ and PM_{2.5} (2012- 2023)

Annual mean NO₂, PM₁₀ and PM_{2.5} are presented in Table for the automatic station onsite at DAP. The trends over ten years are shown in Figure 7. For all parameters, annual limits are below the threshold limits outlined in the Regulations.

Location	Year	NO ₂ (µg/m ³)	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)
Dublin Airport Station	2023	21	12	6
	2022	19	12	NA
	2021	19	11	NA
	2020	22	16	NA
	2019	28	18	NA
	2018	28	20	NA
	2017	20	21	NA
	2016	23	23	NA
	2015	22	20	NA
	2014	22	21	NA
	2013	19	23	NA
	2012	19	20	NA
Annual Limit Value	Regulations	40	40	20

Table 4: Annual Mean NO₂, PM₁₀ and PM_{2.5} Concentrations at Dublin Airport

Notes

1. Values rounded to the nearest number.

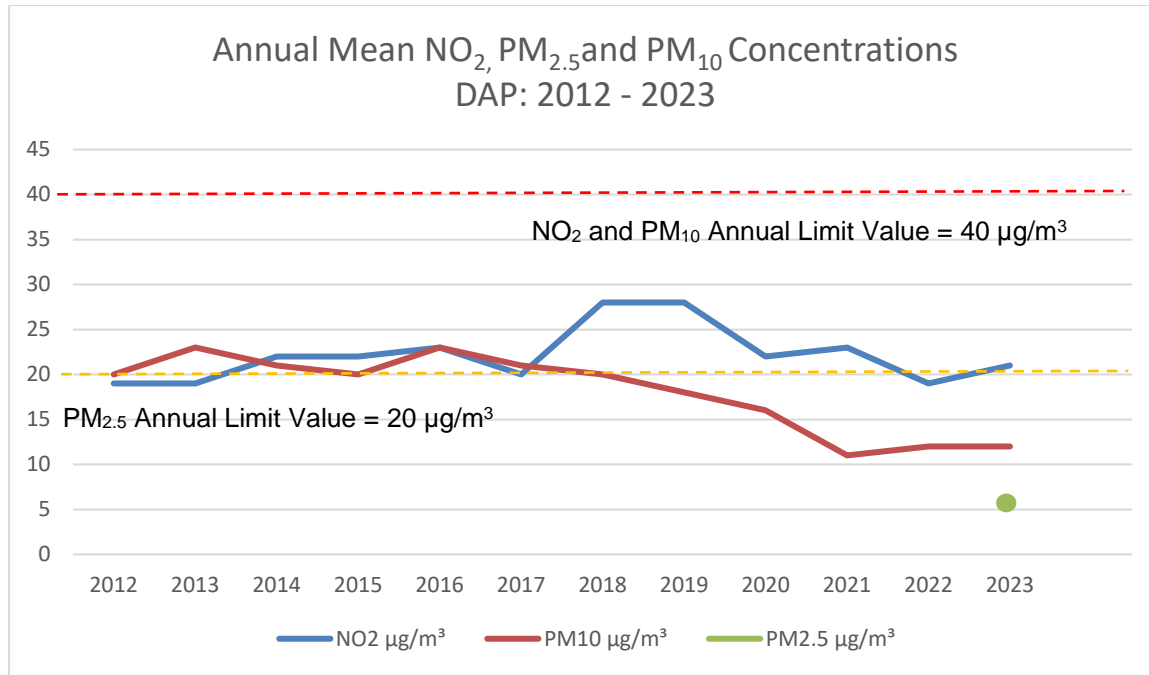


Figure 7 Annual Mean NO₂, PM₁₀ and PM_{2.5} Concentrations at Dublin Airport

PM₁₀, PM_{2.5} and NO₂ results monitored at DAP are well below limits contained in the Regulations. Elevated readings of PM₁₀, PM_{2.5} and NO₂ can occur for a variety of reasons, from both natural and manmade sources including international volcanic eruptions, vehicle traffic, agriculture, industrial emissions, de-icing of roads, etc.

6.0 Results Summary

The EPA is the designated Competent Authority in Ireland for the coordination of ambient air quality monitoring in accordance with the Regulations and undertakes monitoring throughout the country. The tables below compare DAP's annual NO₂, PM₁₀ and PM_{2.5} average concentrations with the EPA national network stations records for years 2013 - 2023.

Location	NO ₂ (µg/m ³)										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023 ¹
Winetavern St.	31	31	31	37	27	29	28	15	24	19	
Rathmines	19	17	18	20	17	20	22	13	22	14	
Swords	15	14	15	16	14	16	15	11	13	12	
Blanchardstown	29	31	25	30	26	25	31	12	34	24	
Dublin Airport Station ²	19	22	22	23	20	28*	28*	22	23	20	21
Annual Limit Value	40										

*elevated readings linked to construction activity.

Table 5: NO₂ comparisons with EPA national network stations (2013 – 2023)

Location	PM ₁₀ (µg/m ³)										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023 ¹
Winetavern St	14	14	14	14	13	14	15	13	12	14	
Rathmines	17	14	15	15	13	15	14	11	12	15	
Phoenix Park	14	12	12	11	9	11	11	10	10	11	
Blanchardstown	20	18	17	18	15	17	19	15	14	15	
Ennis	20	21	18	17	16	16	18	20	19	20	
Dublin Airport Station ²	23	21	20	23	21	20	18	16	11	12	12
Annual Limit Value	40										

Table 6: PM₁₀ comparisons with EPA national network stations (2013 – 2023)

Location	PM _{2.5} (µg/m ³)										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023 ¹
Winetavern St	NA	NA	NA	NA	NA	14	NA	NA	NA	NA	
Rathmines	NA	NA	NA	NA	NA	15	8	8	9	8	
Phoenix Park	NA	NA	NA	NA	NA	11	8	6	6	6	
Blanchardstown	NA	NA	NA	NA	NA	17	NA	8	8	8	
Ennis	NA	NA	NA	NA	NA	16	14	16	15	16	
Dublin Airport Station ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6
Annual Limit Value	20										

Table 7: PM_{2.5} comparisons with EPA national network stations (2013 – 2023)

Notes

1. 2023 EPA monitoring data has not yet been published.
2. Values rounded to the nearest whole number.

7.0 Conclusion

7.1 Onsite Monitoring

The results of the NO₂ and PM₁₀ concentrations using the online analyser indicate concentrations are below the relevant annual limit value of 40µg/m³ and within the allowed criteria of short-term limit values. The results of the PM_{2.5} concentrations using the online analyser indicate concentrations are below the relevant annual limit value of 20µg/m³. The annual average results for PM₁₀ was 12 µg/m³ and for PM_{2.5} was 6 µg/m³ while NO₂ was 21 µg/m³. The NO₂ levels remained broadly similar to the 2022 results and the PM₁₀ levels remained the same, in 2023. We will begin compare annual PM_{2.5} data in the 2024 annual report.

In collaboration with the EPA, Dublin Airport's continuous air monitoring can be viewed on the EPA website at: <https://airquality.ie/>. daa is committed to working with regulators and the local community to ensure that there is transparency about air quality information at the airport.

7.2 Offsite Monitoring

NO₂ readings at Dublin Airport remained largely consistent between 2022 and 2023. While monitoring results at all locations were within the annual limit of 40µg/m³ the highest NO₂ concentrations were identified at the Dublin Airport bus depot location (A11) with an average of 39.28 µg/m³ recorded. A high volume of vehicular activity occurs in this area. daa will continue to closely monitor emission levels at this location.