

Air Quality Monitoring at Dublin Airport: Annual Report for 2013

HSSE Department



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Appendix 1: AQIH health advice (EPA)

Glossary

Abbreviation Definition

| | |
|-------------------------------|--|
| EPA | Environmental Protection Agency |
| NO | Nitrogen Oxide |
| NO ₂ | Nitrogen Dioxide |
| NO _x | Oxides of Nitrogen |
| PM ₁₀ | Airborne Particulate Matter of particle size less than 10 microns in diameter. |
| C ₆ H ₆ | Benzene |
| AQIH | Air Quality Index for Health |

Executive Summary

This report provides an overview of air quality at Dublin Airport and surrounding environs for 2013, based on data obtained from the onsite monitoring stations and diffusion tube monitoring in the surrounding areas. This includes the following parameters: nitrogen dioxide (NO₂); particulate matter (PM₁₀) and benzene (C₆H₆).

daa carries out extensive ambient air monitoring at Dublin Airport and the surrounding area. daa operate an air monitoring station on site at the airport and carry out diffusion tube monitoring in the surrounding areas. A list of these locations is presented in table 1.1 and Figure 1 enclosed within this report.

For comparison purposes the Ambient Air Quality Standards Regulations 2011 (SI 180 of 2011) are referenced. The Air Quality Standards Regulations do not require individual companies or operators to carry out air monitoring or compare the results with limit values specified in the Air Quality Standards Regulations. Monitoring for compliance with the Regulations is the responsibility of local authorities and is supervised by the competent authority under the Regulations, the EPA.

The results from each monitoring location are well below the ambient standards and are typical of urban and inter-urban areas. For national monitoring results carried out by the EPA and local authorities and information relating to air quality please visit www.epa.ie. Up-to-date information including the Air Quality Index for Health is available at www.airquality.epa.ie

1. Introduction

1.1. Background

Dublin Airport is Ireland's busiest international airport, handling approximately 20 million passengers in 2013. Dublin Airport covers a significant area of land in North Dublin, approximately two and a half thousand acres and is bounded on two sides by two of the busiest highways in the country – the M1 and the M50.

A list of the current ambient air quality sampling locations is given in Table 1.1. The spatial relationships of the sampling locations to the airport are indicated on a local area map in Figure 1.

1.2. Aims and Objectives

The aim is to monitor concentrations of air parameters around the airport. The results of the daa monitoring programme are compared with the limit values contained within the Regulations as a means of illustrating the general air quality at each location and not as a measure of compliance.

The parameters monitored were as follows:

- Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}) using the automatic Dublin Airport Station
- Nitrogen Dioxide (NO_2) and Benzene (C_6H_6) using diffusion tubes at 10 locations

2. Monitoring Locations

A list of the ambient air quality sampling locations for 2013 is given in Table 1.1. The spatial relationships of the sampling locations to the airport are indicated on a local area map in Section 2.

| Table 1.1 Community ambient air monitoring locations | | | |
|---|--|---------------------------|--|
| Reference | Location | Measurement Method | Parameters Reported |
| On-site¹ | West of Castlemoate Road, Dublin Airport | Continuous analysers | Nitrogen dioxide (NO ₂) Particulate Matter (PM ₁₀) |
| A1 | Forrest Little Golf Club | Passive Tubes | Nitrogen dioxide (NO ₂), Benzene (C ₆ H ₆) |
| A2 | Kilreesk Lane, St. Margaret's | Passive Tubes | |
| A3¹ | Ridgewood Estate West, Swords | Passive Tubes | |
| A4 | St. Margaret's School & 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 | |

¹ Air Monitoring Station located in the vicinity of a construction compound.

