

Air Quality around Heathrow Airport

Q4 2019 Briefing

Background

Heathrow Airport Ltd (HAL) began an air quality monitoring programme in 1993. Today HAL owns and operates one on-airport monitor and funds three other monitors around the airport. Data from these four continuous monitoring stations, as well as eight other continuous monitors operated by local authorities and DEFRA within 2km of the Airport, are shared and summarised on heathrowairwatch.org.uk.

Air quality management is a key priority for HAL and we continue to work in partnership with our key stakeholders – especially local authorities and national Government – to reduce emissions from all sources in the area in order to meet the EU & UK limit values. The main pollutants of concern around Heathrow are measured at all stations – nitrogen dioxide (NO₂) and particles (measured as PM₁₀ and PM_{2.5}).

Headlines

Key information for this quarter is:

- There was no exceedance of the hourly NO₂ mean of 200µg/m³ recorded in 2019 at a HAL monitoring station. At relevant locations, 18 exceedances are allowed per year before the limit value is breached for a given location.
- There were 6 exceedances of the PM₁₀ daily mean of 50µg/m³ recorded in 2019 at LHR2 and Harlington monitoring sites and there were 4 at Green Gates and Oaks Road. At relevant locations, 35 exceedances are allowed per year before the limit value is breached for a given location.
- NO₂ concentrations increased only at 3 of the 12 monitoring sites in the wider area between 2018 and 2019. They decreased or remained the same at every other site.
- The annual mean NO₂ concentration remained below the annual mean EU limit value of 40µg/m³ at 9 of the 11 monitoring sites outside the airport boundary within 2km of Heathrow. NO₂ concentrations only remain above EU limits at Hillingdon and Hayes monitoring stations, north of the M4 (airport emissions from all sources contribute 16% and 6% of total NO_x at these stations, respectively).
- The number of aircraft movements made by the newest aircraft (CAEP8) has increased to 34.7% at the end of Q4 and the percentage continues to rise (see Fig.2).

Year-to-date monitoring

NO₂, PM₁₀, and PM_{2.5} are measured at HAL-funded monitoring sites. In addition, ozone is measured at the Harlington station. For a strict comparison against air quality objectives, data capture should be >90% over a calendar year. The hourly mean limit value for NO₂ is 200µg/m³, not to be exceeded more than 18 times per calendar year. The daily mean limit value for PM₁₀ is 50µg/m³, not to be exceeded on more than 35 days per calendar year. Table 1 provides a summary of measured data capture from HAL's four monitoring sites as well as 2019 exceedances of the hourly NO₂ and daily PM₁₀ limits. As represented in Table 1, data capture for all pollutants at all HAL-funded monitoring sites has been >90%, except for NO₂ at Oaks Road monitoring station. Figure 1 provides the NO₂ rolling 12-month means since 2010.

Table 2 provides a summary of the results from each station within 2km of Heathrow's boundary as well as the location type describing the environment. The data shown are provisional. Figure 2 presents annual average NO₂ measurement trends at sites either on or close to the airport.

Table 1. Provisional annual means, data capture and exceedances of hourly NO₂ and daily PM₁₀ at HAL-funded monitoring sites in 2019

Monitoring station	2019 mean ($\mu\text{g}/\text{m}^3$)			2019 Data capture (%)			Exceedances in 2019	
	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}	NO ₂ (Hourly)	PM ₁₀ (Daily)
Heathrow LHR2	42	13	9	96	100	100	0	6
Harlington	31	15	10	99	97	97	0	6
Green Gates	31	13	8	99	98	98	0	4
Oaks Road	27	15	10	84	98	98	0	4

Fig.1. NO₂ rolling annual means at HAL funded sites since 2010 (µg/m³)

