

# Heathrow Air Quality

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## Air quality at Heathrow Airport

### Q4 2012

#### Headlines

Key information for air quality monitoring data for 2012 is:

- All Q4 data is provisional and will be ratified by the end of March 2013.
- The annual mean for NO<sub>2</sub> fell at most key monitoring sites – the principal exception being the Hillingdon M4 site (see Figs. 1 and 2).
- Annual average PM<sub>10</sub> concentrations in 2012 remained below the EU limit value (see Fig. 4).
- There were fourteen breaches of the daily average PM<sub>10</sub> limit value (see Fig 3) – which is below the EU limit value of 35 breaches per year.
- Annual mean PM<sub>2.5</sub> concentrations remained at approximately half of the EU target value (see Fig 5).
- Over 91% of aircraft movements were made by more modern CAEP4 or CAEP6 models (see Fig. 7). A 0.9% increase over 2011.

#### Background

Heathrow Airport Ltd (HAL) has monitored air quality since the 1990s at its site located near the northern runway (LHR2). It now monitors air quality at three other sites around the airport – Harlington, Green Gates and Oaks Road (see Fig. 6 for locations of these and other air quality monitoring sites within 2km of Heathrow Airport).

Large areas of London exceed the health-based air quality limit values set by the EU, due primarily to emissions from road traffic and from buildings. Every London borough has declared at least one Air Quality Management Area (AQMA).

Air quality management is a key priority for HAL and we will 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 limit values. The main pollutants of concern at Heathrow are measured at all these sites – oxides of nitrogen (NO<sub>x</sub> – made up of nitrogen dioxide and nitrous oxide) and particles (measured as PM<sub>10</sub> and PM<sub>2.5</sub>). In addition, ozone (O<sub>3</sub>) is measured at Harlington.

#### Measured concentrations

##### Local air quality

Located on the western edge of London and close to two busy motorways, the Great Western mainline and local industries, Heathrow Airport is within an area of high air pollution.

Of the two pollutants of concern - nitrogen dioxide (NO<sub>2</sub>) and particles (measured as PM<sub>10</sub> and PM<sub>2.5</sub>) - NO<sub>2</sub> has the greatest extent of exceedence and large areas of London (and the rest of the UK) exceed the annual average EU limit value, due mainly to emissions from road traffic and from buildings. This pattern is repeated locally, where the activities that take place at Heathrow Airport are just one source of air emissions in the local area.

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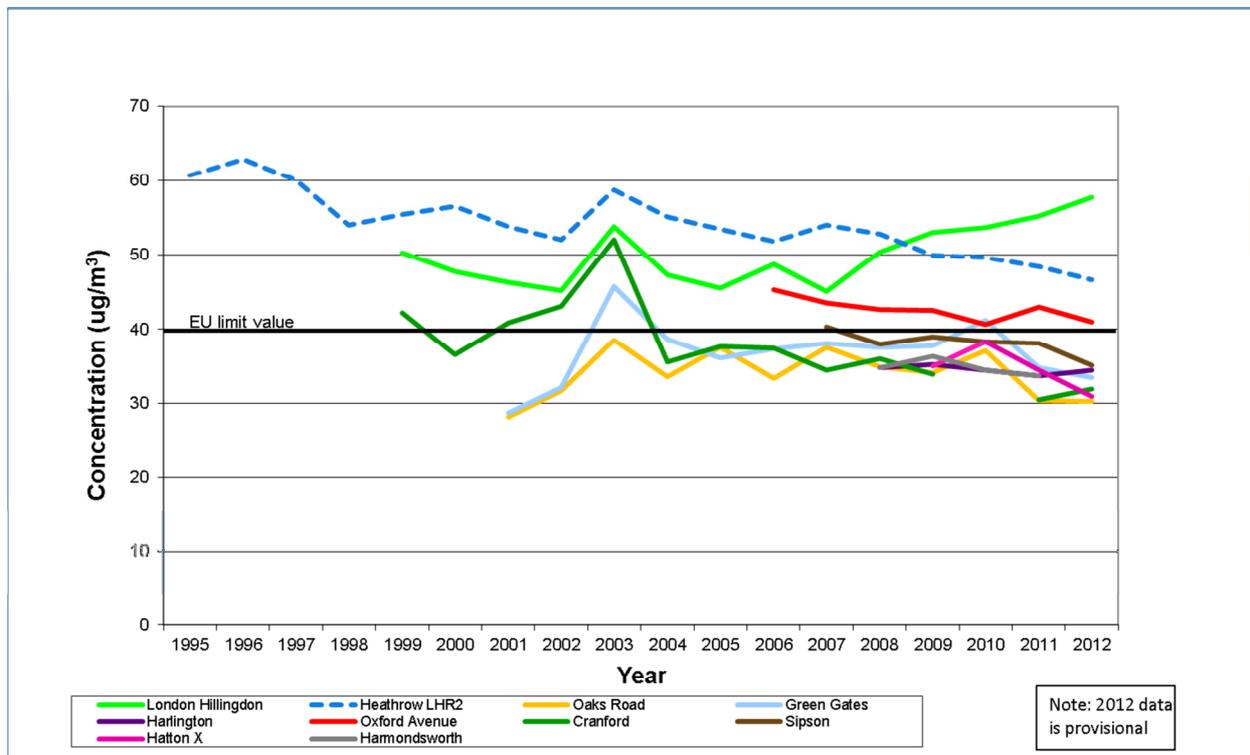
All monitoring data will be ratified by end of March 2013.