2.1. Locations of Monitoring Sites

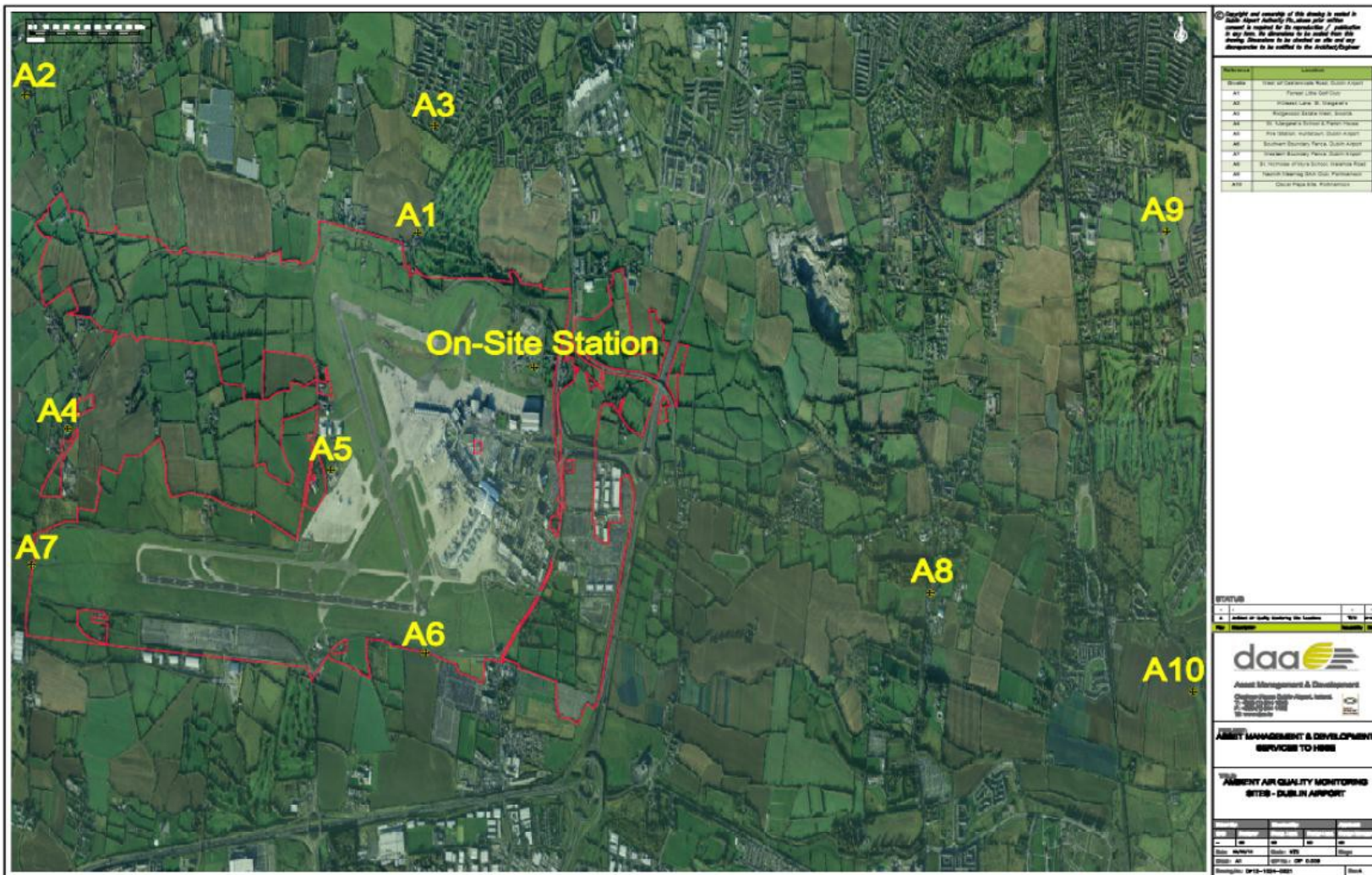


Figure 1: Map of Ambient Air Quality Monitoring Locations for Dublin Airport

3. Description of Parameters and Sampling Methodology

3.1. Passive Sampling: Nitrogen Dioxide (NO₂) & Benzene (C₆H₆)

daa operates a network of passive diffusion tube samplers for nitrogen dioxide and benzene. The intent of this network is to establish the wider spatial pattern of NO₂ and C₆H₆ concentrations in the area surrounding the Airport. The locations of the monitoring sites are shown in Figure 1 and are described in Table 1.1. The diffusion tubes are exposed for approximately 4-week intervals. The tubes were then analysed using UV Spectrophotometry at a UKAS accredited laboratory. The diffusion tubes record monthly mean concentrations, which have been averaged to give the annual mean. The results are expressed in µg/m³.

3.2. Onsite Sampling: Nitrogen Dioxide (NO₂)

Monitoring of NO₂ was carried out on a continuous basis at the airport monitoring location between January and December 2013. Measurement of NO₂ was carried out, using a Horiba APNA-370 ambient NOx monitor which employs a cross-flow modulated chemiluminescence method.

3.3. Onsite Sampling: Particulate Matter (PM₁₀)

Airborne particulate matter with an aerodynamic diameter equal to or less than 10µm was monitored using the onsite continuous analyser on a continuous basis at the airport monitoring location between January and December 2013. The Met One Instruments automatically measures and records airborne particulate concentration levels using the principle of beta ray attenuation. The sampler draws a measured volume of air through a chamber containing a pre-conditioned and pre-weighed filter according to USEPA protocol for PM₁₀ sampling. The results are expressed in µg/m³.

