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Dublin Airport Air Quality Monitoring  
Annual Report 2017

HSSE Environment

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**Dublin Airport Air Quality Monitoring**  
**Annual Report 2017**



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## Glossary

### Abbreviation Definition

EPA	Environmental Protection Agency
NO	Nitrogen Oxide
NO <sub>2</sub>	Nitrogen Dioxide
NOx	Oxides of Nitrogen
PM <sub>10</sub>	Airborne particulate Matter, particle size less than 10 micron.
AQIH	Air Quality Index for Health
The Regulations	Ambient Air Quality Standards Regulations 2011

### Version Control

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## **Executive Summary**

daa undertakes a programme of air quality monitoring at Dublin Airport (DAP) and in surrounding communities. A continuous air monitoring station is located within the DAP boundary. Passive diffusion tube sampling is undertaken at 10 locations within local communities. This report provides an overview of the results of air quality monitoring undertaken by daa at DAP and environs in 2017. Air monitoring locations are listed in Table 1 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. It should be noted that 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 EU Directive 2008/50/EC. The EPA is required to submit an annual Air Quality report to the Minister of Communications, Climate Action and the Environment and to the European Commission. The latest EPA Report entitled: Air Quality in Ireland 2016, Indicators of Ambient Air Quality was published in 2017 and is available on the EPA website.

Data collected from each monitoring location presented in this report was well within the limit values mandated in the Regulations in 2017. Similarly, data collected since implementation of the air quality monitoring programme has been found to be well within the limit values mandated in the Regulations.

daa is considering moving the monitoring station to an alternative location in 2018 and will liaise with Fingal County Council and the EPA in determining the new location for the continuous monitoring station within the DAP boundary. The results of National Air Monitoring Programmes carried out by the EPA and local authorities and further information relating to air quality such as the Air Quality Index for Health can be found at [www.epa.ie](http://www.epa.ie).

## 1.0 Introduction

### 1.1 Background

Dublin Airport (DAP) is located approximately 10 km 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 10 external monitoring locations in the vicinity of the airport in 2017. 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. This report compares the data collected during the daa monitoring programme with limit values contained in The Ambient Air Quality Standards Regulations 2011 (the Regulations) to assess air quality at each monitoring location.

The Regulations 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 (SO<sub>2</sub>)
- Oxides of nitrogen NO<sub>x</sub> (NO and NO<sub>2</sub>)
- Carbon monoxide (CO)
- Ozone (O<sub>3</sub>)
- Particulate Matter (PM<sub>10</sub>)

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

- 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. Results are consistently below limit values (where limits exist).

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

- Nitrogen Dioxide (NO<sub>2</sub>) and Particulate Matter (PM<sub>10</sub>) at the DAP automatic station;  
and
- Nitrogen Dioxide (NO<sub>2</sub>) and Benzene using diffusion tubes at 10 offsite locations.

## 2.0 Monitoring Locations

A list of the ambient air quality sampling locations is presented in Table 1. Sampling locations are presented as Figure 1.

Ref	Location	Method	Parameters
<b>On-site</b>	Dublin Airport.	Continuous analyser <sup>1</sup>	<b>NO<sub>2</sub></b> <b>PM<sub>10</sub></b>
<b>A1</b>	Forrest Little Golf Club.	Passive Tubes	<b>NO<sub>2</sub></b> <b>Benzene</b>
<b>A2</b>	Kilreesk Lane, St. Margaret's.	Passive Tubes	
<b>A3</b>	Ridgewood Estate West, Swords.	Passive Tubes	
<b>A4</b>	St. Margaret's School and Parish House.	Passive Tubes	
<b>A5</b>	Fire Station, Huntstown, Dublin Airport.	Passive Tubes	
<b>A6</b>	Southern Boundary Fence, Dublin Airport	Passive Tubes	
<b>A7</b>	Western Boundary Fence, Dublin Airport	Passive Tubes	
<b>A8</b>	St. Nicholas of Myra School, Malahide Road.	Passive Tubes	
<b>A9</b>	Naomh Mearnóg GAA Club,	Passive Tubes	
<b>A10</b>	Oscar Papa Site, Portmarnock.	Passive Tubes	