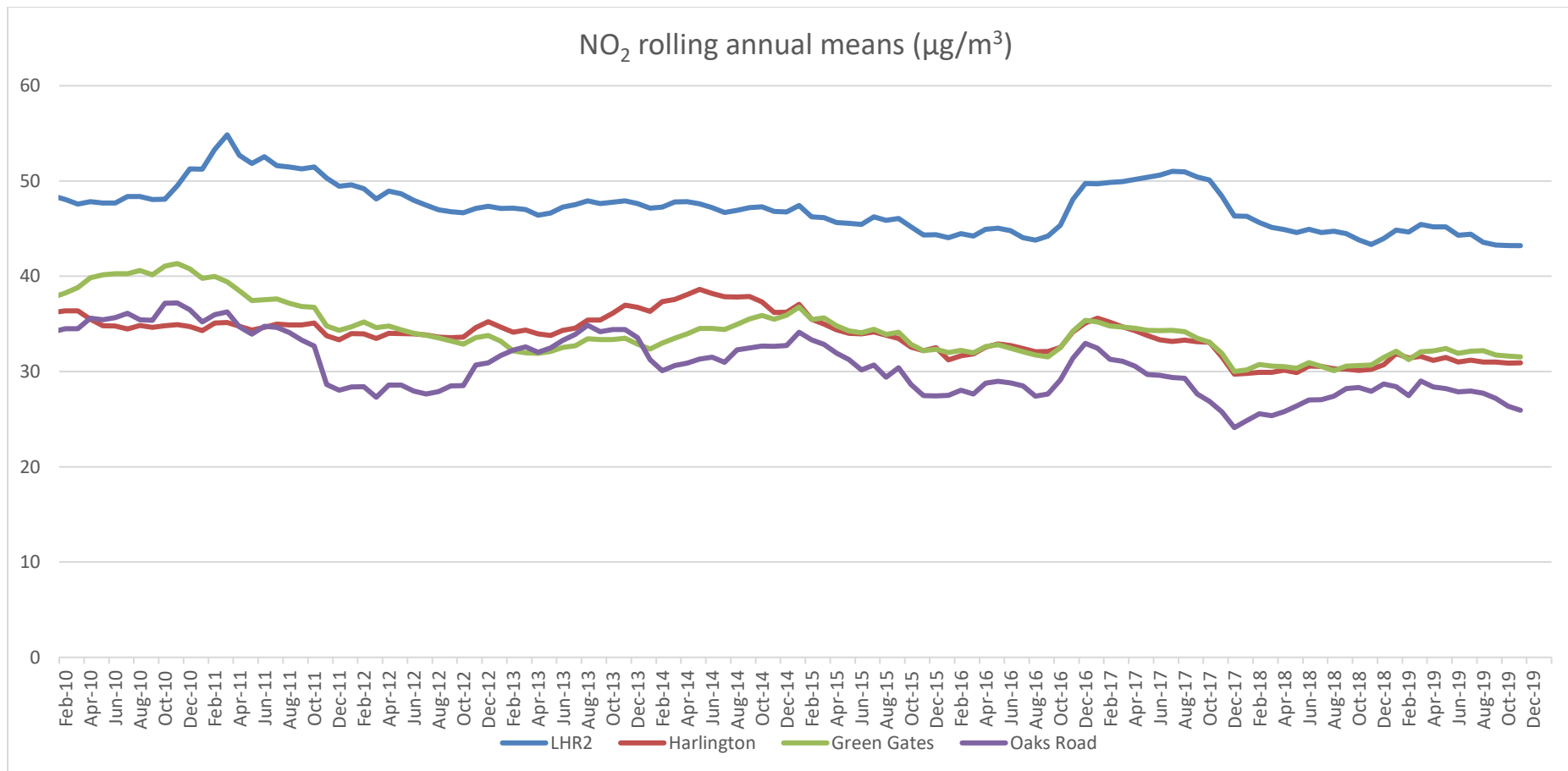


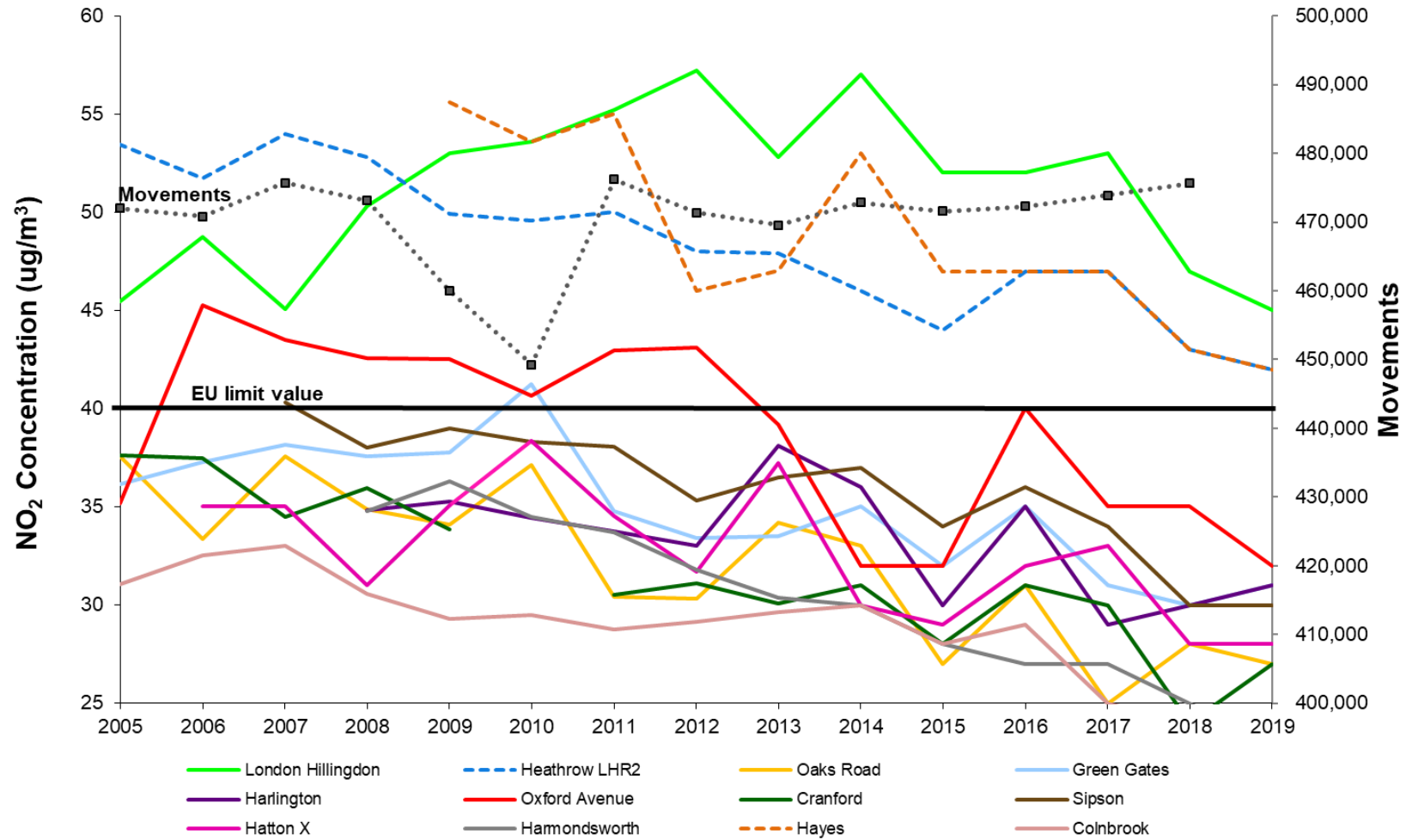
Table 2. Summary of continuous monitoring sites within 2km of Heathrow and provisional results in 2019

Monitoring station	Owner	Location Type	2019 Average NO ₂ (µg/m ³)	Hourly NO ₂ exceedances (hours)	Daily PM ₁₀ exceedances (days)
Heathrow LHR2	Heathrow	Airport	42	0	6
Harlington	Heathrow	Urban Industrial	31	0	6
Green Gates	Heathrow	Airport	31	0	4
Oaks Road	Heathrow	Airport	27	0	4
London Hillingdon	Defra	Urban Background	45	0	0
Hayes	Hillingdon	Roadside	42	0	25
Harmondsworth	Hillingdon	Urban Background	23	0	0
Oxford Ave	Hillingdon	Urban Background	32	0	4
Sipson	Hillingdon	Urban Background	30	0	N/A
Hatton Cross	Hounslow	Roadside	28	0	7
Cranford	Hounslow	Suburban	27	0	7
Colnbrook	Slough	Suburban	24	0	3

Key information from this data is:

- Data for 2019 are still provisional;
- NO₂ concentrations slightly increased only at 3 of the monitoring sites between 2018 and 2019 (Green Gates, Cranford and Harlington). They decreased or remained the same at every other site;
- Two sites exceeded the NO₂ annual mean EU limit value outside of the airport boundary:
 - London Hillingdon is mainly affected by emissions from traffic on the M4. The NO₂ concentration recorded in 2019 was 45µg/m³ (decrease from 47µg/m³ in 2018). Modelling has shown that airport related emissions (including airport-related traffic) contribute 16% of measured NO_x concentrations at this site;
 - The concentration at Hayes, located 1.9 km to the northeast of the airport, decreased from 43µg/m³ to 42µg/m³ between 2018 and 2019. Emissions at Hayes are also dominated by road traffic. Heathrow emissions contribute less than 6% of total NO_x measured at this site; and
 - LHR2 (blue dotted line), located on the airport next to the northern runway, has shown a general decline in concentration since installation in 1993, even though air transport movements (ATMs) have increased over the same period. Annual average NO₂ was 42µg/m³ in 2019, showing a reduction in concentration compared to 2018. The EU limit values for ambient air quality are not applicable at LHR2 as members of the public do not have access to the site.

