Air Quality around Heathrow Airport

Q4 2016 Briefing and End of Year Summary

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 (NO_2) and particles (measured as PM_{10} and $PM_{2.5}$).

Headlines

Key information for this quarter is:

- Data for all stations summarised in this report are still provisional and have not yet been ratified through the end of the year;
- NO_2 concentrations increased at many of the monitoring sites between 2015 and 2016. This pattern has been observed at background monitoring stations across the south east of England, indicating that this is not the result of any changes in local activities;
- The annual mean NO_2 concentration remained below the EU limit values at 9 of the 11 monitoring sites outside the airport boundary within 2km of Heathrow. NO_2 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 hourly mean NO_2 limit value was not exceeded at the continuous monitoring stations. 18 hourly exceedances of 200µg m^{-3} are allowed per year before the limit value is breached for a given location;
- The daily mean PM_{10} limit value was also not exceeded at the continuous monitoring stations. 35 daily exceedances of 50µg m^{-3} are allowed per year before the limit value is breached for a given location. None of HAL's stations recorded more than five daily exceedances of 50µg m^{-3} PM_{10} in 2016; and
- The number of aircraft movements made by the newest aircraft (CAEP8) has increased to over 20% in 2016 and the percentage of continues to rise (see Fig. 2).

Measured Concentrations

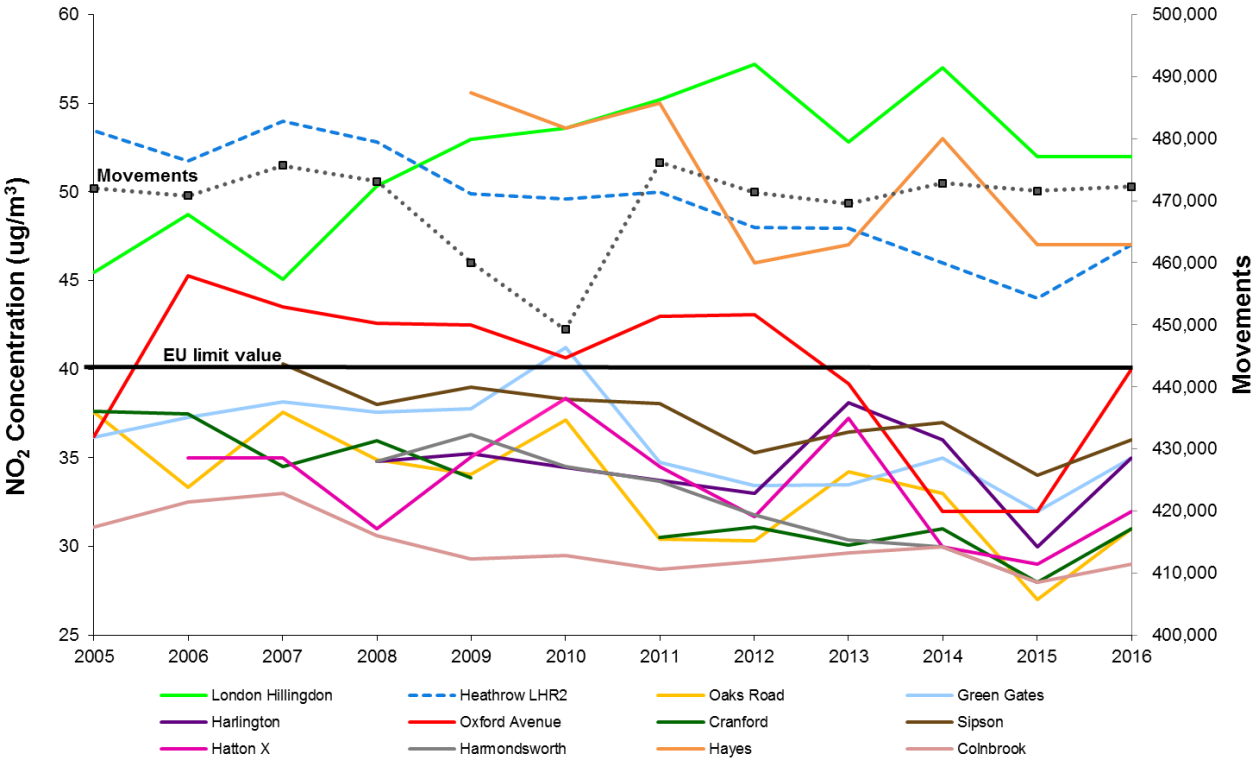
Air quality monitoring is carried out at 12 continuous automatic monitoring stations within 2km of Heathrow. Details of these monitoring stations, including an interactive map of their locations, are available at heathrowairwatch.org.uk.