**Table 1** Community Ambient Air Quality Monitoring Locations

### Note

1. A review of the Air Quality Monitoring Station location will be undertaken in 2018.



**Figure 1** Air Quality Monitoring Locations



### **3.0 Parameters and Sampling Methodology**

#### **3.1 Offsite Passive Sampling**

##### **3.1.1 Nitrogen Dioxide (NO<sub>2</sub>) and Benzene (C<sub>6</sub>H<sub>6</sub>)**

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/m<sup>3</sup> (micrograms per cubic metre). Monthly mean concentrations have been averaged to give an annual mean which can be compared with limit values as presented in

of this report.

#### **3.2 Onsite Sampling**

##### **3.2.1 Equipment Calibration**

An external expert service provider undertakes routine monthly servicing of the DAP air quality monitoring equipment. Additionally, the monitoring station undergoes a full service twice yearly. During monthly 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 monthly calibration process takes approximately 24 hours, data collection resumes after this 24-hour period.

The dates of calibration and maintenance of the air monitoring equipment in 2017 were as follows:

- 7<sup>th</sup> February
- 16<sup>th</sup> March
- 10<sup>th</sup> April
- 12<sup>th</sup> May
- 20<sup>th</sup> July
- 17<sup>th</sup> August
- 1<sup>st</sup> September
- 23<sup>rd</sup> October
- 9<sup>th</sup> November
- 3<sup>rd</sup> January (2018)

In 2017, due to down times of the monitoring equipment during calibration, approximately 94% of NO<sub>2</sub> data was captured. The NO<sub>2</sub> monitoring equipment was not impacted by any faults or specific maintenance issues in 2017. The capture of PM<sub>10</sub> data was approximately 85%, due to down time of the monitoring equipment during calibration and a fault in June/July 2017 which arose from a blockage of the filtering mechanism.

### **3.2.2 Nitrogen Dioxide (NO<sub>2</sub>)**

Onsite monitoring of NO<sub>2</sub> is carried out on a continuous basis at the continuous airport monitoring station. Measurement of NO<sub>2</sub> is carried out using a Horiba APNA-370 ambient NOx monitor which employs a cross-flow modulated chemiluminescence method. The results are expressed in µg/m<sup>3</sup>.