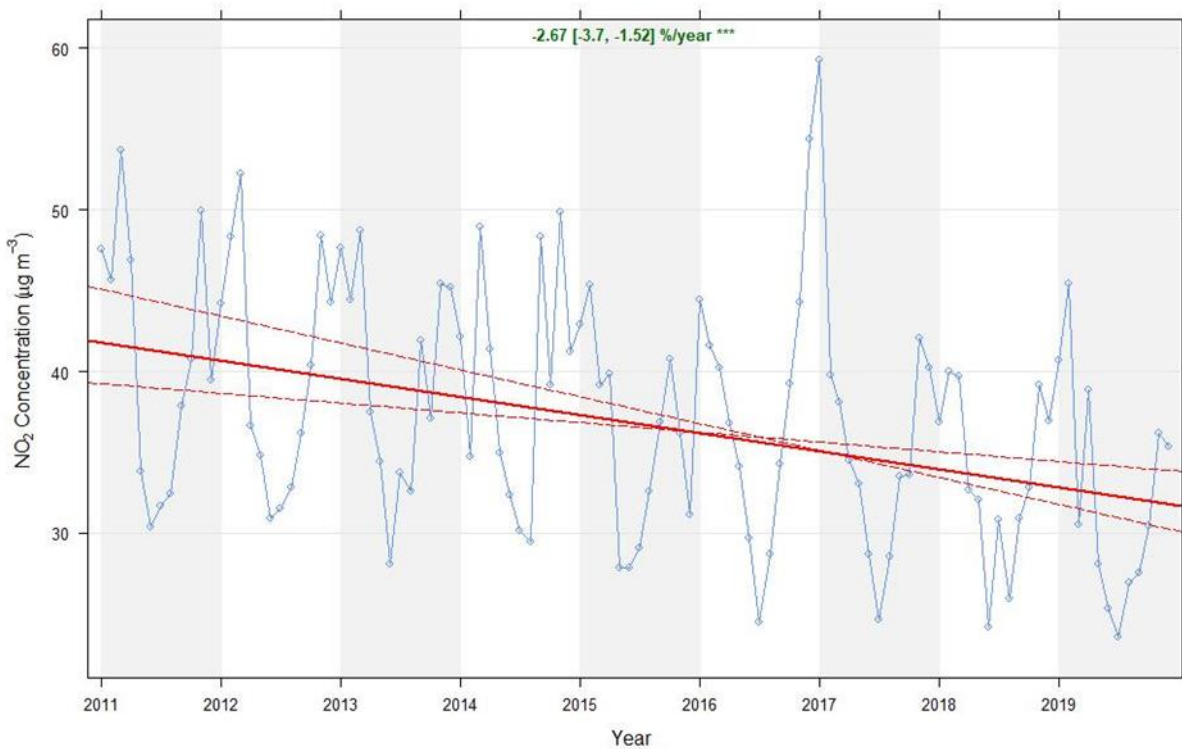
Figure 2. Measured annual average NO₂ concentrations around Heathrow since 2005



NO₂ Trend Analysis

The openair package¹ which provides a consistent set of tools for analysing and understanding air pollution data has been used to analyse trends in NO₂ concentrations measured by automatic monitors in the vicinity of (<5 km away from) Heathrow Airport in the period 2011 to 2019. The focus is on trends across all sites, or groups of sites with specific features, rather than an analysis of trends at specific sites. Figure 3. shows the analysis of NO₂ concentrations at all sites and indicates that NO₂ concentrations are reduced by 2-3% per year over this period. The reductions are likely primarily driven by reducing vehicle emissions as newer vehicles that meet tighter emission standards replace older ones.