For a strict comparison against EU limit values and air quality objectives, data capture should be >90% over a calendar year. The annual mean EU limit value for both NO_2 and PM_{10} is 40µg m^{-3}. The hourly mean limit value for NO_2 is 200µg/m^3, not to be exceeded more than 18 times per calendar year. The daily mean limit value for PM_{10} is 50µg/m^3, not to be exceeded on more than 35 days per calendar year. Table 1 provides a summary of the results from each station within 2km of Heathrow's boundary as well as the type of source environment its measurements represent. Fig. 1 presents annual average NO_2 measurement trends at sites either on or close to the airport.

Table 1. Summary of continuous monitoring sites within 2km of Heathrow and provisional results in 2016

Monitoring station	Owner	Source Type	2016 Average NO_2 (µg m^{-3})	Hourly NO_2 exceedances (hours)	Daily PM_{10} exceedances (days)
Heathrow LHR2	Heathrow	Airport	47	8	3
Harlington	Heathrow	Urban Industrial	35	0	5
Green Gates	Heathrow	Airport	35	0	3
Oaks Road	Heathrow	Airport	31	0	2
London Hillingdon	Defra	Urban Background	52	2	N/A
Hayes	Hillingdon	Roadside	47	1	32
Harmondsworth	Hillingdon	Urban Background	27	0	3
Oxford Ave	Hillingdon	Urban Background	40	0	11
Sipson	Hillingdon	Urban Background	36	0	N/A
Hatton Cross	Hounslow	Roadside	32	0	6
Cranford	Hounslow	Suburban	31	2	8
Colnbrook	Slough	Urban Background	29	0	5

Figure 1. Measured annual average NO_2 concentrations around Heathrow since 2005 and annual air transport movements (ATMs)



Key information from this data is:

- Data for 2016 still provisional;
- NO_2 concentrations increased at many of the monitoring sites between 2015 and 2016. This pattern has been observed at background monitoring stations across the south east of England, indicating that this is not the result of any changes in local activities;
- Two sites exceeded the NO_2 annual mean EU limit value outside of Heathrow (the provisional annual mean at Oxford Avenue is 39.6 µg m^{-3}):
    - London Hillingdon is mainly affected by emissions from traffic on the M4. The NO_2 concentration recorded in 2016 was 52 µg m^{-3} (no change from 2015). Modelling has shown that airport related emissions (including airport-related traffic) contribute 16% of measured NO_X concentrations at this site.
    - Hayes, located 1.9 km to the northeast of the airport, also saw no change from 2015. The annual mean concentration remained at 47 µg m^{-3}. Emissions at Hayes are also dominated by road traffic. Heathrow emissions contribute less than 6% of total NO_X measured at this site.
- 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 NO_2 was 47 µg m^{-3} in 2016. The EU limit values for ambient air quality are not applicable at LHR2 as members of the pubic do not have access to the site.

Monitoring at HAL Sites

Table 2 provides a summary of measured data capture from HAL's four monitoring sites. Year-end data capture at HAL's monitoring sites remained above 90% for all pollutants monitored.

Table 2. 2016 data capture at HAL-funded monitoring sites

Monitoring station	NO_2 data capture	PM_{10} data capture	$PM_{2.5}$ data capture
Heathrow LHR2	92.6%	96.1%	98.9%
Harlington	90.6%	99.8%	99.8%
Green Gates	98.7%	98.6%	98.6%
Oaks Road	99.2%	99.1%	99.1%

Emission Reduction Efforts

Heathrow has successfully reduced annual ground-based nitrogen oxides (NOx) emissions by 430 tonnes (16%) between 2009 and 2013[1] 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.

2016 Blueprint for Reducing Emissions

Previously, we developed *Heathrow's 2015 Blueprint for Reducing Emissions*, a 10-point plan to reduce emissions from all airport sources of ground-based NOx, focusing on our four main sources of ground-based NOx: aircraft activity, airport traffic, airside vehicles, and heating. To build on the success of the 2015 Blueprint and continue to reduce emissions further, *Heathrow's 2016 Blueprint for Reducing Emissions* was launched in April. The 2016 Blueprint comprises the top 10 actions we are delivering this year to reduce emissions and help improve local air quality. It is available by clicking the link above or by visiting heathrowairwatch.org.uk.

CAEP standard of aircraft movements

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

Fig. 2 shows the proportion aircraft movements at Heathrow based by CAEP standard. The proportion of flights made by newer, cleaner aircraft (CAEP4 or better) increased from 93.6% in 2015 to 94.5% at the end of Q4 2016. CAEP8 only movements increased to 20.8%. 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.

[1]http://www.heathrowairwatch.org.uk/documents/Heathrow_Airport_2013_Air_Quality_Assessment_Detailed_Emissions_Inventory.pdf

Fig.2. Total aircraft movements since 2010 by CAEP standard