4. Community Monitoring Results

The diffusion tubes record monthly mean concentrations, which have been averaged to give the annual mean.

4.1 Average Monthly NO₂ Concentrations

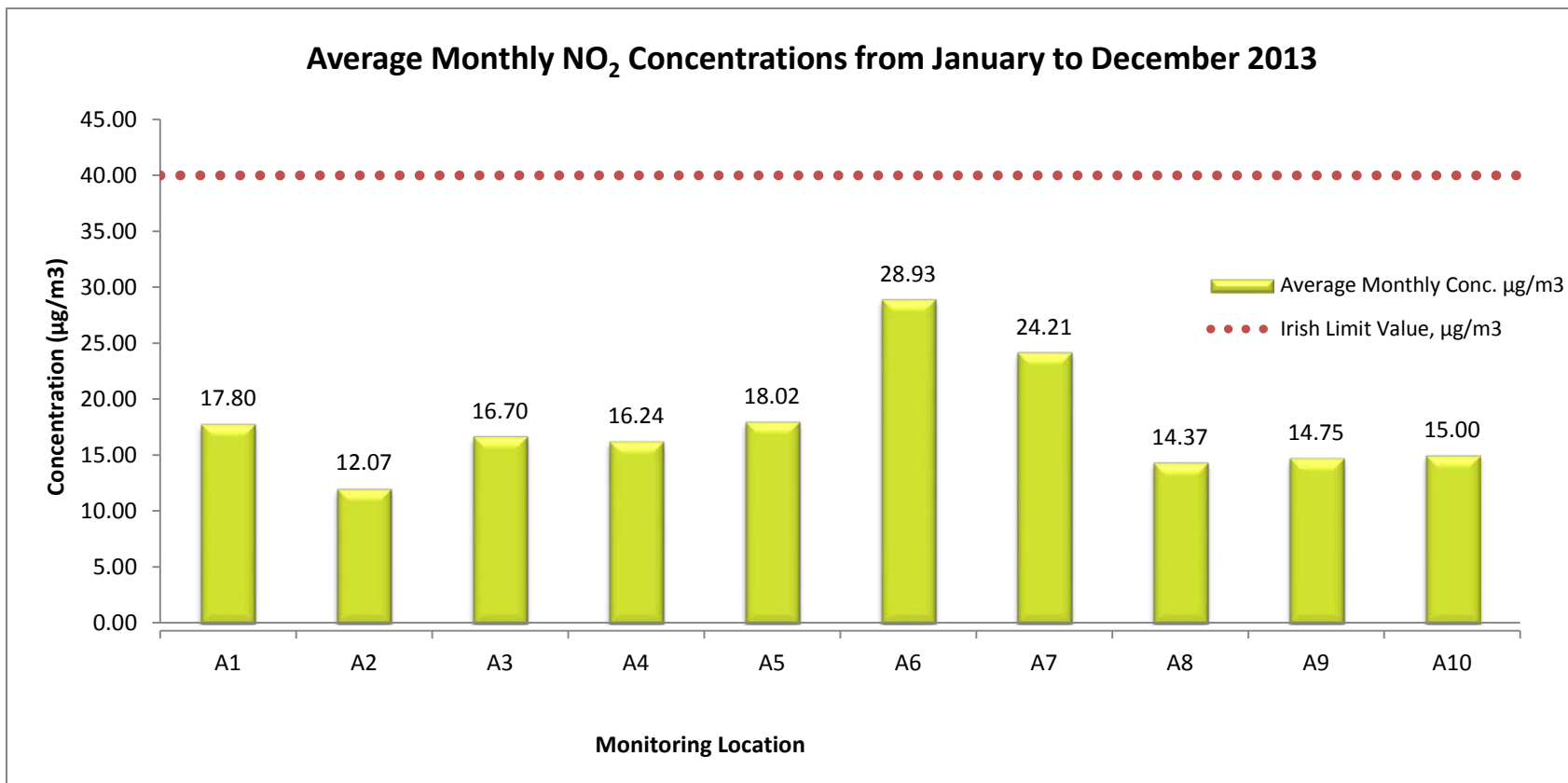


Figure 2: Average Monthly NO₂ Concentrations 2013

4.2 Average Monthly Benzene Concentrations

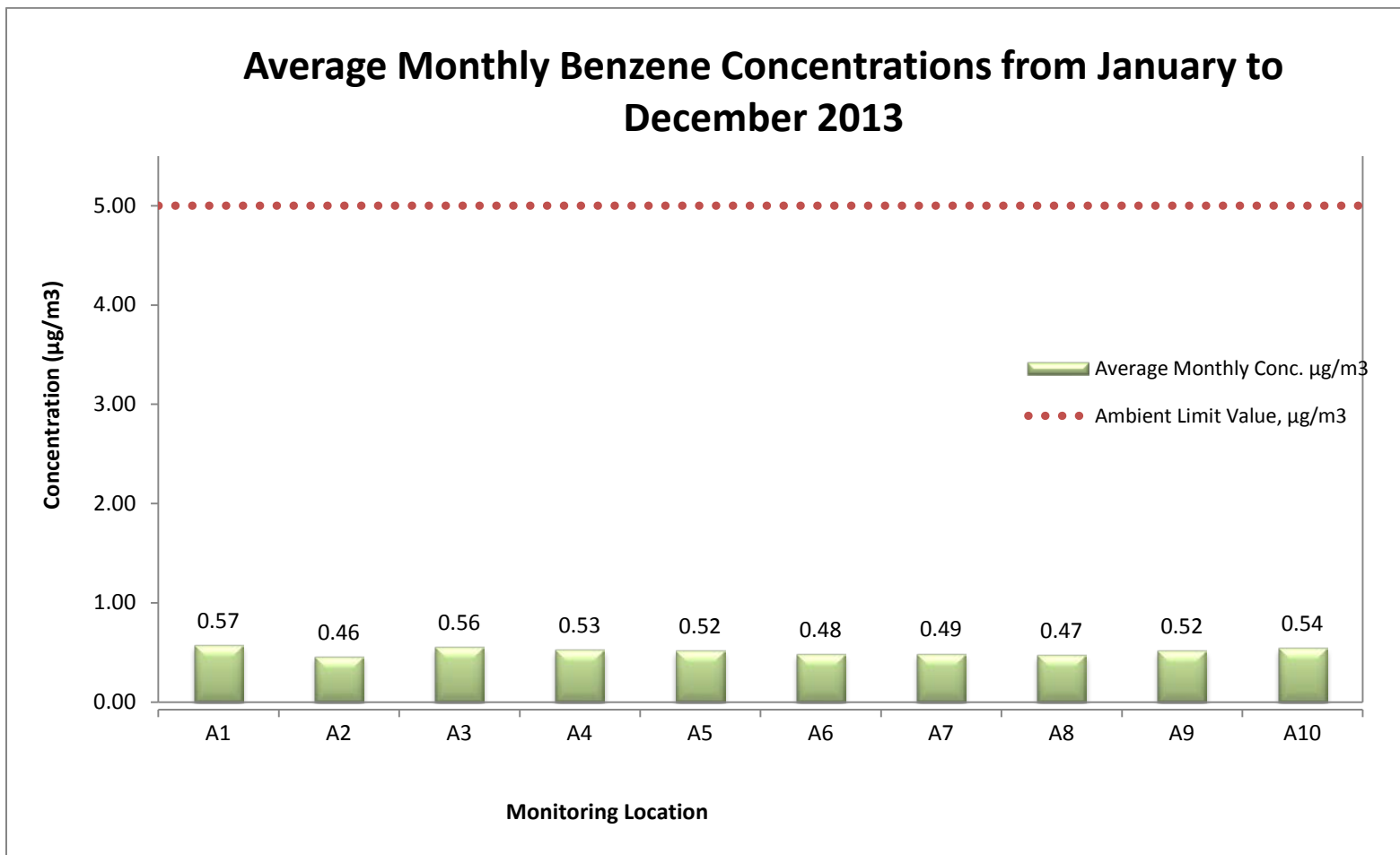


Figure 3: Average Monthly Benzene (C₆H₆) Concentrations 2013

5. On-site Airport Monitoring Station Results

5.1. Daily Average NO₂

The 2013 annual mean nitrogen dioxide concentration measured at the automatic station in Dublin Airport was 18.7 µg/m³ (microgrammes per cubic metre). The annual mean Irish limit value (40 µg/m³) was not exceeded in 2013.

Table 5-1: Air Quality Limit and Target Values as set out by CAFÉ Directive and S.I. No. 180 of 2011

| Objective | Averaging Period | Limit or Threshold Value |
|-----------------------------|------------------|--------------------------|
| NO ₂ Limit Value | Calendar Year | 40 |

