

LAQN Update

21st June 2016
Timothy Baker, Louise Mittal

King's College London

(all LAQN partners)

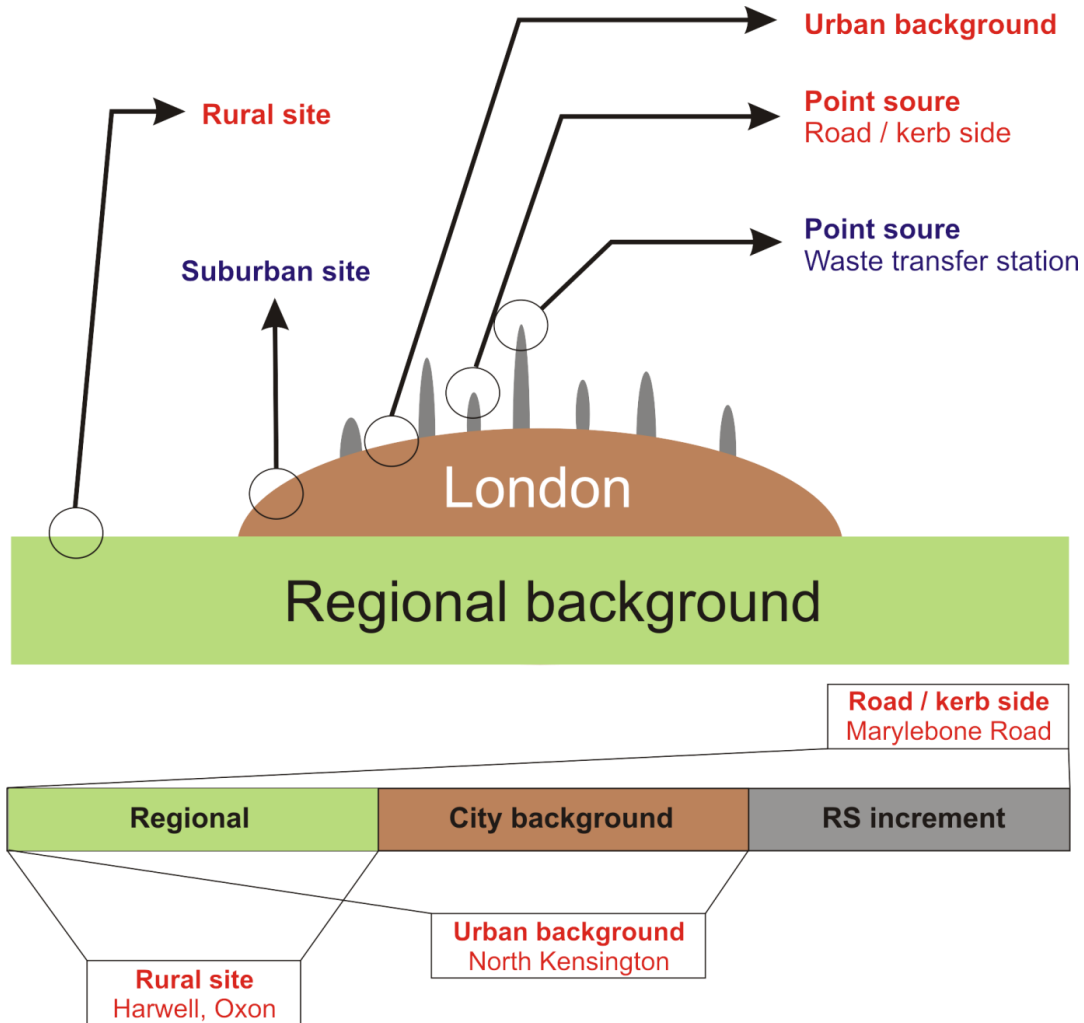
Contents

The current situation and decadal changes in London's air pollution

1. Summary Trend & latest results for:
 - i. PM_{10} and $PM_{2.5}$
 - ii. NO_x / NO_2
 - iii. O_3
2. Pollution Episodes in last 18 months
3. LAQN innovations

The “Lenschow” perspective

Lenschow et al 2001



Summary LAQN data

- For each pollutant we have summarised measurements in two ways:
 - 1) Trends in long-term measurements sites:
 - Marylebone Road kerbside
 - Inner London roadside
 - Inner London background
 - Outer London roadside
 - Outer London background
 - 2) 2015 measurements against the AQS Objective / EU LV

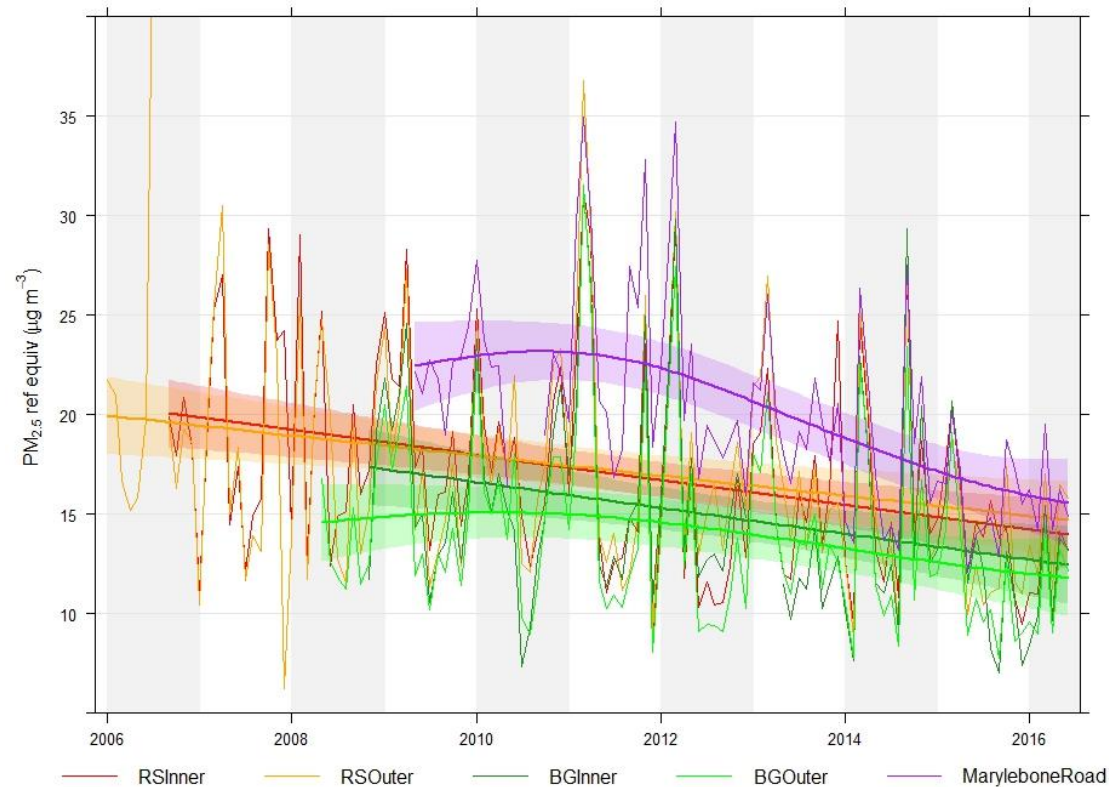
Currently over 110 sites in LAQN

- *Note: assessment of EU LV compliance involves more than just the measurements (esp. for PM.) EU LV compliance assessment is a Defra responsibility.*
- *Some provisional data and analysis included.*

PM_{2.5} (ish)

Changes in measurement methods and historic small numbers of monitoring sites make trends difficult.