## Nitrogen dioxide (NO<sub>2</sub> - annual average limit value 40µg/m<sup>3</sup> by 2010)

The annual average EU limit value for NO<sub>2</sub> was met at the majority of monitoring sites close to Heathrow Airport in 2011 – presented in Fig. 1. Key information is:

- Oxford Avenue (red) is approximately 200m northeast of the airport boundary. Concentrations have exceeded the limit value since installation in 2005 and fell to approximately 41µg/m<sup>3</sup>; down from 43µg/m<sup>3</sup> in 2011. Direct airport emissions are approximately 19% of measured NO<sub>x</sub> concentrations, 6% is from airport-related road traffic, 18% from non-airport traffic and 57% from background sources.
- Two other sites exceeded the limit value:
  - London Hillingdon (light green) is mainly affected by emissions from traffic on the M4. Concentrations increased in 2012 to approximately 58µg/m<sup>3</sup> (55.2 µg/m<sup>3</sup> in 2011). Direct airport emissions are approximately 4% of measured NO<sub>x</sub> concentrations, 13% is from airport-related road traffic, 38% from non-airport traffic and 45% from background sources.
  - LHR2 (blue dotted line), located near the northern runway, has shown a gradual decreasing trend in concentrations, though it is in an area of high emissions. A concentrations of approximately 46µg/m<sup>3</sup> was recorded in 2012, down from 48µg/m<sup>3</sup> in 2011. Direct airport emissions are approximately 30% of measured NO<sub>x</sub> concentrations, 19% is from airport-related road traffic, 14% from non-airport traffic and 37% from background sources.

**Fig. 1 NO<sub>2</sub> annual average concentrations measured at selected sites around Heathrow Airport since 1995**



Approximately 30% of aircraft operations were easterlies, a similar proportion was seen in 2011.