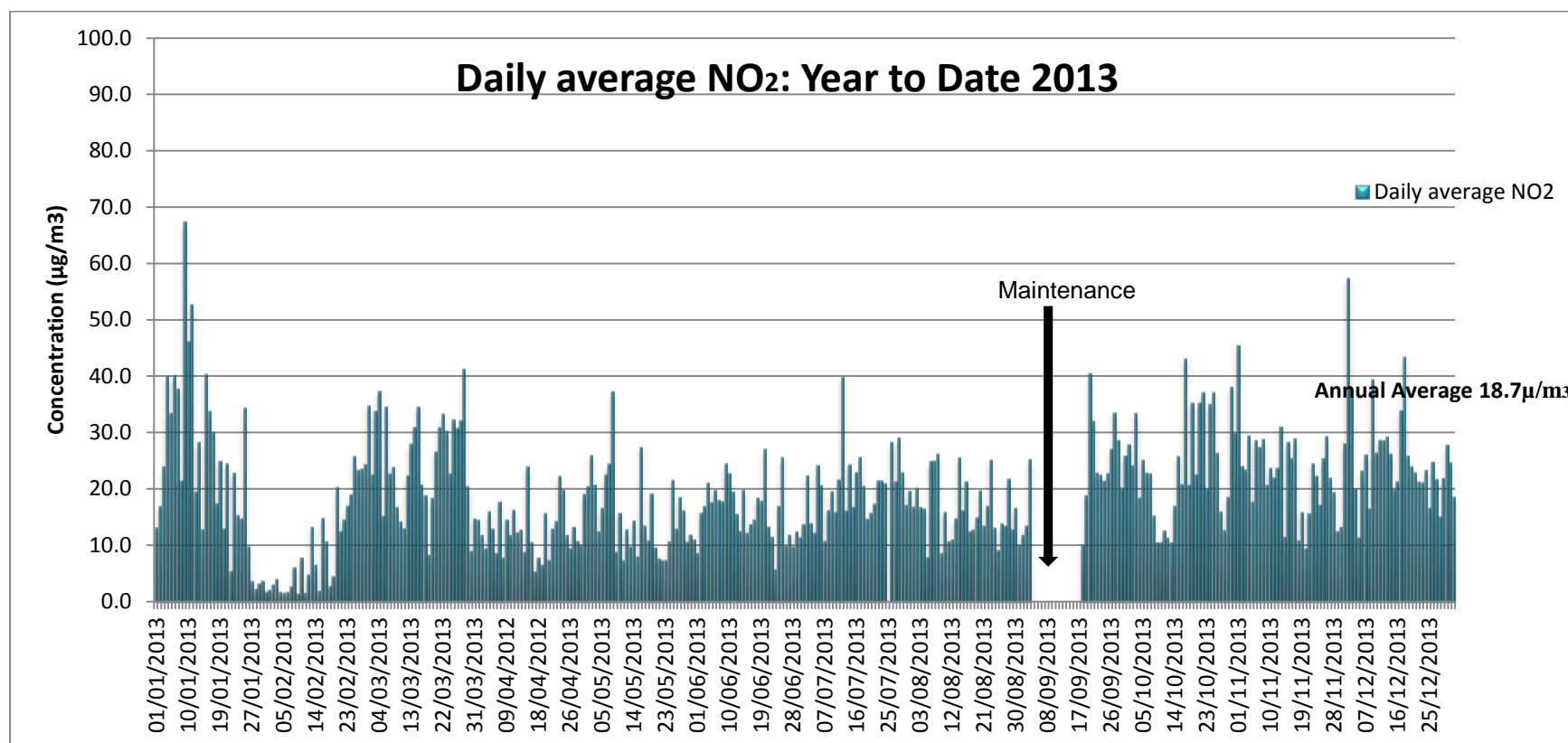


Figure 4: Daily Average NO₂ 2013

5.2. Daily average PM₁₀

The 2013 annual mean particulate matter concentration measured at the automatic station in Dublin Airport was 22.5 µg/m³ (microgrammes per cubic metre). The annual limit value (40 µg/m³) was not exceeded in 2013. The 2013 daily value did not surpass the no. of allowed exceedances as per the Ambient Air Quality Regulations.

Table 5-2: Air Quality Limit and Target Values as set out by CAFÉ Directive and S.I. No. 180 of 2011

| Objective | Averaging Period | Limit or Threshold Value | No. of Allowed Exceedances | No. of Exceedances |
|------------------------------|------------------|--------------------------|--|--------------------|
| PM ₁₀ Limit Value | One day | 50 | Not to be exceeded on more than 35 days per year | 3 |
| PM ₁₀ Limit Value | Calendar Year | 40 | | 0 |