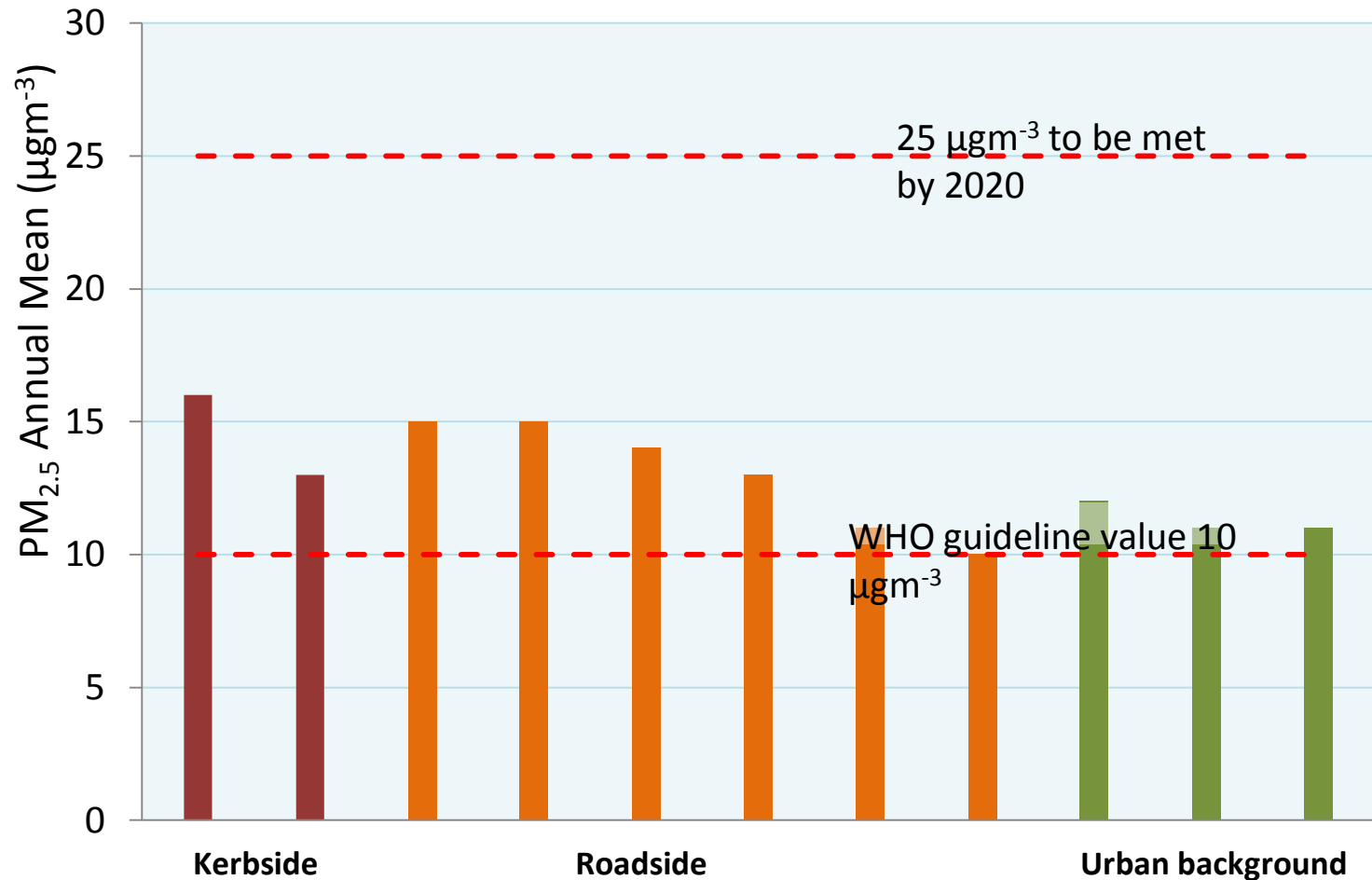
TEOM measurement sites only shown (Not reference equivalent)



PM_{2.5}

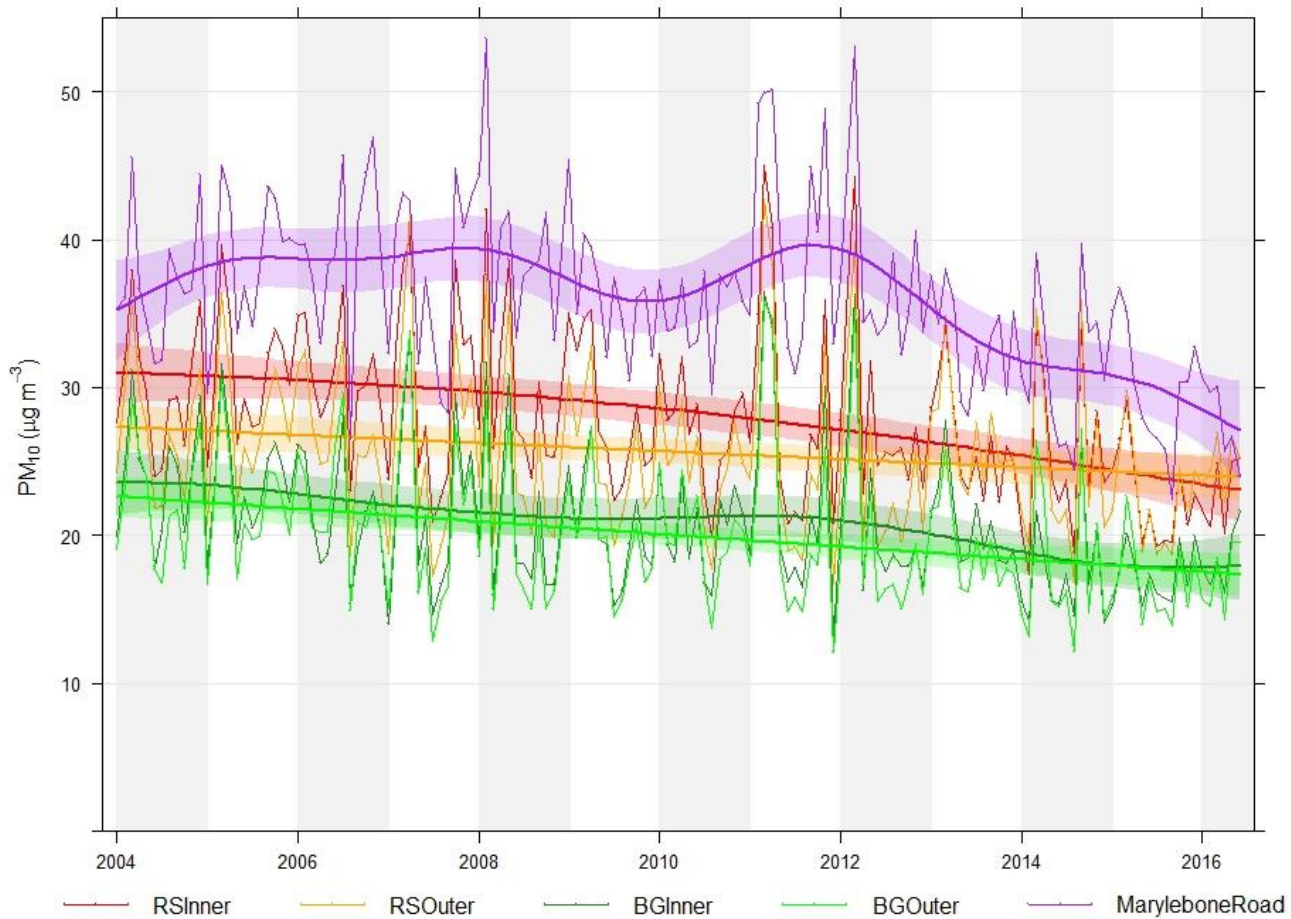
FDMS measurements only (Reference Equivalent)