### **3.2.3 Particulate Matter (PM<sub>10</sub>)**

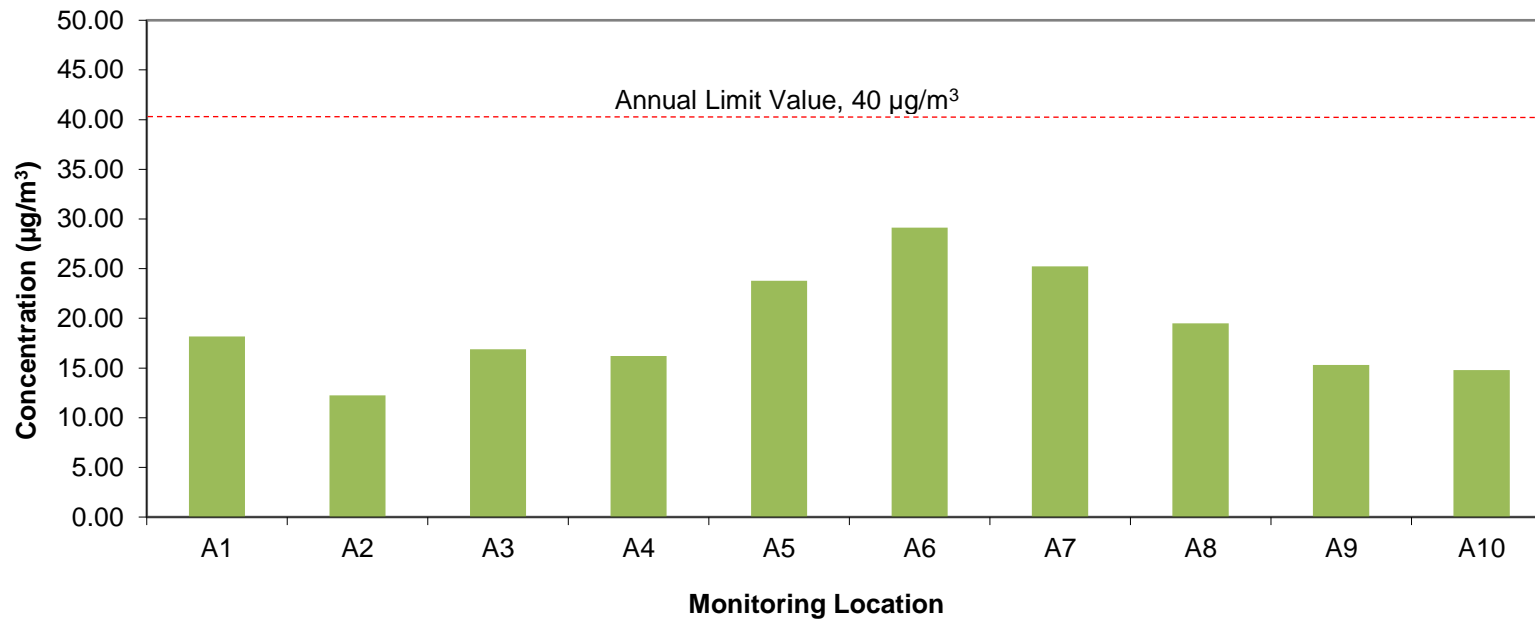
PM<sub>10</sub> is defined as airborne particulate matter with an aerodynamic diameter equal to or less than 10µm. PM<sub>10</sub> is monitored on a continuous basis at the airport monitoring station.

The PM<sub>10</sub> instrument automatically measures and records airborne particulate concentration levels using the principle of beta ray attenuation. The sampler monitors the PM<sub>10</sub> 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 PM<sub>10</sub> sampling. The results are expressed in µg/m<sup>3</sup>.

## 4.0 Monitoring Results

### 4.1 Offsite NO<sub>2</sub> Monitoring Results

Figure 2 presents the annual mean NO<sub>2</sub> concentration for each location based on the monthly passive tube sampling. The Regulations mandate that the annual mean limit value must be below 40 µg/m<sup>3</sup> for NO<sub>2</sub>. As can be seen from Figure 2, the annual mean values were below the limit value at all monitoring locations in 2017.