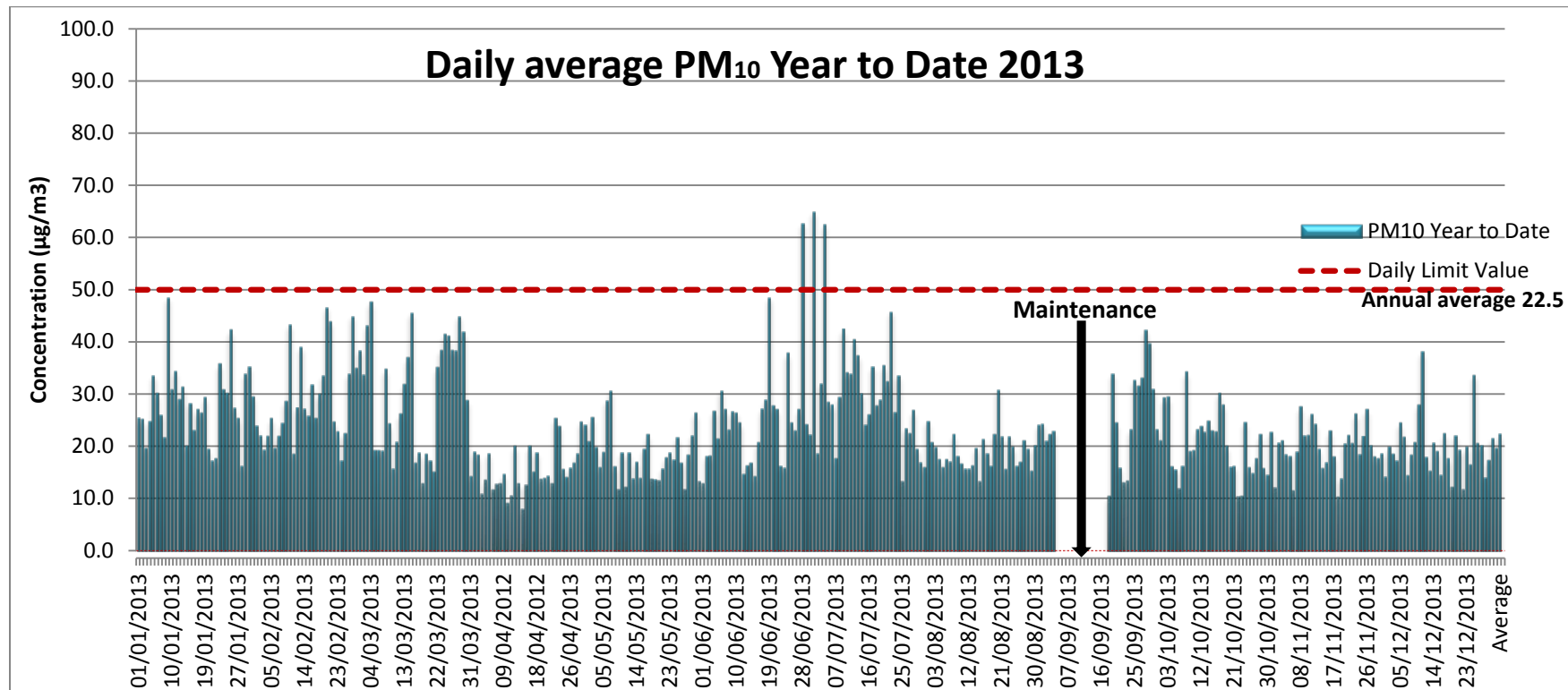


Figure 5: Daily Average PM₁₀ 2013

5.3. Annual Average NO₂ & PM₁₀ (2011-2013)

Annual mean NO₂ and PM₁₀ are presented in Table 5-3 for the automatic station at Dublin Airport. The trends over the last three years are shown in Figure 6. There are no exceedances when compared with the limit values contained within the Ambient Air Quality Regulations.

Table 5-3: Annual Mean NO₂ and PM₁₀ concentrations at Dublin Airport

| Location | Year | NO ₂ | PM ₁₀ |
|---|------|-----------------|------------------|
| Dublin Airport Station | 2013 | 19 | 23 |
| | 2012 | 19 | 20 |
| | 2011 | 18 | 19 |
| Annual Limit Value (µg/m ³) | | 40 | 40 |