Some SMART BAMs now in place but didn't make 90% for 2015



PM₁₀

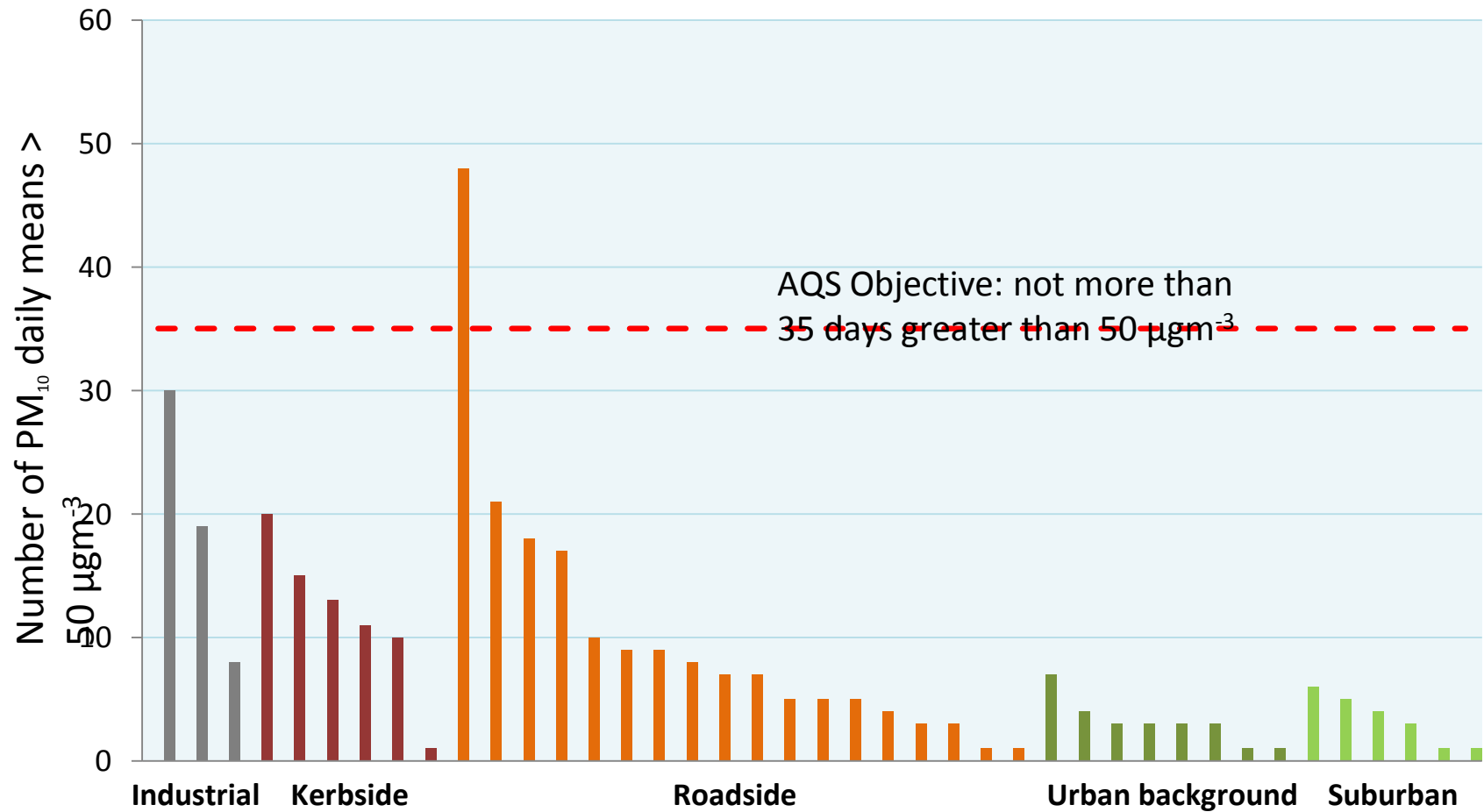
Trends only possible since 2004 – first date that the VCM could be operated.
Probable that changes in the regional background are driving the apparent decrease in PM across site types.



PM₁₀

2015 vs the AQS objective / EU LV

Only sites that achieved 90% data capture included.



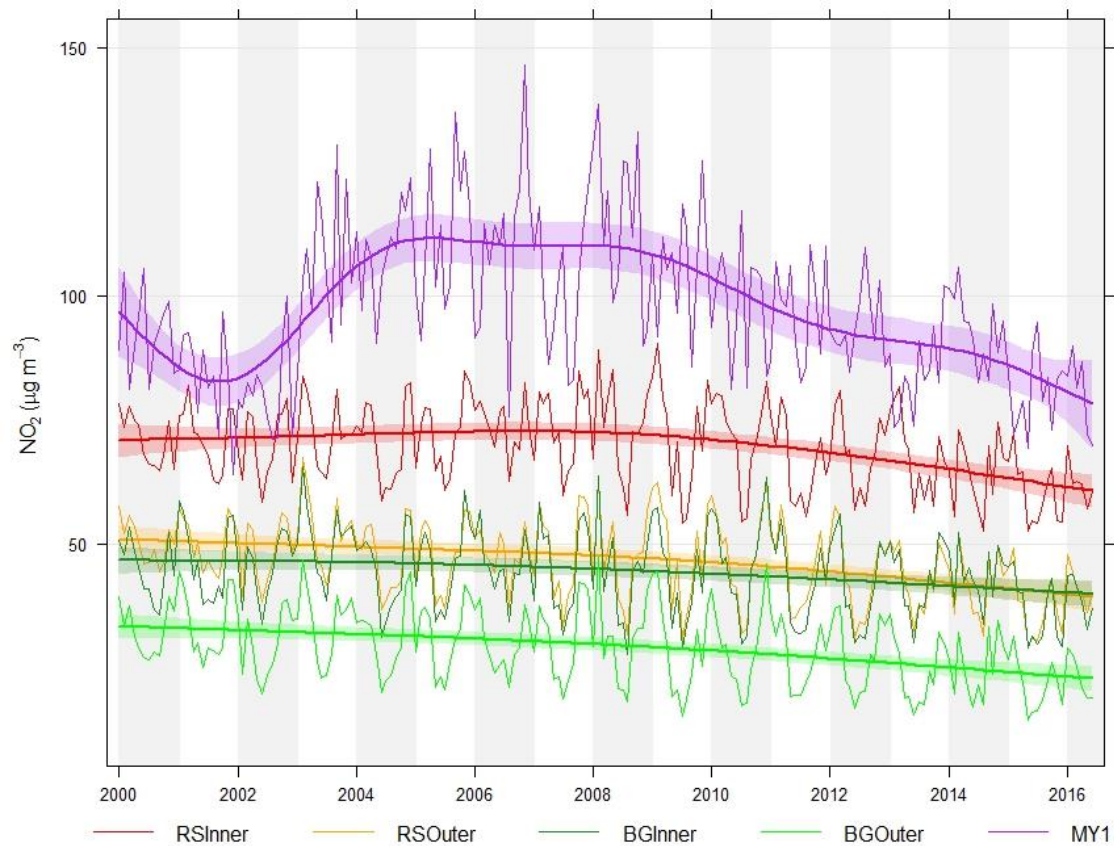
NO_x

Primary pollutant (NO+NO₂) tells us about emissions related to NO₂.



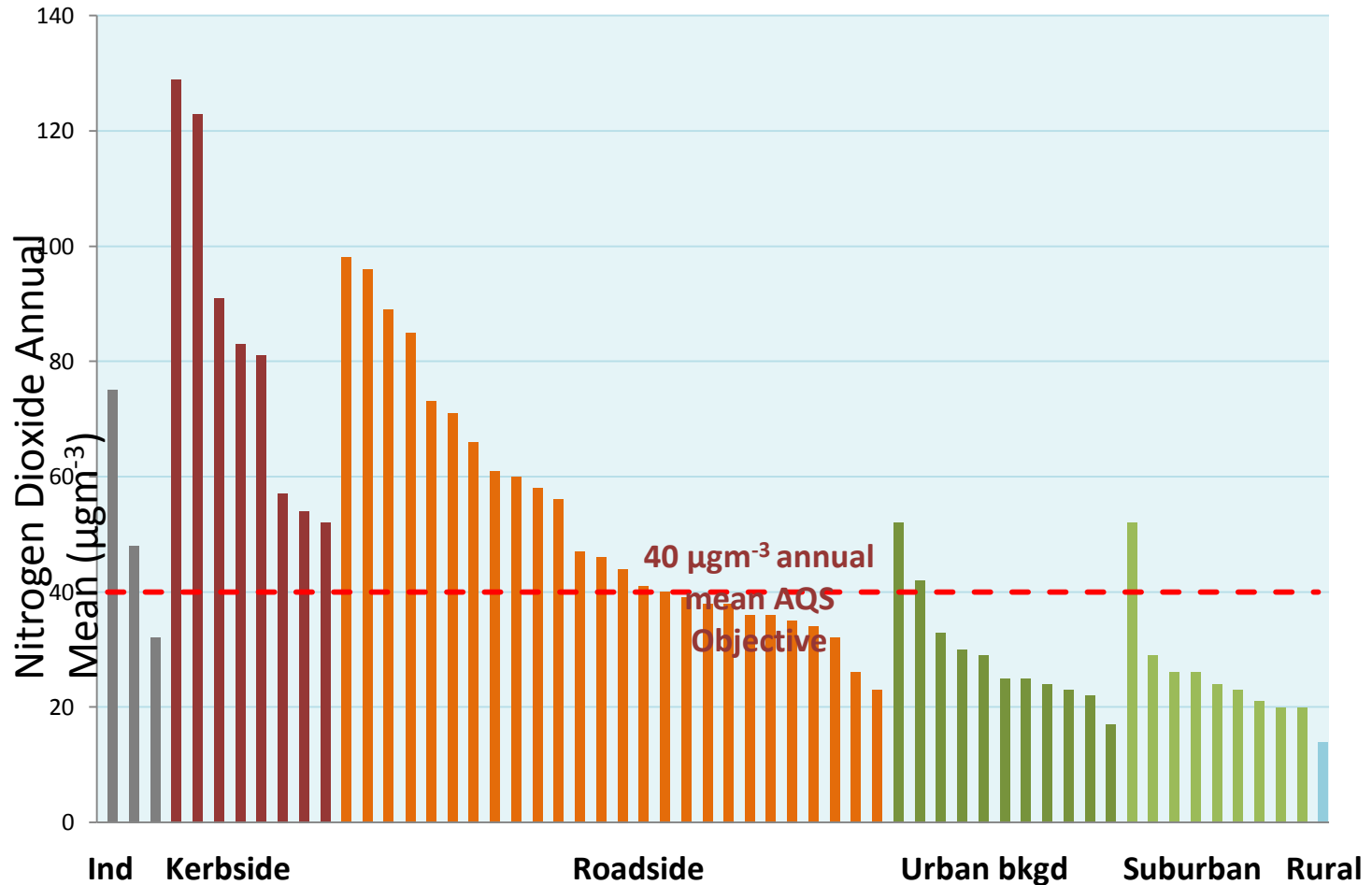
NO₂

Roadside seems to be reflecting slow decrease seen at background.
Roadside increment for Inner London seems to be reducing.



