

**Imperial College
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Projects

**Environmental
Research Group**

London Air Quality Network Summary Report 2020

Independent analysis provided by:




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Title	London Air Quality Network – Summary Report 2020
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Customer	London Air Quality Network
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1 Introduction

This report details the results of air pollution measurements made on the London Air Quality Network during 2020. Measurements have been presented with specific reference to the UK Air Quality Strategy (AQS) Objectives and the EU Limit Values.

The London Air Quality Network (LAQN) is a unique resource, providing robust air pollution measurements that are essential to underpin air quality management and health studies. The public face of the network, the LondonAir web site (www.londonair.org.uk), is visited by thousands of Londoners seeking hourly updated air pollution information.

The LAQN was formed in 1993 to coordinate and improve air pollution monitoring in London. The majority of London's 33 boroughs supply measurements to the network with additional measurements from local authorities surrounding London, thereby providing an overall perspective of air pollution in London and the Home Counties.

The LAQN is operated and managed by the Environmental Research Group (ERG) at Imperial College London. QA/QC audits are carried out by the National Physical Laboratory (NPL). Each borough funds air quality monitoring in its own area. The Department of Environment, Food and Rural Affairs (Defra) funds ERG to operate the Marylebone Road site and to maintain several of the LAQN sites as affiliate sites to the UK Automatic Urban and Rural Network (AURN). Analysis of LAQN measurements has been augmented by measurements from directly-funded Defra sites in London. Measurements from Defra sites were provided by Ricardo Energy and Environment from the National Air Quality Archive and were included within the LAQN database. Transport for London also funds monitoring to help assess the air pollution impacts of the Congestion Charging Scheme and Low Emission Zone and some sites are funded by Business Improvement Districts (BIDs).

Pollution concentrations in 2020 were affected by the Covid-19 pandemic, which led to major changes in the types of activities that cause much of the ambient air pollution in the UK, such as traffic and industry. The UK was ordered into lockdown on 23rd March due to rapidly rising Covid-19 infection rates. Traffic volume and consequently concentrations of certain pollutants, especially NO_x, dropped steeply. Lockdown restrictions gradually began to ease in June 2020 but varying levels of restrictions remained in place for the rest of the year. The effects of these restrictions must be taken into consideration when comparing air quality measurements in 2020 to other years.

2 Air quality Strategy Objectives and EU Limit Values

There is ample evidence of the adverse health effects caused by air pollution (WHO, 2006 and 2021). In response to these health impacts, the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (Defra, 2008) sets out the UK's way forward on air quality issues, details objectives to be achieved, and proposes measures to help reach them. These UK objectives largely reflect EU Limit Values (EC, 2008). The GLA and the London boroughs and district councils outside the capital have responsibilities for the management of air quality and must work towards the attainment of AQS objectives. The AQS Objectives and EU Limit Values are detailed in Table 1. Monitoring progress towards the attainment of these Objectives and Limit Values forms a core activity for the LAQN.

Pollutant	Concentration	Measured as	To be achieved by (UK)	To be achieved by (EU)
Carbon Monoxide (CO)	10.0 mg m ⁻³	Maximum daily running 8-hour mean	31 December 2003	1 January 2005
Nitrogen Dioxide (NO ₂)	200 µg m ⁻³ not to be exceeded more than 18 times a year	1-hour mean	31 December 2005	1 January 2010
	40 µg m ⁻³	Annual mean	31 December 2005	1 January 2010
Sulphur dioxide (SO ₂)	350 µg m ⁻³ , not to be exceeded more than 24 times a year	1-hour mean	31 December 2004	1 January 2005
	125 µg m ⁻³ , not to be exceeded more than 3 times a year	24-hour mean	31 December 2004	1 January 2005
	266 µg m ⁻³ , not to be exceeded more than 35 times a year	15-minute mean	31 December 2005	n/a
Ozone (O ₃)	100 µg m ⁻³ not to be exceeded more than 10 times a year	8 hourly running or hourly mean	31 December 2005	n/a
Ozone (O ₃)	Target of 120 µg/m ³ not to be exceeded more than 25 times a year averaged over 3 years		n/a	31 December 2010
Particles (PM ₁₀) (gravimetric)	50 µg m ⁻³ , not to be exceeded more than 35 times a year	Daily mean	31 December 2004	1 January 2005
	40 µg m ⁻³	Annual mean	31 December 2004	1 January 2005
Particles (PM _{2.5}) (gravimetric)	25 µg m ⁻³	Annual mean	2020	2010
	20% cut in urban background exposure	Annual mean	2010 - 2020	2010 - 2020

Table 1: AQS Objectives and EU Limit Values.

3 Results

The AQS Objective results measured at LAQN sites during 2020 are detailed in Tables 2 to 8.

Key to site types:

RU	=	Rural
S	=	Suburban
U	=	Urban background
R	=	Roadside
K	=	Kerbside
I	=	Industrial

Key to network and funding status

AA	=	Affiliated to UK AURN. Final data set published by DEFRA
A	=	AURN DEFRA funded. Final data set published by DEFRA
T	=	TfL funded
O	=	Other non-local authority funding (annotated in brackets after site name)

All other instruments are funded by the respective local authorities

3.1 Carbon Monoxide

Site Name	Type	Capture Rate (%)	No occurrences of rolling 8hr mean $\geq 10\text{mgm}^{-3}$ (8.6ppm)	Achieved?
Kensington and Chelsea - North Ken ^{AA}	U	99	0	yes
Westminster - Marylebone Road ^{AA}	K	78	0	n/a

Table 2: AQS Objective results for CO

Summary

- All sites with data capture of 90% or above achieved the CO rolling 8 hourly mean objective.
- Large reductions in CO over last 20 years with the introduction of catalytic converters on petrol vehicles.
- Only two LAQN sites now measure CO.