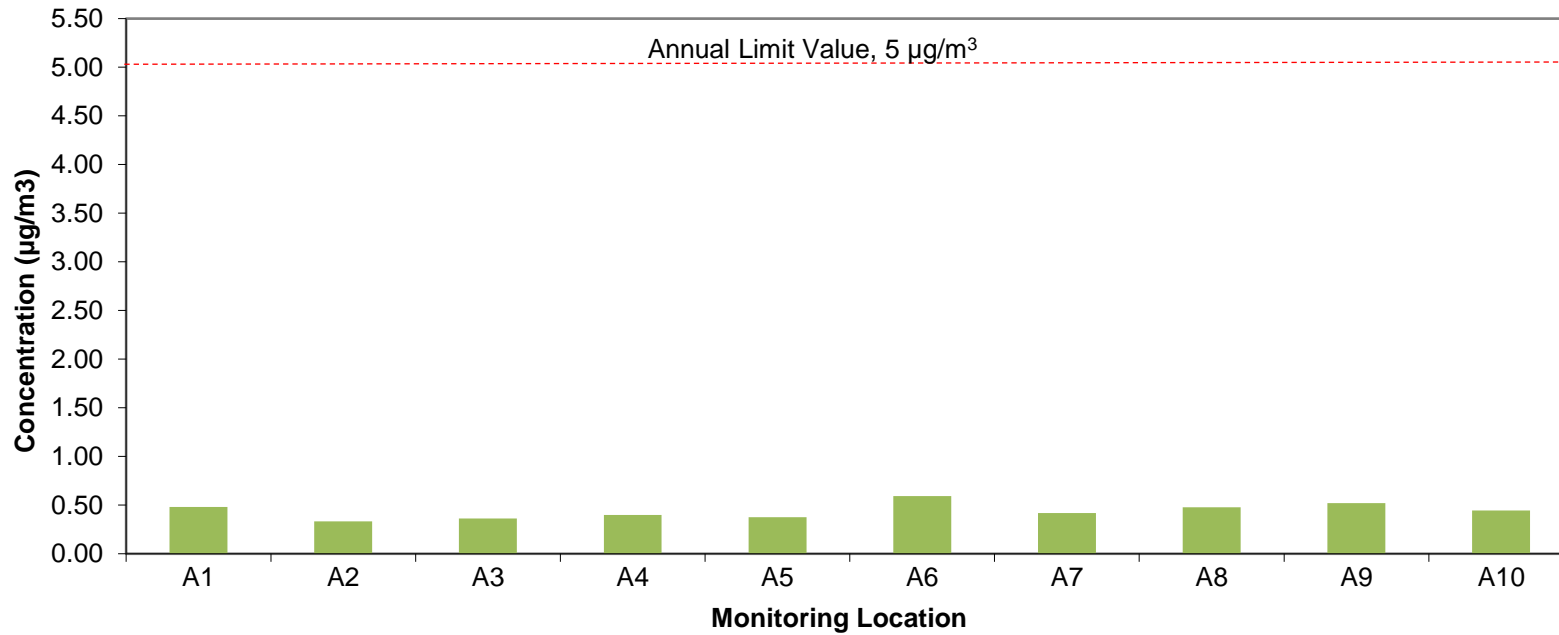


*\*A6 and A7 locations closest to motorway.*

**Figure 2:** Average NO<sub>2</sub> Concentrations by location, 2017

#### 4.2 Offsite Benzene (C<sub>6</sub>H<sub>6</sub>) Monitoring Results

Figure 3 presents the mean Benzene concentration for each location, based on the monthly passive tube sampling in 2017. The Regulations mandate an annual mean limit value of 5 µg/m<sup>3</sup> for Benzene. As can be seen from Figure 3, the annual mean values were well below the limit value of 5 µg/m<sup>3</sup> and less than 1 µg/m<sup>3</sup> at all monitoring locations.



**Figure 3:** Average Monthly Benzene (C<sub>6</sub>H<sub>6</sub>) Concentrations by location 2017

### **4.3 Odours**

Fuel odours may arise from many sources including road traffic, ground handling equipment as well as aircraft on the ground. Depending on weather conditions odours from fuel (hydrocarbons) may be detected at locations close to the airport. As discussed in section 4.2 of this report, diffusion tubes results for benzene indicate that the average concentrations are well below the national limit value at all locations.

The human nose is extremely sensitive and can detect very low concentrations of hydrocarbons in the air. Weather also impacts the dispersion of odour and affects the strength of odour and locations affected.

#### 4.4 On-site Airport Monitoring Station Results: Daily Average NO<sub>2</sub>

NO<sub>2</sub> concentrations are measured at the automatic station at DAP. Figure 4 presents the daily average NO<sub>2</sub> concentrations measured during 2017. The equivalent daily average was calculated as 20.3 µg/m<sup>3</sup>.