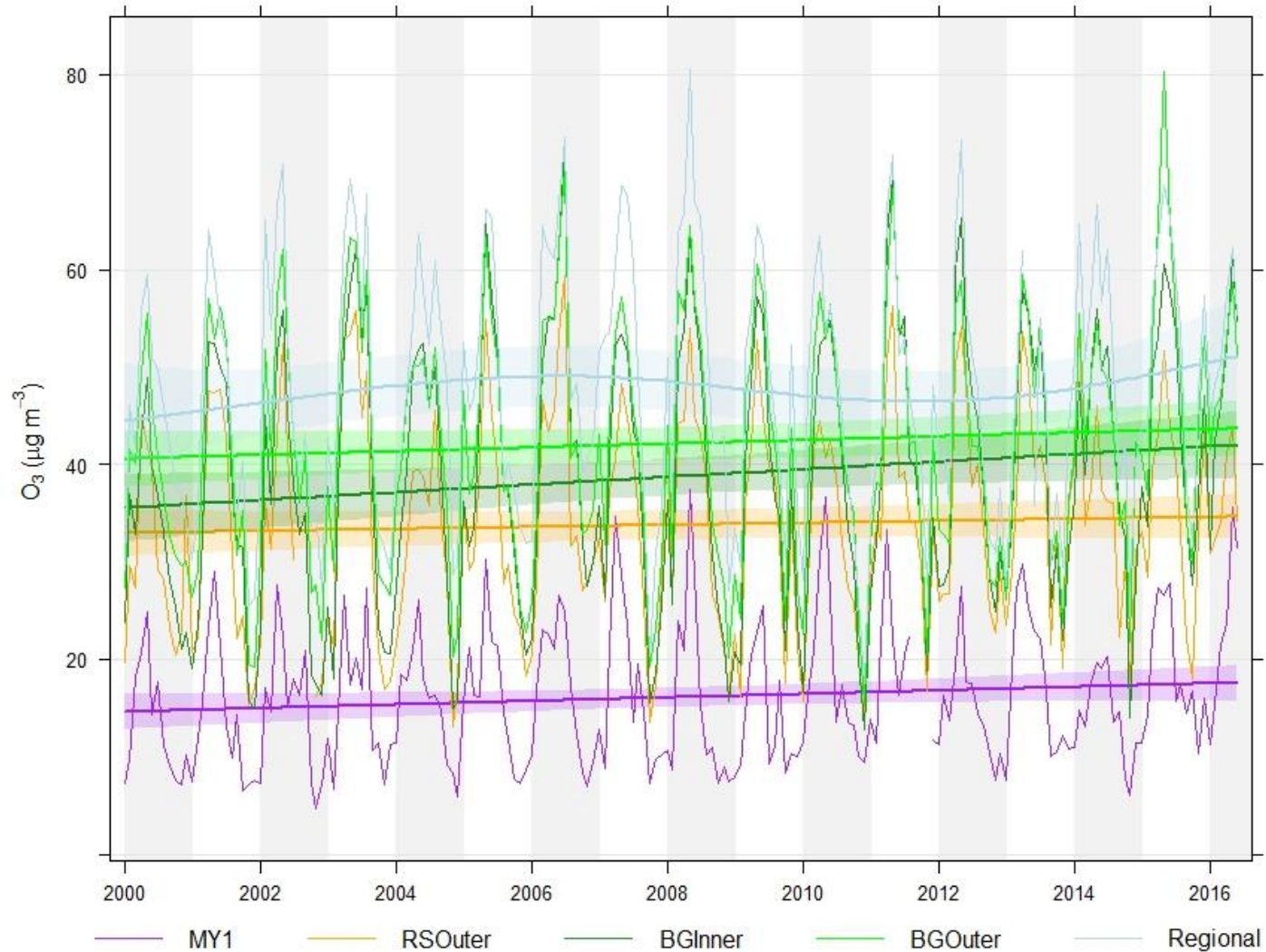
NO₂

Widespread breaches of the AQS Objective and possibly EU LV(?)
Some roadside exceed by more than 2-3x



O₃

Decrease in London decrement as observed by AQEG (2009)

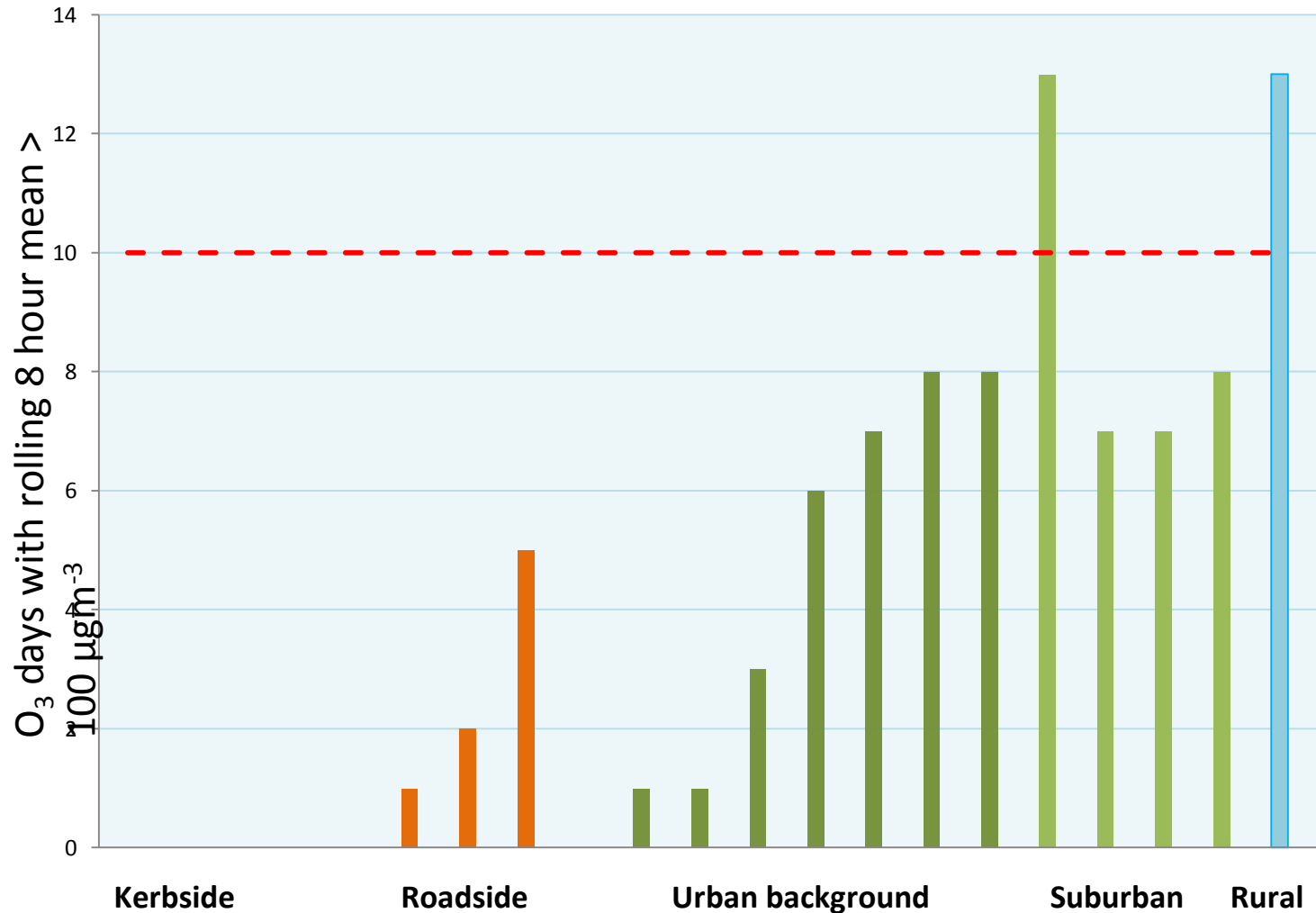


O₃

Some breaches of the AQS Objective but not nearly as widespread as previous years.