**Fig. 2 NO<sub>2</sub> running annual average concentrations at selected sites since 1995**

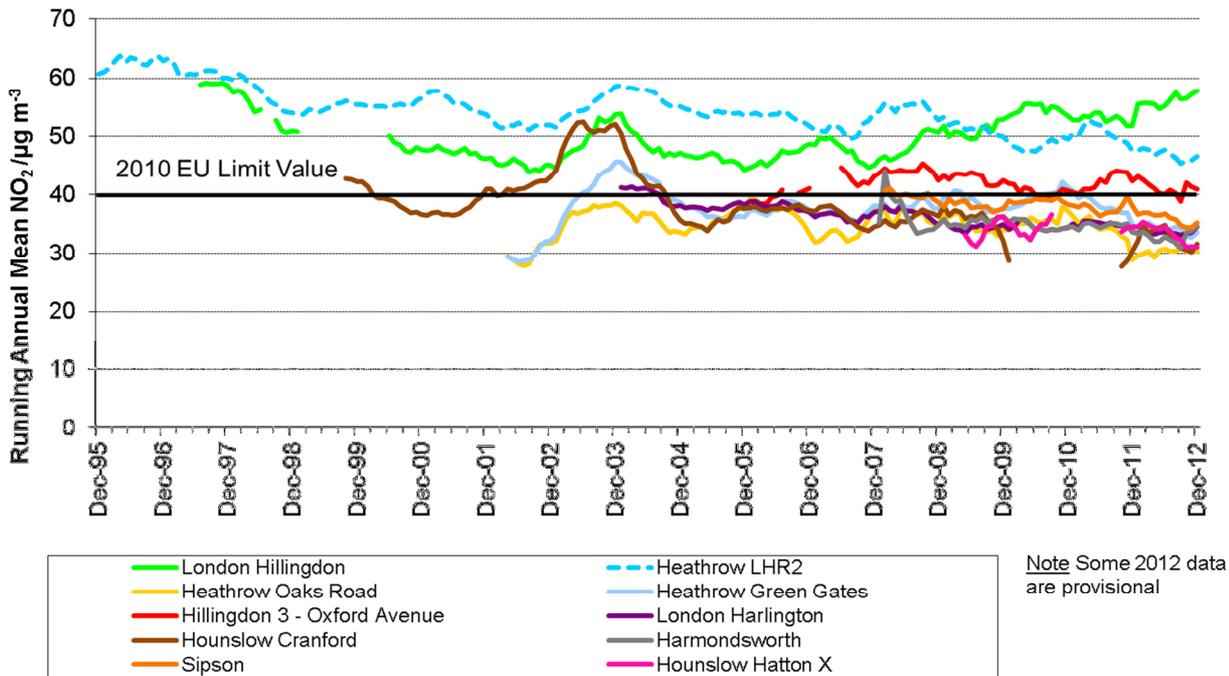


Fig. 2 shows the NO<sub>2</sub> monitoring data expressed as running annual means, which allows us to track changes throughout the year. In general, these concentrations fell for most of 2012, but increased slightly in the last quarter. The principal site where an increasing trend was recorded is the site near the M4 (London Hillingdon).

## Particles (2005 PM<sub>10</sub> EU limit value of 50µg/m<sup>3</sup> (35 breaches allowed)) (2020 PM<sub>2.5</sub> EU target of 25µg/m<sup>3</sup>)

PM<sub>10</sub> is measured at all four of HAL’s monitoring sites and concentrations measured at LHR2 are generally the highest. Results are presented in Figs. 3 and 4.

Only 14 exceedances of the EU limit value were recorded at LHR2 in 2012 – six more than in 2011. This is a higher number than usual and this pattern has been seen across many monitoring sites in London and the South-East due to weather conditions.

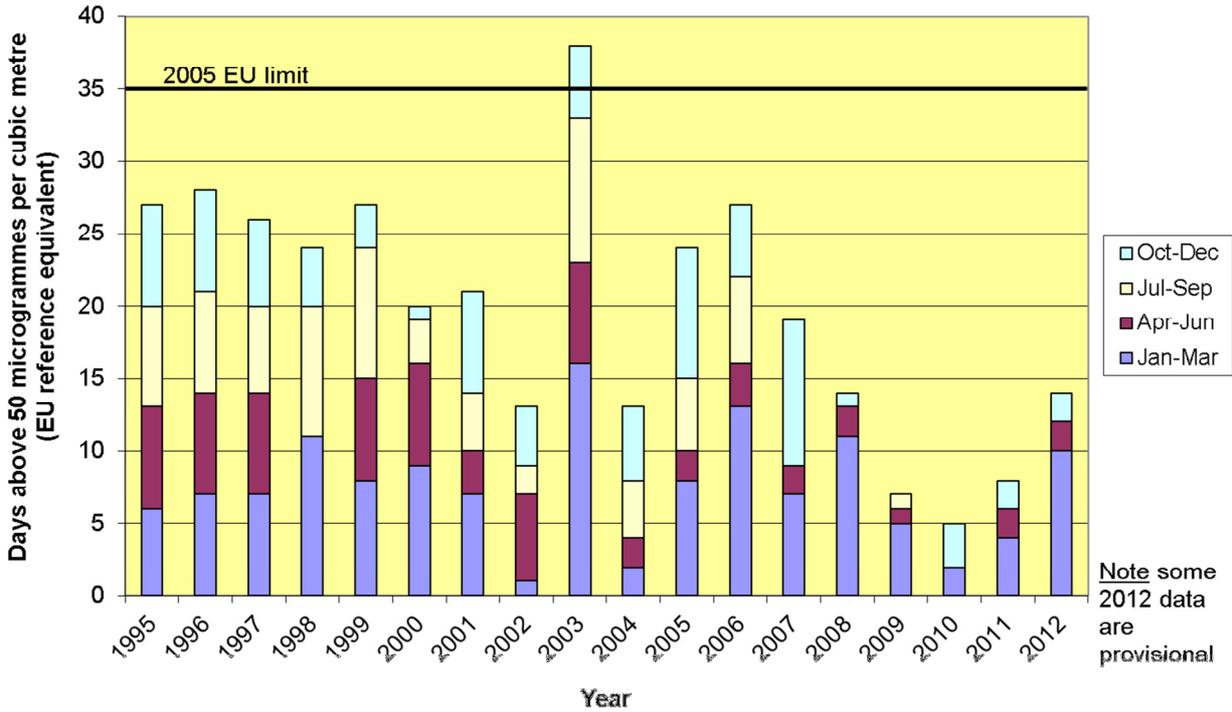
The EU limit value for PM<sub>10</sub> has been met at LHR2 since 2003, when unfavourable weather conditions produced 38 breaches at LHR2 and affected sites throughout the UK.