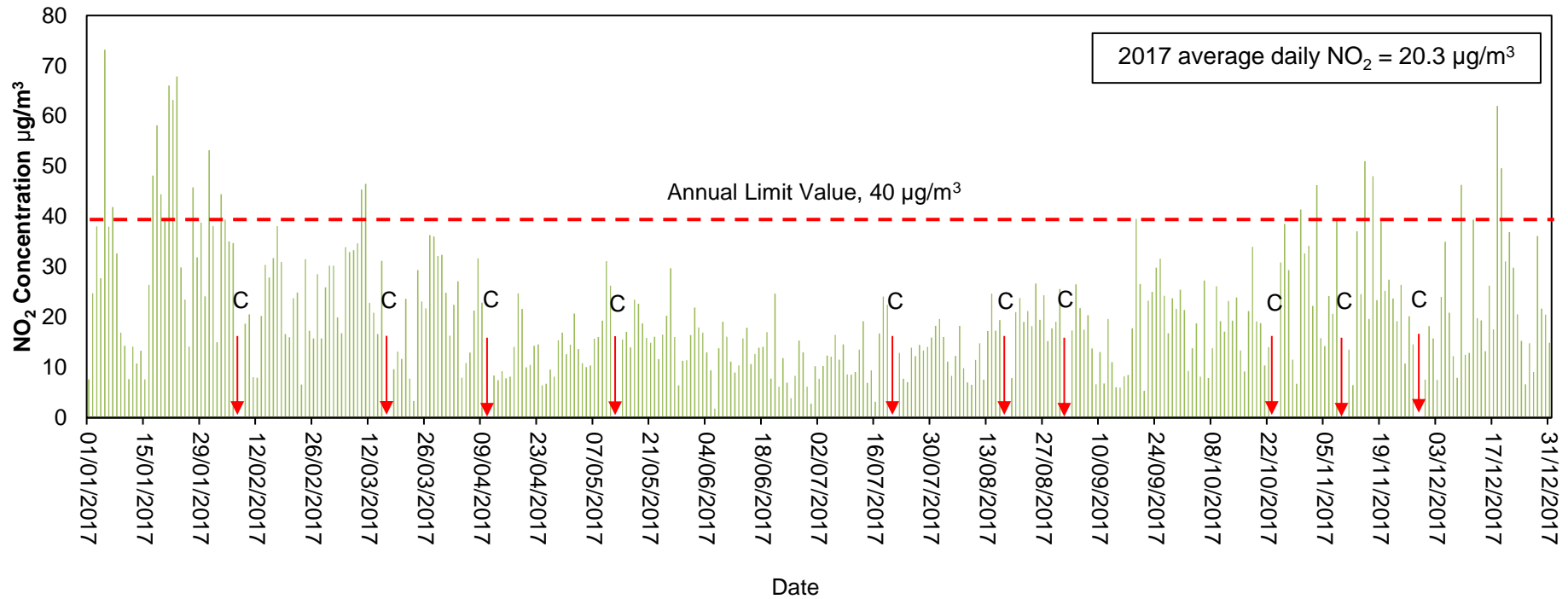


Figure 4: Daily Average NO<sub>2</sub> 2017

**Legend**  
C = Calibration

#### 4.5 On-site Airport Monitoring Station Results: PM<sub>10</sub>

Daily average PM<sub>10</sub> concentrations recorded at the automatic station in DAP in 2017 are presented in Figure 5. The mean PM<sub>10</sub> was calculated as 20.7 µg/m<sup>3</sup>. The Regulations set a 24 hour PM<sub>10</sub> limit value of 50 µg/m<sup>3</sup>, and an annual mean limit value of 40 µg/m<sup>3</sup> as shown in Table 2.

Objective	Averaging Period	Limit or Threshold Value (µg/m <sup>3</sup> )	No. of Allowed Exceedances (Regulations 2011)	No. of Exceedances
PM <sub>10</sub> Limit Value	24 hour	50	Not to be exceeded on more than 35 days per year	4
PM <sub>10</sub> Limit Value	Calendar Year	40	NA	NA