Many sites measured 30 – 40 days with max 8h > 100 $\mu\text{g}\text{m}^{-3}$ in 2008.

Reflection of quality of “summers” ?.



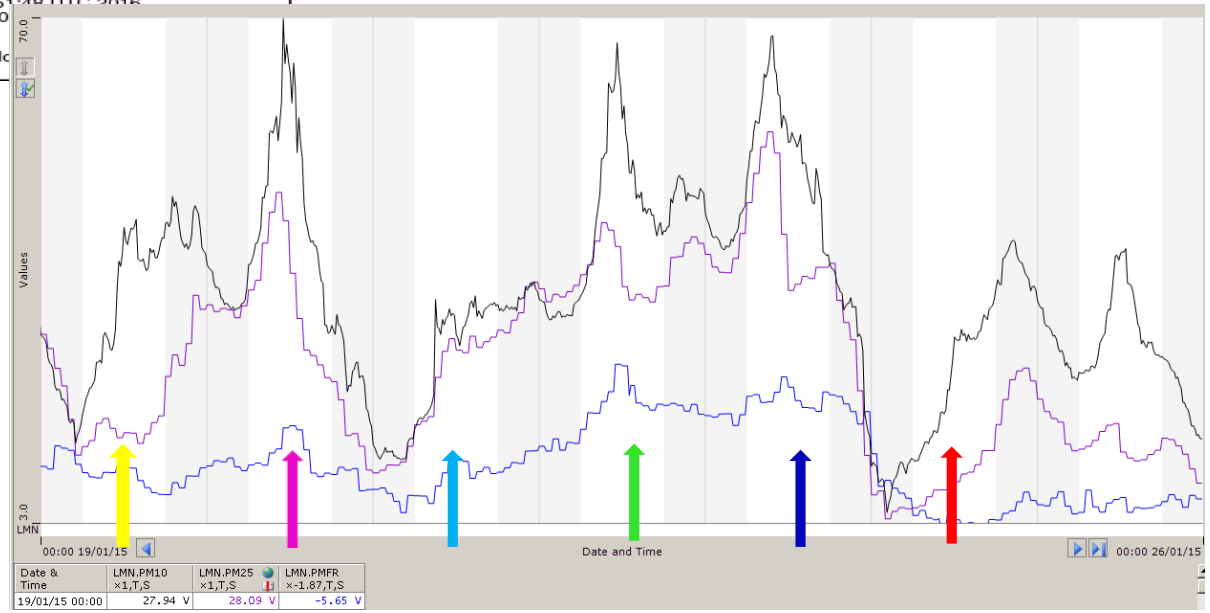
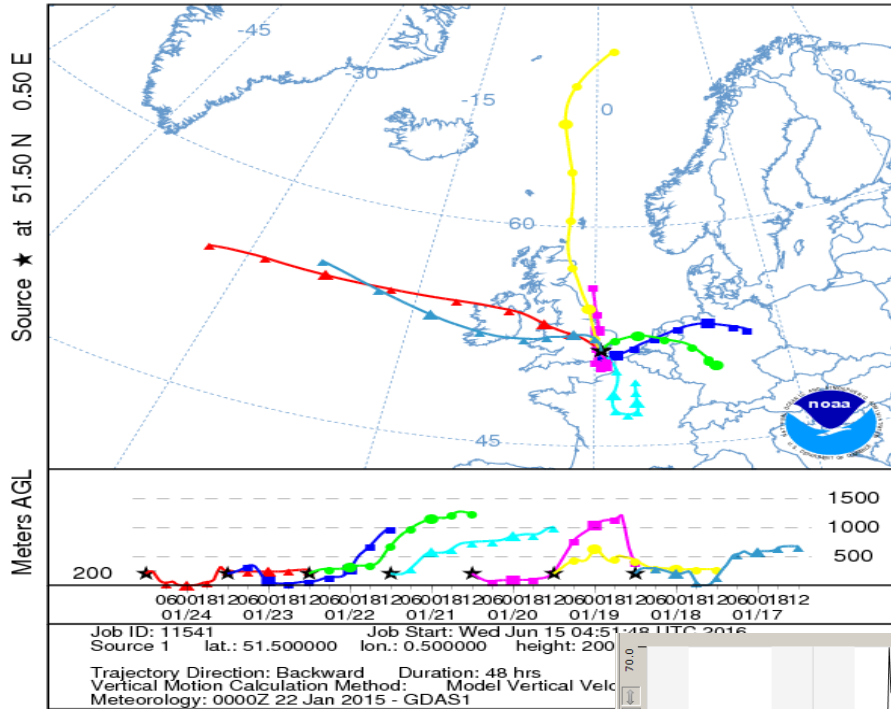
POLLUTION EPISODES 2015/16

2015/16 Episodes

Start Date	End Date	Length	Type	NO2	O3	PM10	PM2.5	Points of Note
05/05/2016	09/05/2016	4	Photo		M	M	M	
22/03/2016	23/03/2016	2	Primary			M		
→ 10/03/2016	13/03/2016	4	Import			H	VH	12th worst Pm2.5 since DAQI
→ 19/01/2016	20/01/2016	2	Pri-UK-Import	M		H	H	Highest NO2 at some sites
27/12/2015		1	Saharan			H		
17/12/2015		1	Saharan			M		
31/10/2015	01/11/2015	2	Primary			M	H	
23/10/2015	24/10/2015	2	Primary	M				
08/10/2015	09/10/2015	2	Primary	M				
03/10/2015	04/10/2015	2	Mixed			M	M	
02/08/2015		1	Photo		M			O3 remained elevated into night
→ 30/06/2015	02/07/2015	3	Photo		H			O3 remained elevated overnight
08/04/2015	09/04/2015	2	Primary-Import	M		M	M	
17/03/2015	18/03/2015	2	Import			H	VH	
09/02/2015	12/02/2015	3	Primary	M		M		
→ 19/01/2015	23/01/2015	4	Primary-Import	M		H	M	Isolated VH PM10 associated with road salt ?
20/01/2015		1	Primary	M		M		Isolated H PM10 associated with road salt ?

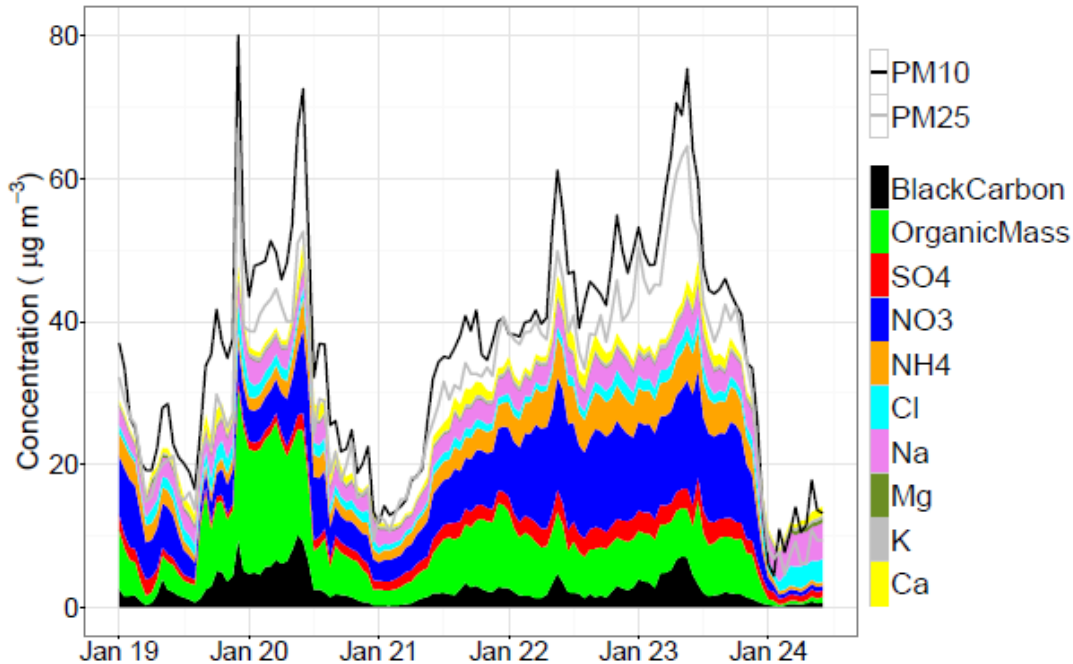
NOAA HYSPLIT MODEL
 Backward trajectories ending at 1200 UTC 24 Jan 15
 GDAS Meteorological Data