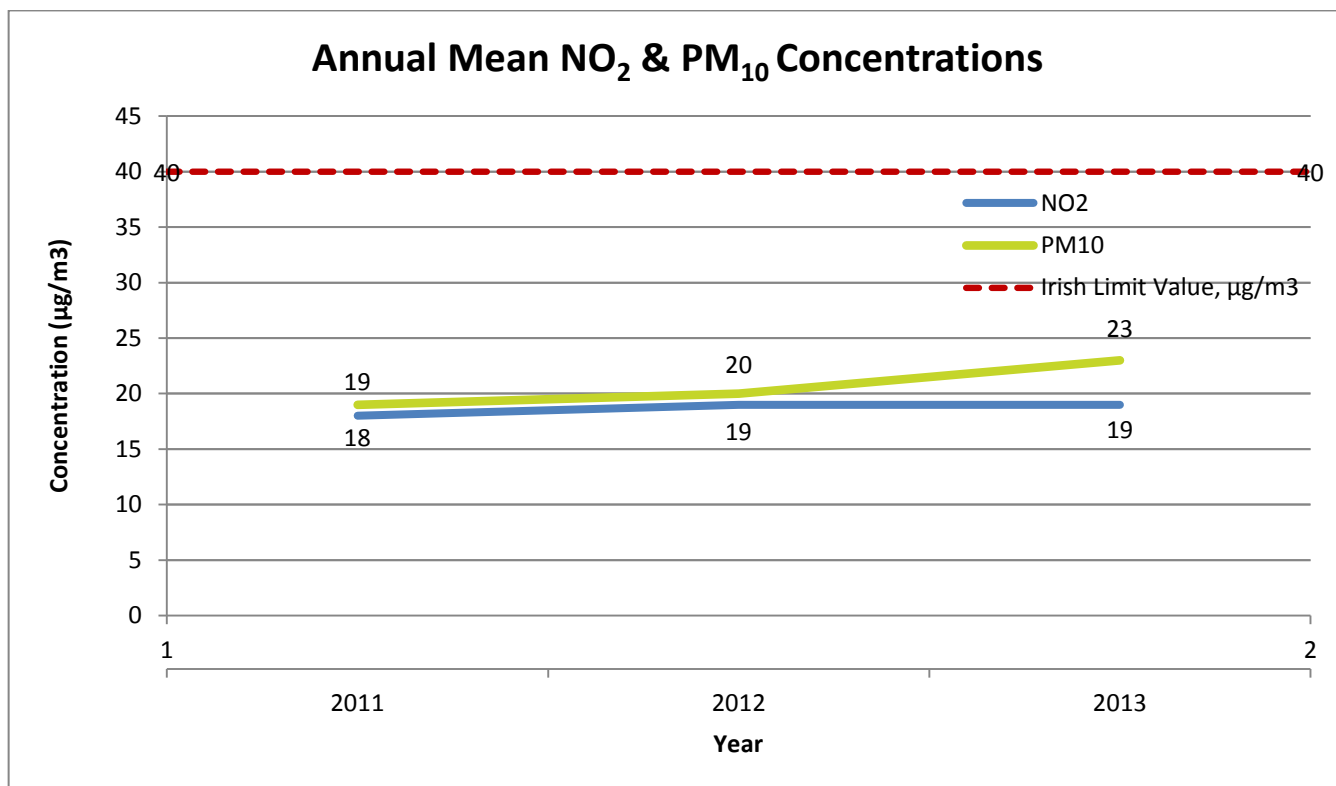


Figure 6: Annual Mean NO₂ and PM₁₀ Concentrations at Dublin Airport

NO₂ is the abbreviation for Nitrogen Dioxide. The main sources of primary NO₂ in the airport area are road traffic, heating emissions and air traffic. Average NO₂ concentrations have remained consistent from 2011 to 2013.

PM₁₀ is the abbreviation for fine Particulate Matter with a diameter smaller than 10 microns. PM₁₀ emissions have risen since 2011 and are influenced by fuel combustion sources, industrial processes, transportation sources as well as natural and miscellaneous sources which are fugitive dust and agricultural activities. The Air Monitoring Station is located in the vicinity of a construction compound.

6. Results Summary

6.1 EPA Air Quality Monitoring Program

The Environmental Protection Agency (EPA) has undertaken a significant number of air quality monitoring programs over the last few years. The EPA is the designated Competent Authority in Ireland for the co-ordination of ambient air quality monitoring in accordance with EU Directives. The tables below compares Dublin Airport's annual NO₂ and PM₁₀ average with the EPA national network stations for years 2010-2012. The most recent report relating to the monitoring of ambient air at various locations around Ireland is the "Air Quality in Ireland 2012 – Key Indicators of Ambient Air Quality" (EPA 2013).

Table 6-1.1: NO₂ comparisons with EPA national network stations for years 2010 - 2012 (EPA Annual Report 2010-2012)

| Location | NO ₂ | | | |
|-------------------------------------|-----------------|------|------|-------------------|
| | 2010 | 2011 | 2012 | 2013 ² |
| Winetavern St (City Centre) | 35 | 34 | 29 | |
| Rathmines | 25 | 20 | 21 | |
| Ringsend | 29 | 32 | 25 | |
| Swords | 16 | 14 | 15 | |
| Blanchardstown | | 31 | 30 | |
| Dublin Airport Station ³ | 18 | 19 | 19 | 19 |
| Annual Limit Value | 40 | | | |