It is not unusual for daily mean PM<sub>10</sub> levels to exceed 50µg/m<sup>3</sup>, though the EU limit value allows 35 exceedances (equal to 35 days) per year before the limit value is breached.

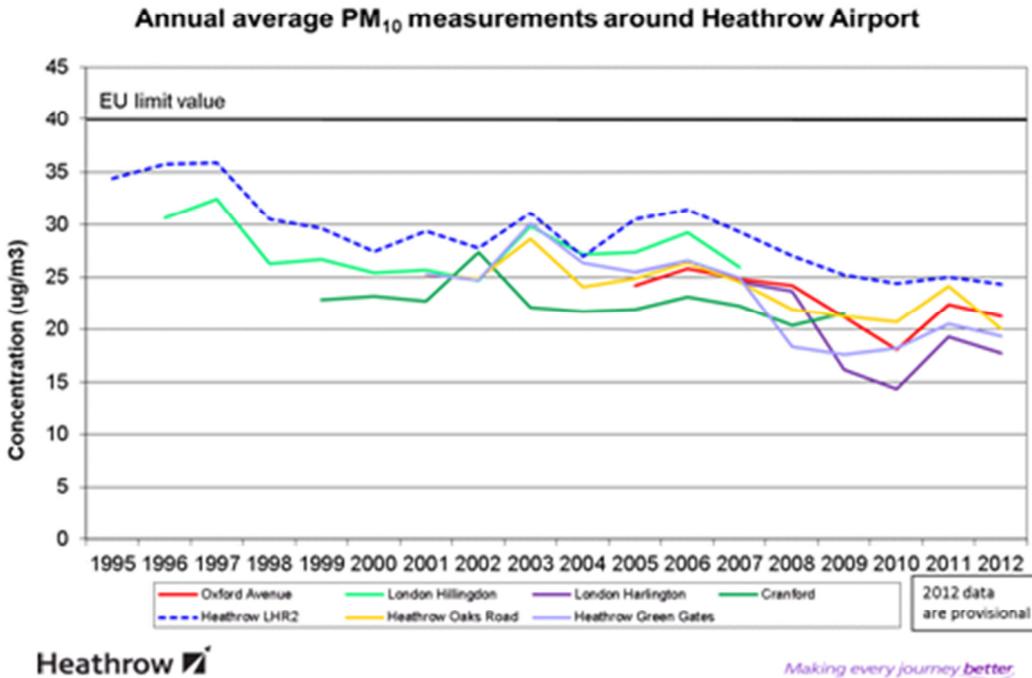
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**Fig. 3 PM<sub>10</sub> at LHR2 since 1995 – Comparison with the 2005 EU limit value (number of days above 50µg/m<sup>3</sup>)**