19-23 Jan 2015 (Primary - Import)

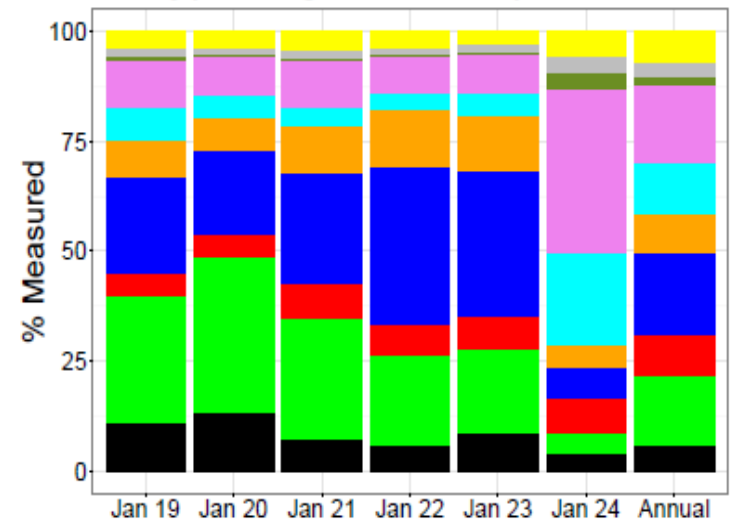


What's in a Particle ?

Real-time chemical composition of PM

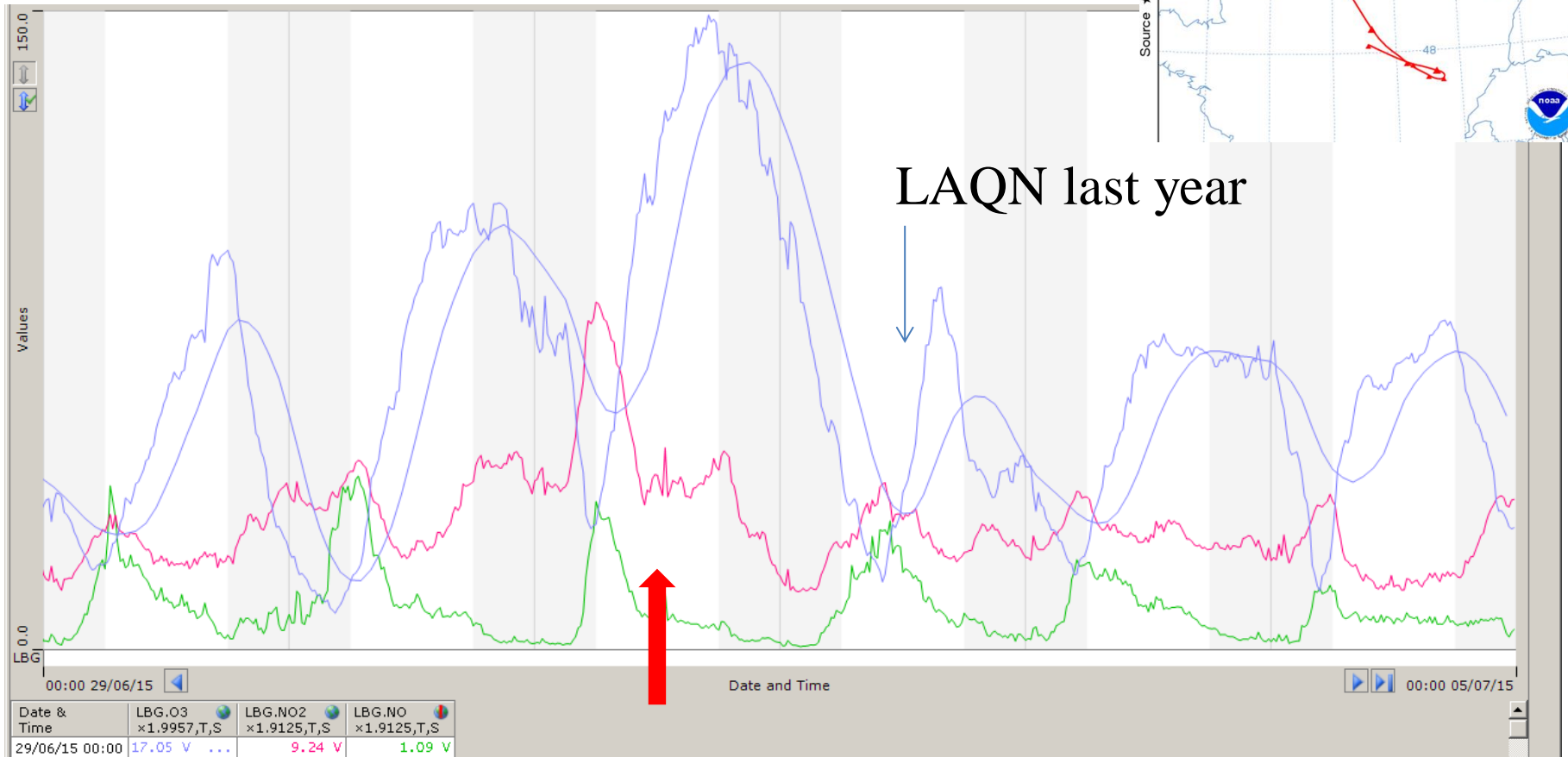


Daily percentage chemical composition of PM



- *Black Carbon – diesel vehicles and wood burning;
- *Organic Mass – both local (traffic, wood burning and cooking) and distant sources;
- *SO₄ – industry;
- *NO₃ – both distant and local sources (traffic, and domestic heating);
- *NH₄ – agriculture;
- *Cl, Na and Mg – sea salt produced from breaking waves;
- *K – wood burning and wind-blown soil;
- *Ca – resuspended soil and construction;

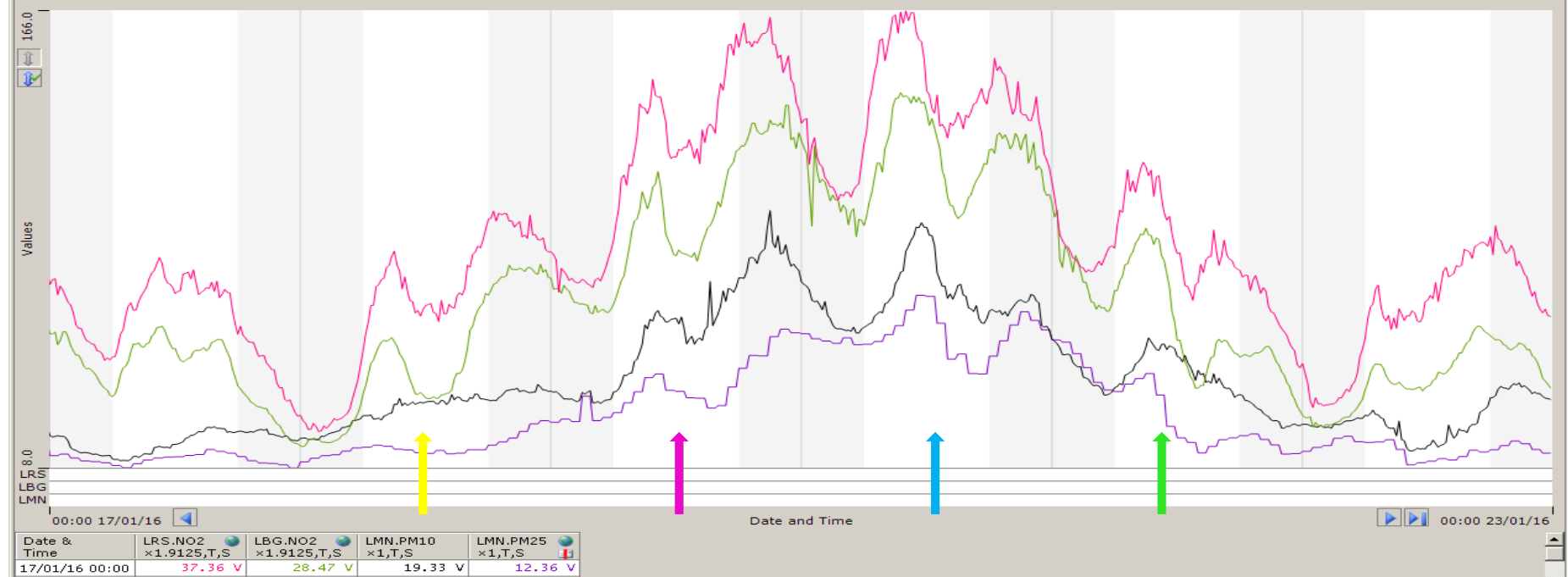
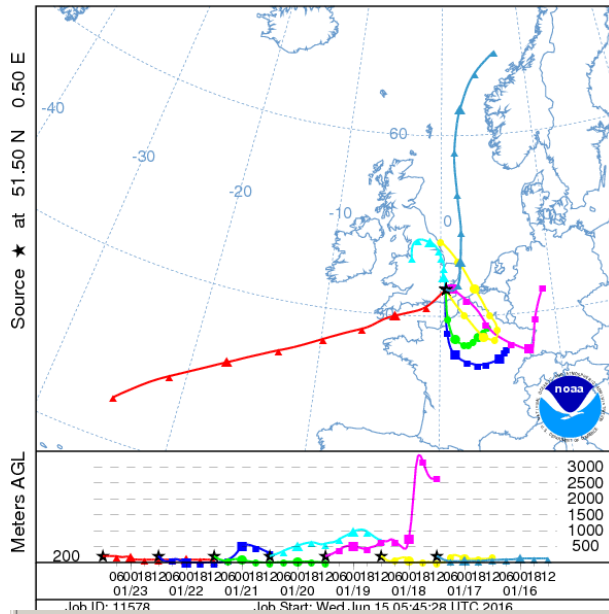
High Ozone Jun/Jul 15