**Table 2** PM<sub>10</sub> Limit Values

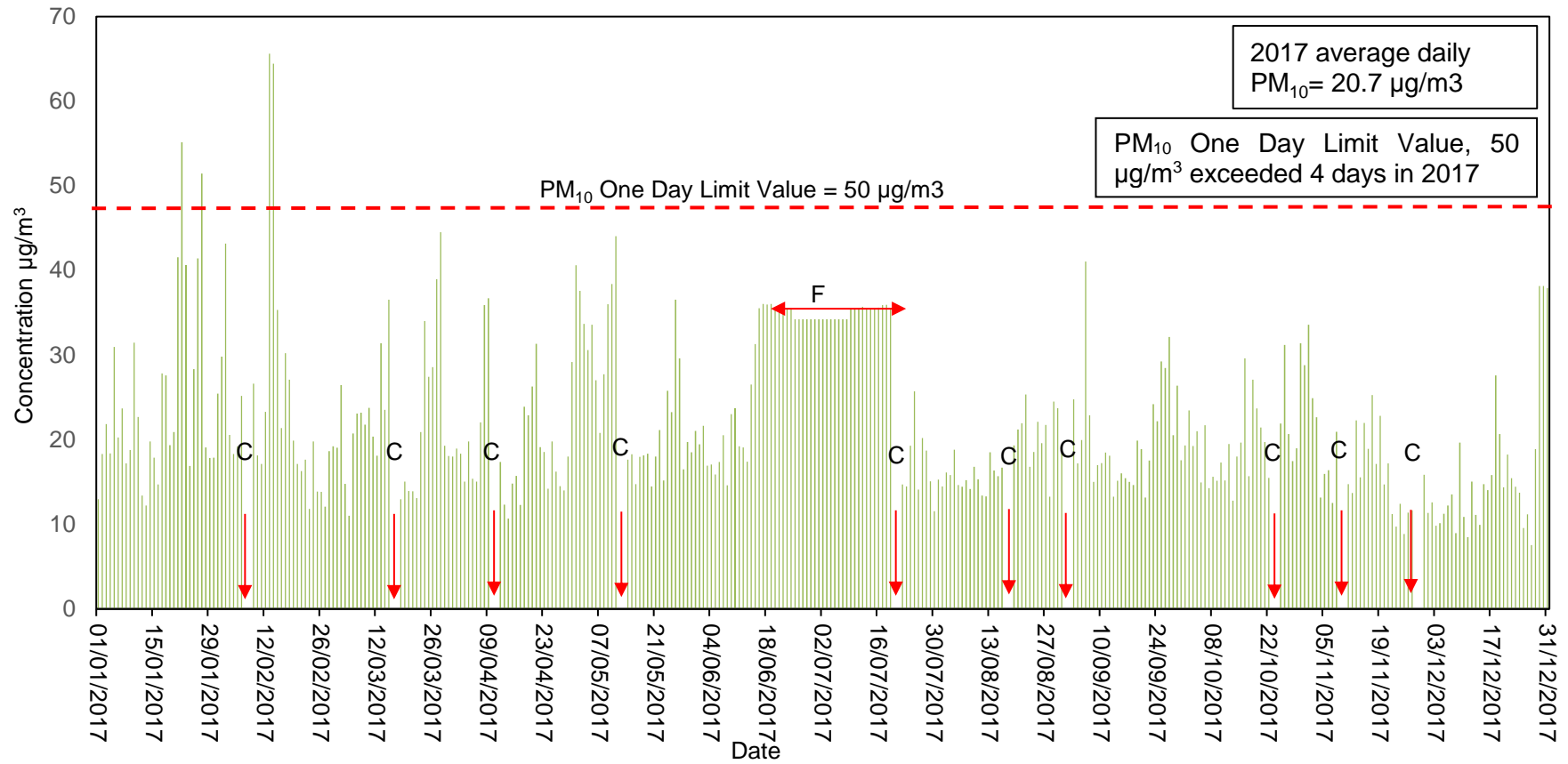


Figure 5: Daily Average PM10 2017

**Legend**  
 C = Calibration  
 F = Fault



### 5.0 Onsite: Annual Average NO<sub>2</sub> and PM<sub>10</sub> (2011- 2017)

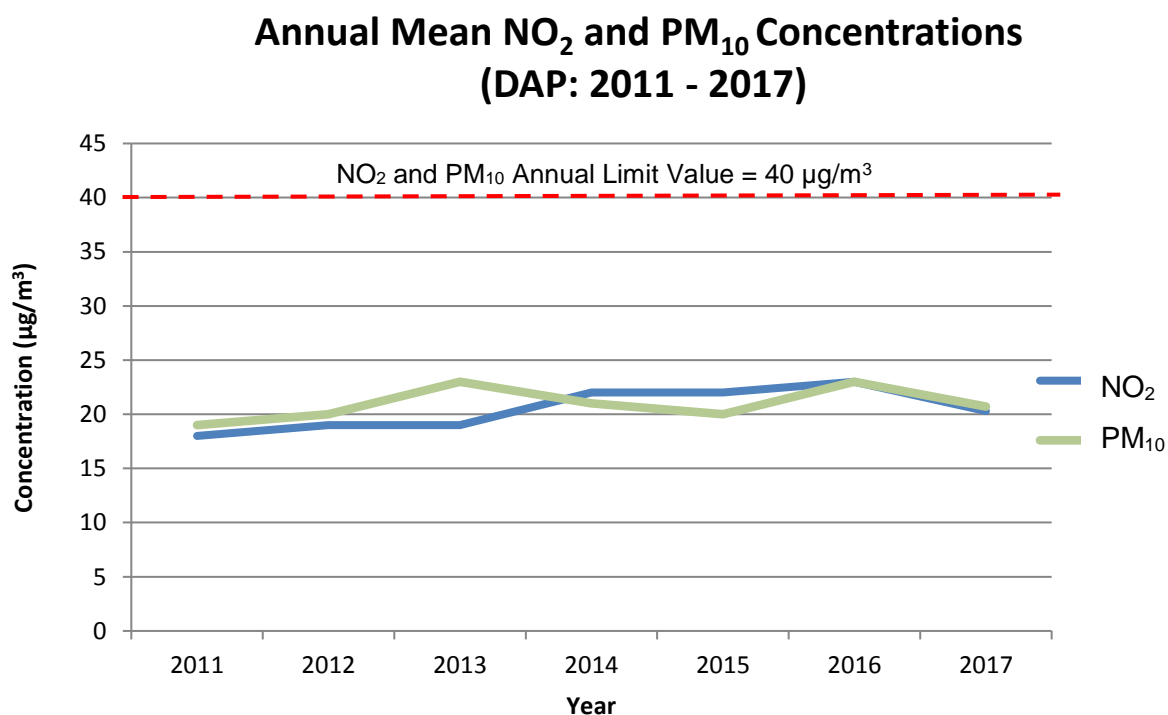
Annual mean NO<sub>2</sub> and PM<sub>10</sub> are presented in Table 3 for the automatic station onsite at DAP. The trends over six years are shown in Table 3. For both parameters, annual limits are well below the threshold limits contained within the Regulations.

Location	Year	NO <sub>2</sub> (µg/m <sup>3</sup> )	PM <sub>10</sub> (µg/m <sup>3</sup> )
Dublin Airport Station	2017	20	21
	2016	23	23
	2015	22	20
	2014	22	21
	2013	19	23
	2012	19	20
<b>Annual Limit Value</b>	<b>Regulations</b>	<b>40</b>	<b>40</b>

**Table 3** Annual Mean NO<sub>2</sub> and PM<sub>10</sub> Concentrations at Dublin Airport

#### Notes

1. Values rounded to the nearest number.



**Figure 6** Annual Mean NO<sub>2</sub> and PM<sub>10</sub> Concentrations at Dublin Airport

PM<sub>10</sub> results monitored at DAP are well below limits contained in the Regulations and have decreased marginally compared to previous years. It is widely recognised that elevated readings of PM<sub>10</sub>, can occur for a variety of reasons, from both natural and manmade

sources including international volcanic eruptions, sand storms, agriculture, industrial emissions, de-icing of roads etc. These factors can be further exacerbated by a change in prevailing wind conditions. The compound effect is that air quality monitoring stations may intermittently record elevated readings of PM<sub>10</sub> due to an event unrelated to local activities.