**Fig. 4 Annual average gravimetric PM<sub>10</sub> measurements around Heathrow Airport since 1995**



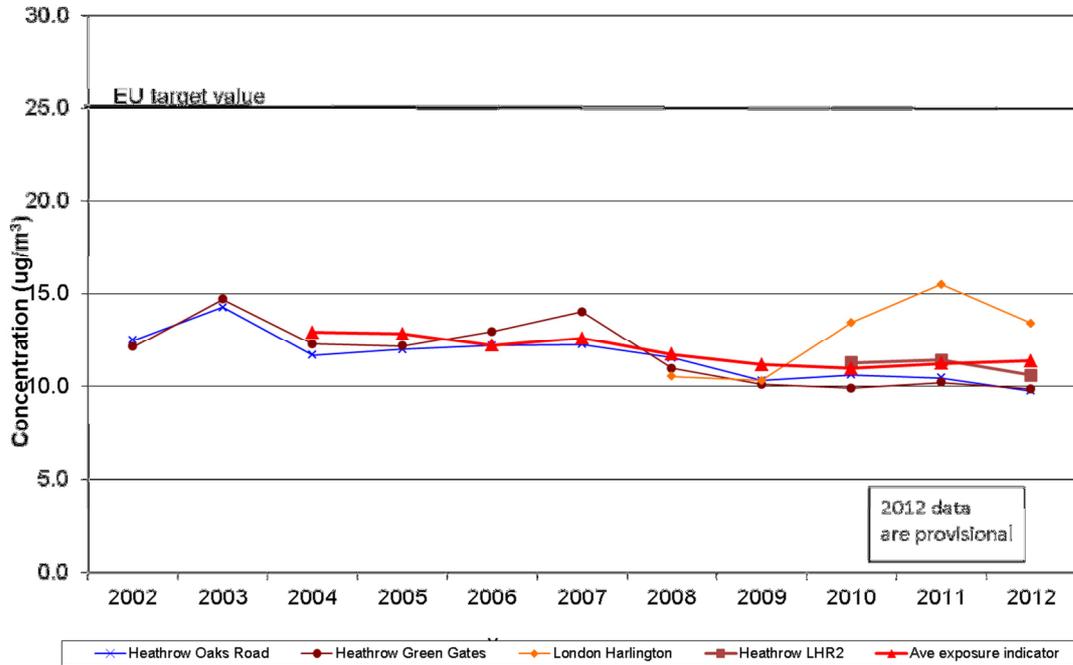
Making every journey better.

Annual average PM<sub>10</sub> concentrations at all sites were below the EU limit value in 2012 and were lower than in 2011.

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**Fig. 5 Annual average gravimetric PM<sub>2.5</sub> measurements around Heathrow Airport since 2005 – Comparison with the EU limit value (2020 PM<sub>2.5</sub> EU target of 25µg/m<sup>3</sup>)**



Annual mean concentrations of PM<sub>2.5</sub> measured at Green Gates, Oaks Road, Harlington and LHR2 for 2012 are presented in Fig 5. It also includes the average exposure indicator, which is a three year average for all monitoring sites.

Concentrations measured at three of the sites were similar to 2010, whereas those measured at Harlington have been higher since 2009. We have a slightly different monitor at Harlington which captures a greater proportion of the volatile fraction of particles – it uses a TEOM FDMS, as opposed to TEOM instruments at the other three sites. Unfortunately the TEOM FDMS is more prone to breakdown and the data capture at Harlington has been below the minimum EU requirement (90%) since the instrument was installed. This situation has improved, and we achieved data capture of over 90% in 2012.

HAL is investigating replacement of all its particle monitors in 2013 with an alternative to the TEOM and TEOM FDMS. These alternative monitors collect the volatile fraction – giving a truer reading of particle concentration – as well as having much more reliable data capture.