- Day/night cycle $O_3 \rightleftharpoons NO_2$
 $NO + O_3 \rightleftharpoons NO_2 + O_2$

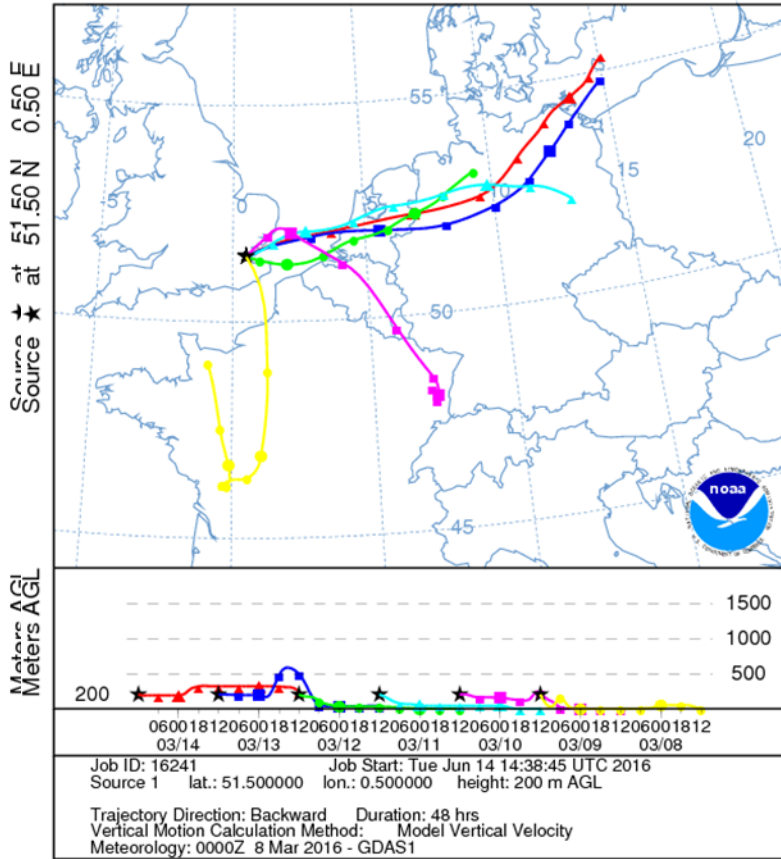
Jan 2016

Import can be from rest of UK & Primary Contribution on top (Highest NO₂)

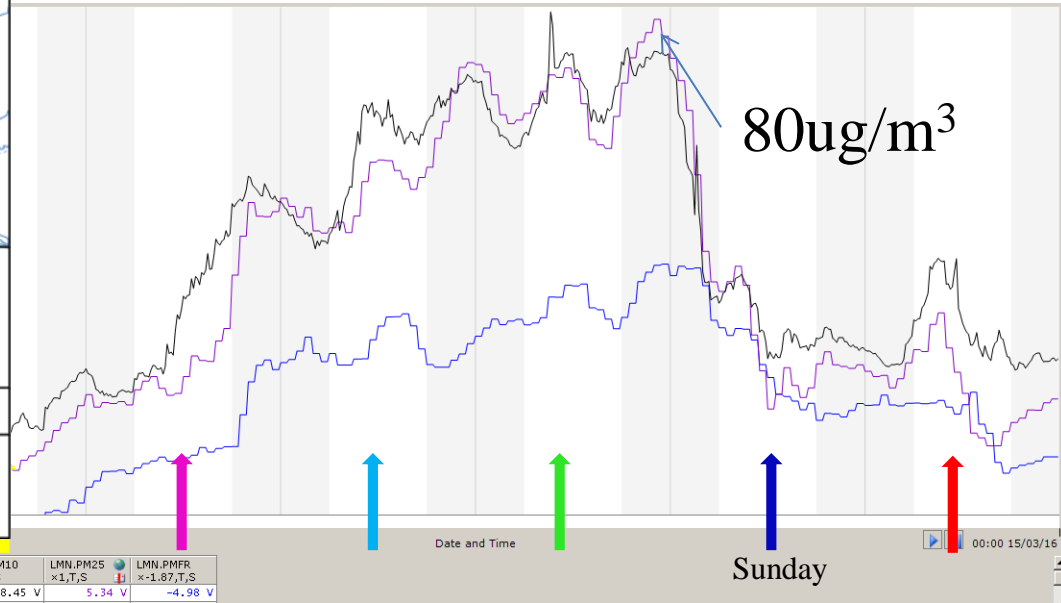


10-13 Mar 2016 (Import)

NOAA HYSPLIT MODEL
 Backward trajectories ending at 1200 UTC 14 Mar 16
 GDAS Meteorological Data



Highest PM2.5 since it's been included in DAQI (2012)
Average across London
 (Roadside and Background)
 peaked at around 80ug/m³



Date & Time	LMN_PM10 x1,T,S	LMN_PM25 x1,T,S	LMN_PMR x1.87,T,S
09/03/16 00:00	8.45 V	5.34 V	-4.98 V

LAQN INNOVATIONS

Rollout of new IP capable modems

- King's own, supply and support
 - Modem (and any replacement needed)
 - SIM
 - We pay the bill
 - You save on line costs or mobile bills
- Future technology linked to older equipment
- IP connection
 - CSD dial up retained for third party access
 - Remote reboot
 - We can see if active on network & get signal strength

LAQN Innovations

- IP Modems
- An updated LondonAir [Website](#)

LAQN Innovations

- IP Modems
- An updated LondonAir [Website](#)
- Widget

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OUT NOW

LIVE MUSIC EVENTS

09/09 - 09/10 New York City - Americana Music Festival

09/10 - 09/11 New York City - Americana Music Festival

09/11 - 09/12 New York City - Americana Music Festival

LATEST VIDEO

Taylor Swift - ...

vevo

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Read this: Have you ever...? We've asked the all-time Taylor Swift. Here you will find the...
We do have a top gallery with over 1000 Taylor Swift photos, including photos and photos of...
of appearance. Make sure to follow us for all the new photos. We hope you enjoy the site and please back soon.

FOLLOW US

Follow @taylorswift on Twitter

LATEST VIDEO

Taylor Swift's Gift

IS TAYLOR SWIFT?

October 20, 2015 in Relationship, Taylor Swift, Taylor Swift's Gift

Get the right insurance for your pet. **Petplan**

PEOPLE'S CHOICE AWARDS 2016

Taylor was 2 People's Choice Awards

Favorite Female Artist
Steve Largent
Lena Dunham
Madonna
Selena Gomez
Taylor Swift

Favorite Pop Artist

YouTube **taylor swift** Upload

Mix - Taylor Swift

Taylor Swift - Blank Space
TaylorSwiftVEVO

Taylor Swift - Shake It Off
TaylorSwiftVEVO

Taylor Swift - Bad Blood ft. Kendrick Lamar
TaylorSwiftVEVO

Taylor Swift - Style
TaylorSwiftVEVO

Taylor Swift - Wildest Dreams
TaylorSwiftVEVO

Taylor Swift - 22
TaylorSwiftVEVO

Meghan Trainor - All About That Bass
MeghanTrainorVEVO

50+ videos
Mix - Taylor Swift - Blank Space
YouTube

Taylor Swift - Blank Space
TaylorSwiftVEVO

Subscribe 13,656

1,430,85102

Taylor Swift - Shake It Off

taylor swift

Who to follow: Maile Salmon, Bermondsey Street, BBC News (World), and more.