Table 6-1.2: PM₁₀ comparisons with EPA national network stations for years 2010 - 2012 (EPA Air Quality in Ireland Annual Report 2010-2012)

| Location | PM ₁₀ | | | |
|-----------------------------|------------------|------|------|------|
| | 2010 | 2011 | 2012 | 2013 |
| Winetavern St (City Centre) | 19 | 14 | 13 | |
| Rathmines | 18 | 16 | 14 | |
| Phoenix Park | 11 | 12 | 11 | |
| Ringsend | 23 | 20 | 20 | |
| Blanchardstown | | 16 | - | |
| Ennis | 27 | 22 | 19 | |
| Dublin Airport Station | 19 | 20 | 20 | 23 |
| Annual Limit Value | 40 | | | |

² EPA 2013 results not yet published.

³ DAP values rounded off the nearest number.

6.2 AQIH Index

The Environmental Protection Agency's Air Quality Index for Health (AQIH) is a number from one to 10 that tells you what the air quality currently is in your region. A reading of 10 means the air quality is very poor and a reading of one to three inclusive means that the air quality is good. For a complete AQIH assessment five parameters should be measured. The AQIH is calculated every hour. The current readings are available on the EPA's [AQIH map](#).

Whilst not directly applicable to Dublin Airport's air quality results daa assessed the AQIH on measurement of two air parameters; NO₂ (Nitrogen Dioxide) and PM₁₀ (particles with a diameter <10 µm). The index for each parameter is calculated separately. The table below shows the concentration ranges for each parameter.

Table 6-2: AQIH for NO₂ and PM₁₀ concentrations at Dublin Airport

| Station | Parameter | Number of Fair Days | Number of Poor Days | Number of Very Poor Days | Band |
|---------|------------------|---------------------|---------------------|--------------------------|------|
| DAP | PM ₁₀ | 0 | 0 | 0 | Good |
| | NO ₂ | 0 | 0 | 0 | Good |

Using the EPA Air Quality Indices framework as a guide to characterise PM₁₀ & NO₂ results, ambient air quality at Dublin Airport is defined as "Good". Further information on the AQIH health advice messages can be found in Appendix 1.

6.3 Conclusion

The results of the NO₂ and PM₁₀ concentrations using the online analyser indicate concentrations are below the relevant long-term (annual) limit value of 40µg/m³ and within the allowed criteria of short term limit values.

The diffusion tube results for NO₂ indicate that the highest concentrations are recorded adjacent to the main roads around the airport. The monitoring locations are only a few metres from the road and therefore pick up on 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 NO₂.

In comparison with the relevant legislation, S.I. No. 180 of 2011 Air Quality Standards Regulations 2011, the levels of benzene detected at all locations are within the yearly average limit value of 5µg/m³.

Using the EPA Air Quality Indices framework as a guide to characterise PM₁₀ & NO₂ results, ambient air quality at Dublin Airport is defined as "Good". The EPA is the designated Competent Authority in Ireland for the co-ordination of ambient air quality monitoring in accordance with EU Directives.

Appendix 1- AQIH

The AQIH health advice messages are messages to help you and your family better manage your health. The table below gives health messages for individuals who are sensitive to air pollution (at risk) and for the general population.

| Band | | Index | Accompanying health messages for at-risk groups and the general population | |
|-----------|----|---|--|--------------------|
| | | | At-risk individuals * | General population |
| Good | 1 | Enjoy your usual outdoor activities. | Enjoy your usual outdoor activities. | |
| | 2 | | | |
| | 3 | | | |
| Fair | 4 | Adults and children with lung problems, and adults with heart problems, who experience symptoms, should consider reducing strenuous physical activity, particularly outdoors. | Enjoy your usual outdoor activities. | |
| | 5 | | | |
| | 6 | | | |
| Poor | 7 | Adults and children with lung problems, and adults with heart problems, should reduce strenuous physical activity, particularly outdoors, and particularly if they experience symptoms. | Anyone experiencing discomfort such as sore eyes, cough or sore throat should consider reducing activity, particularly outdoors. | |
| | 8 | | | |
| | 9 | People with asthma may find they need to use their reliever inhaler more often. Older people should also reduce physical exertion. | | |
| Very Poor | 10 | Adults and children with lung problems, adults with heart problems, and older people, should avoid strenuous physical activity. | Reduce physical exertion, particularly outdoors, especially if you experience symptoms such as cough or sore throat. | |
| | | People with asthma may find they need to use their reliever inhaler more often. | | |

Reference: EPA (2014) "What is the Air Quality Index for Health?". Available at <http://www.epa.ie/air/quality/index/#d.en.51484> [Accessed on 20/02/2014]