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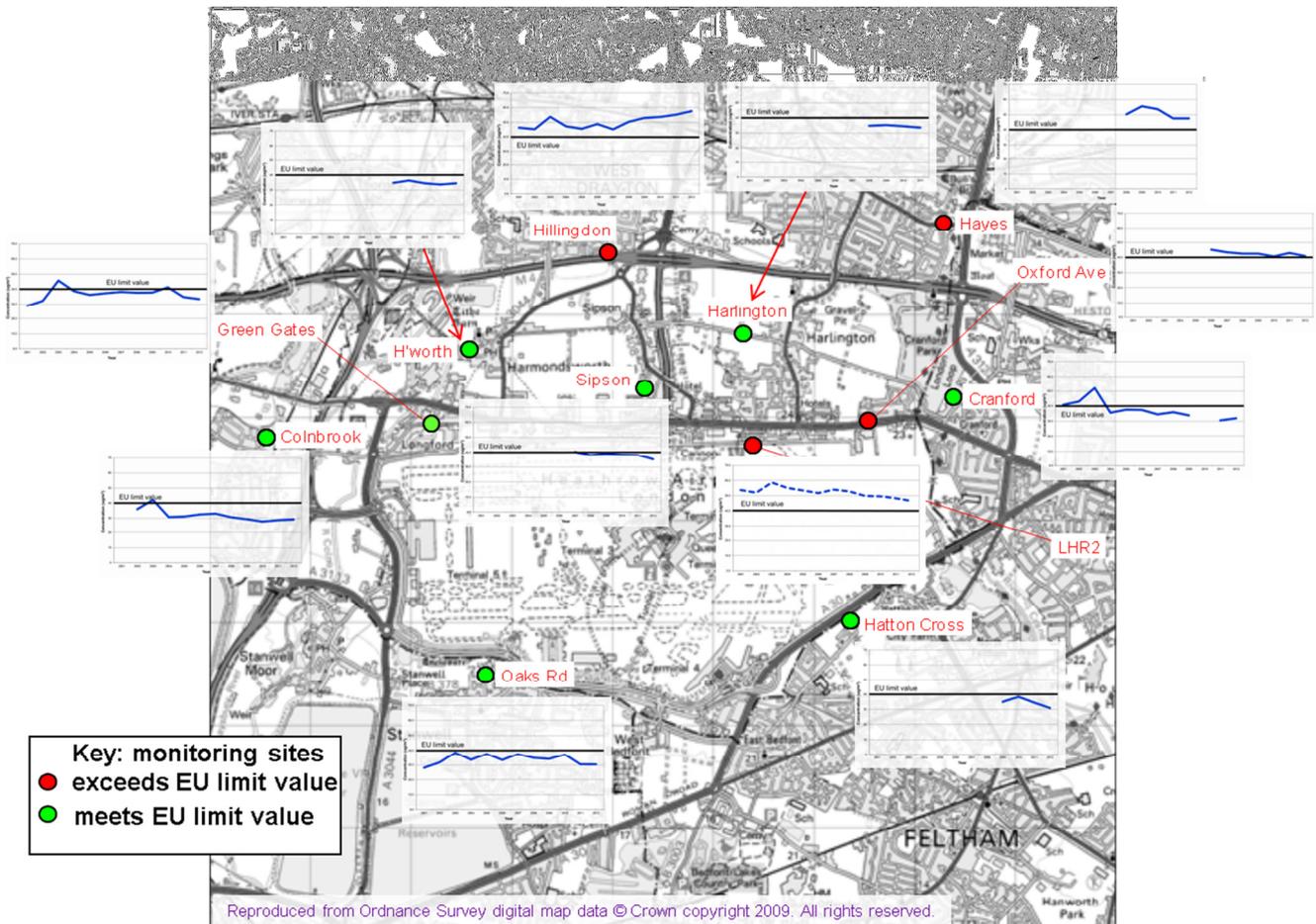
## Locations of the air quality monitoring sites at Heathrow and their individual NO<sub>2</sub> monitoring history.

The locations of relevant air quality monitoring sites are shown in Fig. 6, which also shows the trend in NO<sub>2</sub> concentrations measured at each site since 2001, putting the data into a geographical context.

The previous Air Quality Briefings described the proportions of emissions calculated for each monitoring site when the HAL Emissions Inventory 2008/9 was compiled. Fig. 6 shows the trend in measured NO<sub>2</sub> concentration at each site as well as providing the geographical context for the data presented in Fig.1.