Figure 3. Analysis of NO₂ Concentrations at All Sites (2011-2019) (%/yr)



¹ <http://www.openair-project.org/>

Emission Reduction Efforts

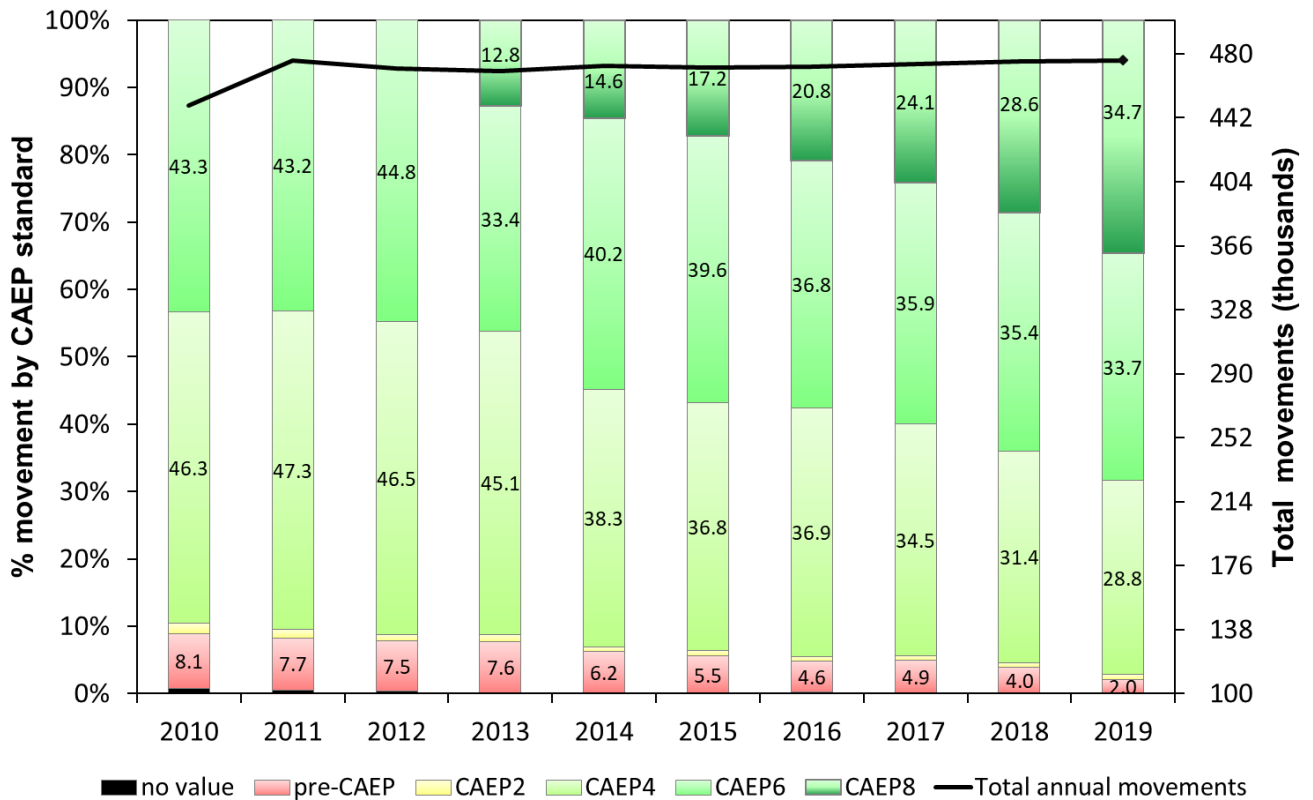
Heathrow successfully reduced annual ground-based nitrogen oxides (NO_x) emissions by 430 tonnes (16%) between 2009 and 2013² as part of our commitment to playing our part in improving local air quality. These reductions have been achieved through a combination of efforts to reduce emissions from every major source, including aircraft, vehicles, and heating.

CAEP standard of aircraft movements

Through its Committee on Aviation Environmental Protection (CAEP), the International Civil Aviation Organization (ICAO) sets new emission standards for aircraft engines – including for NO_x. Engine models which were certified on or after 1 January 2014 must meet CAEP8, the latest standard for NO_x.

Fig.4 shows the proportion of aircraft movements at Heathrow based by CAEP standards. The proportion of flights made by newer, cleaner CAEP8 aircraft increased from 28.6% in 2018 to 34.7% at the end of Q4 2019. The trend is expected to continue as airlines proceed in replacing their older, higher emission aircraft and Heathrow's NO_x emission landing charges and engagement encourages the use of best-in-class aircraft.

Fig.4. Total aircraft movements since 2010 by CAEP standard



²http://www.heathrowairwatch.org.uk/documents/Heathrow_Airport_2013_Air_Quality_Assessment_Detailed_Emissions_Inventory.pdf