Trends: #FeelGoodCookbook, #FeelGoodCookbook, #FeelGoodCookbook, #BeatsWords.

Danny Crawford
Taylor Swift, Tim McGraw: CMA Music Festival: Country's Night to Rock
8/12/2013

Taylor Swift, Tim McGraw: CMA Music Festival: C...

Taylor Swift, Tim McGraw: CMA Music Festival: Country's Night to Rock...
Taylor Swift answers fans' questions, and performs "Reed" and "Tim McGraw" before being joined on stage by Tim McGraw and Keith Urban for "Highway Don't Care".

The New York Times

Artbeat The Culture at Large

Taylor Swift's 'Blank Space' Is Vevo's Most-Watched Video

By ANDREW B. CROW OCTOBER 20, 2015 9:46 PM 21 Comments

Share: Email, Facebook, Twitter, Save, More

8 Great Cities to Retire in!

If you have a \$250,000 portfolio, download the most-read guide for retirees written by Forbes columnist and money manager Ken Fisher's firm. It's called "Premier Retirement Destinations."

Click Here to Download Your Guide!

Citizen Sense

ABOUT PROJECTS PEOPLE POLLUTION SENSORS URBAN SENSORS WILD SENSORS WEATHER HELPS KITS EVENTS RESOURCES ADVISORY

London Air Widget from London Air Quality Network

We are trialling the London Air Widget, developed by the Environmental Research Group at King's College. It's a little widget which contains hourly and annual pollution maps, alerts, the forecast, videos, news and a street guide, based on the [London Air](#) site. We have included the widget here in a blog post so that it can be viewed at a larger size, but the widget can also be included in the side bar of a website.

Annual Hackers and Texting Fash

As part of a day-long event on citizen science at the Dana Centre in London, Jennifer Gabeys and Helen Pittard of the Citizen Sense...

Tell London's mayoral candidates – scrap the Silvertown Tunnel

London's mayoral candidates include Sam Berry (Green), Zac Goldsmith (Conservative), Sadiq Khan (Labour) and Caroline Pidgeon (Liberal Democrat)

The final public consultation into Transport for London's Silvertown Tunnel proposals is over. But it's not too late to do your bit to stop the £1bn toxic tunnel - because London's next mayor can axe the project in 2016.

We were delighted with the response to our campaign against a new road which is likely to increase congestion and pollution in neighbourhoods on both sides of the river. We're grateful to everybody who took the opportunity to speak out - and especially those who told us how useful they found our suggested response.

And we'd especially like to thank our brilliant volunteers who helped us deliver 10,000 leaflets to homes on both sides of the river - many to people who'd never heard about TfL's scheme before.

More than 100 people came to our public meeting at the Forum in Greenwich last month. We're glad that the more people find out about the Silvertown Tunnel, the more they don't want it.

What happens next?

LATEST

Tell London's mayoral candidates - scrap the Silvertown Tunnel (0)
 Lewisham Council votes to oppose TfL's toxic Silvertown Tunnel (0)
 Times's ranking out: Here's some help in saying NO to TfL's toxic Silvertown Tunnel (0)
 Come to the No to Silvertown Tunnel public meeting - 12 November, The Forum at Greenwich (0)
 It's time to say NO: Londoners deserve better than TfL's Silvertown Tunnel plans (0)

London Air Widget Builder

Option	Description
450 x 500 Width x Height	Width and height in pixels.
NONE Start Authority	Will automatically expand the local authority section of the specified local authority id (LAI).
LIST Start Tab	Determines which tab of the left menu is selected at start. Note: if showAlertsOnNew is true and there are alerts then this setting will be overridden.
<input type="checkbox"/> Hide Left Menu	If selected then the left menu will be hidden from the user.
<input type="checkbox"/> Hide Tabs	Can be used to hide items on the left menu. Check the box for each item you wish to hide.

LIST MAP ALERT FORECAST VIDEO NEWS GUIDE TWITTER

[show advanced settings](#)

iframe snippet

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<iframe id="theFrame" width="450" height="500" frameborder="0">
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Polluted Putney: why we should all care about air quality

By Judith Chapman, Chair, Putney Society

(This article was published in the July 2015 Bulletin)

It is estimated that the UK population lost 140,000 years of life in 2006 from premature mortality. This compares with an estimated 100,000 years of life lost from cancer due to air pollution. The OLA has estimated that also in 2006, 4,287 deaths in London were due to long-term exposure to particulates, with the inner city area (PM2.5) being particularly deadly.

To long known to cause the estimated number of deaths associated with PM2.5 air pollution in Wandsworth in 2010 was 188 and the associated number of life years lost was 1,483. These most often affect the population in children, as concentrations of particulates are highest nearest to the road.

London is known to exceed the World Health Organisation's guideline for particulate matter in Putney and is ranked as one of the most polluted areas in the Borough and the particulates exceed the WHO guideline in a number of sites near train roads used around the Borough and the pollution levels identified in Putney High Street exceed the annual mean guideline significantly more than other sites.

Our air quality is affected by many sources of emissions, predominantly transport and when that sector reports lower vehicles whether buses, HGVs or private cars. Our High Streets form an urban canyon with a narrow canopy and a highly continuous facade of buildings which prevent the prevailing winds from dispersing pollution.

Wandsworth Council have now published a [Draft Air Quality Action Plan](#) for consultation. You are invited to say what you think about the quality of the Putney, please send the document and respond. The Putney Society has sent a letter to the Council, which has already received a number of responses. We hope you will find it of interest.

The Mayor is proposing a ULEZ for central London - should it be extended to include pollution hot spots such as Putney?

What is the Council doing to access the Mayor's fund for Low Emission neighbourhoods - a source of finance aimed at finding innovative ways of tackling pollution hotspots?

What is the Council doing to take the consultation EIA?

What's the air like where I live?

Healthy Air London is a community organisation based at the Royal College of Surgeons in the City of London. We are committed to the improvement of air quality in London. Take a look and see how your local area is performing.

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Widget Builder

London Air Widget Builder

Option	Description
450 x 500 Width x Height	Width and height in pixels.
NONE Start Authority	Will automatically expand the local authority section of the specified local authority id (LAId).
LIST Start Tab	Determines which tab of the left menu is selected at start. Note: if showAlertsOnNew is true and there are alerts then this setting will be overridden.
<input type="checkbox"/> Hide Left Menu	If selected then the left menu will be hidden from the user.
LIST <input type="checkbox"/> MAP <input type="checkbox"/> ALERT <input type="checkbox"/> FORECAST <input type="checkbox"/> VIDEO <input type="checkbox"/> NEWS <input type="checkbox"/> GUIDE <input type="checkbox"/> TWITTER <input checked="" type="checkbox"/> Hide Tabs	Can be used to hide items on the left menu. Check the box for each item you wish to hide.

[show advanced settings](#)

1.10.2.0

Air quality widget from King's College London

Brixton Road Moderate

Nitrogen Dioxide increased from Low to Moderate.

iframe snippet

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hideMapButtonSet=0&showAlertsOnNew=1&embedflash=1&showL
Aids=0&maxNewsItemsToDisplay=10&startLeftButton=LIST&st
artAuthorityButtonSet=AUTHORITIES&leftMenuSpacing=COSY&
hiddenMenuButtons=TWITTER"></iframe>
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Conclusions

Changes in air pollution in London over the last ~ 10 years show the successful outcomes of some measures to abate road traffic emissions (mainly from petrol vehicles)

Large decreases in NO_x early in C21 but have slowed since.

PM_{10} , $\text{PM}_{2.5}$, NO_x and NO_2 all showing slow downward trend in general.

Still very large breaches of the AQS objective for NO_2 in London.

Background NO_2 has decreased and there is some indication of slight decrease in road NO_2 since 2010 but the picture is complex and not the same at all locations.

Conclusions

AQS/LV compliance for PM₁₀ is getting better but trend is still up at some sites and non exhaust particulate may be getting worse.

PM₁₀ decreases in the last ten years largely due to drop in regional background.

O₃ should not be ignored as concentrations in London rise towards regional background and the regional background itself is slowly increasing (AQEG, 2009).

Thanks

This presentation has involved the crunching of 10s of millions of air pollution measurements

- Louise Mittal
- Thank you all the boroughs & districts, GLA, Defra and TfL who support the London Air Quality Network enabling this unique perspective for London and beyond.