The air quality monitoring station is currently located adjacent to an increasingly active construction compound which may have resulted in elevated readings of PM<sub>10</sub> on some occasions. DAP is considering moving the monitoring station to an alternative location in 2018 and will liaise with Fingal County Council and the EPA in determining the new location for the continuous monitoring station within the DAP boundary to facilitate the collection of data which is of most use to the local communities, Fingal County Council and DAP.

## 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 NO<sub>2</sub> and PM<sub>10</sub> average concentrations with the EPA national network stations records for years 2010 - 2016. The most recent EPA report on ambient air monitoring in Ireland is the "Air Quality in Ireland 2016 – Key Indicators of Ambient Air Quality" (EPA 2017).

Location	NO <sub>2</sub> (µg/m <sup>3</sup> )							
	2010	2011	2012	2013	2014	2015	2016	2017 <sup>1</sup>
Winetavern St	35	34	29	31	31	31	36.6	
Rathmines	25	20	21	19	17	18	20	
Swords	16	14	15	15	14	15	15.7	
Blanchardstown		31	30	29	31	25	30.2	
Dublin Airport Station <sup>2</sup>	18	19	19	19	22	22	23	20
Annual Limit Value	40							

**Table 4** NO<sub>2</sub> comparisons with EPA national network stations (2010 – 2017)

Location	PM <sub>10</sub> (µg/m <sup>3</sup> )							
	2010	2011	2012	2013	2014	2015	2016	2017 <sup>1</sup>
Winetavern St	19	14	13	14	14	14	14	
Rathmines	18	16	14	17	14	15	15	
Phoenix Park	11	12	11	14	12	12	11	
Blanchardstown		16	-	20	18	17	18	
Ennis	27	22	19	20	21	18	17	
Dublin Airport Station <sup>2</sup>	19	20	20	23	21	20	23	21
Annual Limit Value	40							

**Table 5** PM<sub>10</sub> comparisons with EPA national network stations (2010 – 2017)

### Notes

1. 2017 EPA monitoring data has not yet been published.
2. Values rounded to the nearest number.

As can be seen from Table 4, the average annual concentrations of NO<sub>2</sub> monitored at DAP in 2017 (20 µg/m<sup>3</sup>) were 45% lower than those recorded by the EPA's air quality monitoring station at Winetavern Street in Dublin City Centre in 2016 (36.6 µg/m<sup>3</sup>). 2017 EPA monitoring data has not yet been published.

As previously mentioned in this report, the air quality monitoring station is currently located adjacent to an increasingly active construction compound and this may have contributed to

elevated readings of PM<sub>10</sub> and NO<sub>2</sub>. daa is considering moving the monitoring station to an alternative location in 2018 and will liaise with Fingal County Council and the EPA in determining the new location for the continuous monitoring station within the DAP boundary to facilitate the collection of data which is of most use to the local communities, Fingal County Council and DAP

## **7.0 Conclusion**

**Onsite Monitoring:** The results of the NO<sub>2</sub> and PM<sub>10</sub> concentrations using the online analyser indicate concentrations are well below the relevant annual limit value of 40µg/m<sup>3</sup> and well within the allowed criteria of short term limit values.

**Offsite Monitoring:** The diffusion tube results for NO<sub>2</sub> indicate that the highest concentrations are recorded adjacent to the main roads around the airport. The monitoring locations A6 and A7 are only a few metres from the road and are therefore influenced by roadside concentrations which are close to the vehicular emission source. Concentrations further away from the roadways are much lower and similar to the concentrations recorded at the on-site station. All concentrations are below the annual average limit value for NO<sub>2</sub>. Diffusion tube results for benzene indicate that concentrations at all locations are well below the annual average limit value.