- The only site not previously mentioned is Hayes, to the northeast of Heathrow. Direct airport emissions are approximately 4% of measured NO<sub>x</sub> concentrations, 2% is from airport-related road traffic, 33% from non-airport traffic and 61% from background sources.

**Fig. 6. Nitrogen dioxide monitoring sites and annual mean measurements since 2001**

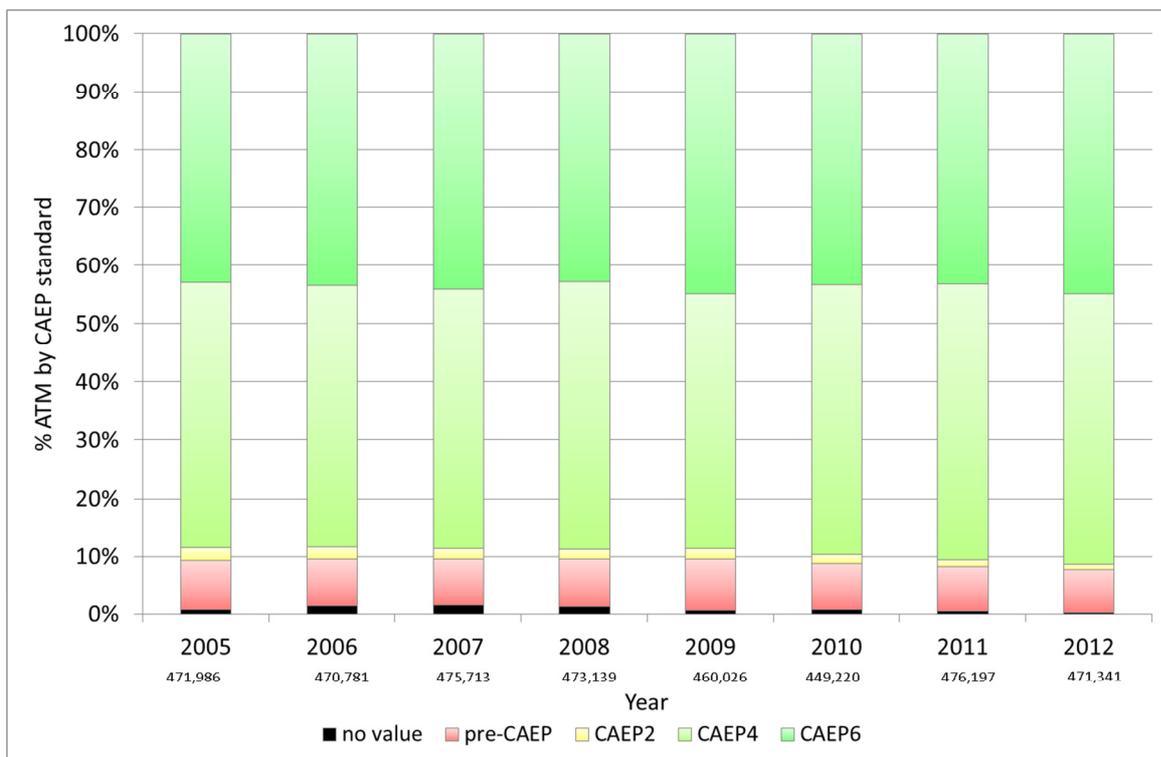


## CAEP value of air traffic movements

Through its Committee on Aviation Environmental Protection (CAEP), the International Civil Aviation Organization (ICAO) sets new emissions standards for aircraft engines – including for NO<sub>x</sub>. CAEP6 is the latest standard and came into force in 2008.

Fig. 7 shows the proportion air traffic movements (ATMs) based on their relationship to the CAEP NO<sub>x</sub> emissions standards. The number of ATMs each year is also presented. It shows the relative proportion of flights made by newer, cleaner aircraft (those defined as CAEP4 or better) has risen to its highest ever point. Over 91% of flights were made by aircraft of CAEP4 standard or better in 2012 – a 0.9% increase over 2011. This is a reflection of airlines replacing older aircraft with newer models and HAL's NO<sub>x</sub> landing charge which encourages the use of aircraft with lower emissions.

**Fig. 7. - CAEP4 compliance of ATMs (air traffic movements) since 2005**



We will investigate 2012 aircraft emissions and report them later in 2013.