3.2 Nitrogen Dioxide

Site Name	Type	Capture Rate (%)	Annual Mean <= 40 ug ^m - ³	Annual Mean Achieved?	No more than 18 occurrences of hourly mean > 200ug ^m - ³ (104.7ppb)	Hourly Mean Achieved?
Barking and Dagenham - Rush Green	S	99	17	yes	0	yes
Barking and Dagenham - Scrattons Farm	S	99	20	yes	0	yes
Bexley - Belvedere	S	94	18	yes	0	yes
Bexley - Belvedere West	U	100	17	yes	0	yes
Bexley - Slade Green ^{AA}	S	97	19	yes	0	yes
Brent - ARK Franklin Primary Academy	R	100	29	yes	0	yes
Brent - Ikea	R	91	49	no	0	yes
Brent - John Keble Primary School	R	99	29	yes	0	yes
Brent - Neasden Lane	I	100	29	yes	0	yes
Bromley - Harwood Avenue	R	95	21	yes	0	yes
Camden - Bloomsbury ^A	U	78	28	n/a	0	n/a
Camden - Euston Road	R	50	48	n/a	0	n/a
Camden - Holborn (Bee Midtown) ^D	K	72	34	n/a	0	n/a
Camden - Swiss Cottage ^{AA}	K	93	33	yes	0	yes
Castle Point - Hadleigh	R	17	17	n/a	0	n/a
City of London - Beech Street	R	99	29	yes	0	yes
City of London - The Aldgate School	U	95	22	yes	0	yes
City of London - Walbrook Wharf	R	87	45	n/a	0	n/a
Croydon - Norbury	K	99	35	yes	0	yes
Croydon - Park Lane	R	9	36	n/a	0	n/a
Croydon - Purley Way A23	R	99	24	yes	0	yes
Ealing - Acton Vale	U	56	19	n/a	0	n/a
Ealing - Hanger Lane Gyrotory	R	100	51	no	0	yes
Ealing - Horn Lane	I	97	33	yes	0	yes
Ealing - Western Avenue	R	98	35	yes	0	yes
Enfield - Bowes Primary School	R	99	30	yes	0	yes
Enfield - Bush Hill Park	S	100	18	yes	0	yes
Enfield - Derby Road	R	98	28	yes	0	yes
Enfield - Prince of Wales School	U	100	18	yes	0	yes
Greenwich - A206 Burrage Grove	R	99	26	yes	0	yes
Greenwich - Blackheath	R	94	29	yes	0	yes
Greenwich - Eltham ^{AA}	S	94	13	yes	0	yes
Greenwich - Falconwood	R	100	27	yes	0	yes
Greenwich - Fiveways Sidcup Rd A20	R	79	26	n/a	1	n/a
Greenwich - John Harrison Way	R	100	26	yes	0	yes
Greenwich - Plumstead High Street	R	100	30	yes	0	yes
Greenwich - Trafalgar Road (Hoskins St)	R	99	34	yes	0	yes
Greenwich - Tunnel Avenue	R	8	35	n/a	0	n/a
Greenwich - Westhorne Avenue	R	100	25	yes	0	yes
Greenwich - Woolwich Flyover	R	98	43	no	0	yes
Hackney - Old Street ^T	R	97	37	yes	0	yes
Haringey - Priory Park South ^{AA}	U	100	16	yes	0	yes
Haringey - Haringey Town Hall ^{AA}	R	98	30	yes	0	yes

Site Name	Type	Capture Rate (%)	Annual Mean $\leq 40 \mu\text{g m}^{-3}$	Annual Mean Achieved?	No more than 18 occurrences of hourly mean $> 200 \mu\text{g m}^{-3}$ (104.7ppb)	Hourly Mean Achieved?
Harrow - Pinner Road	R	50	23	n/a	0	n/a
Harrow - Stanmore	U	99	15	yes	0	yes
Havering - Rainham	R	100	23	yes	0	yes
Havering - Romford	R	98	29	yes	0	yes
Hillingdon - Harlington ^A	U	99	20	yes	0	yes
Hillingdon - Keats Way ^A	S	98	28	yes	0	yes
Islington - Arsenal	U	98	20	yes	0	yes
Islington - Holloway Road	R	98	31	yes	0	yes
Kensington and Chelsea - North Ken ^{AA}	U	99	21	yes	0	yes
Kingston Upon Thames - Cromwell Road	R	92	45	no	0	yes
Kingston Upon Thames - Kingston Vale	R	99	25	yes	0	yes
Kingston Upon Thames - Tolworth Broadway	R	73	34	n/a	0	n/a
Lambeth - Bondway Interchange	I	98	36	yes	0	yes
Lambeth - Brixton Road	K	96	60	no	1	yes
Lambeth - Streatham Green	U	100	26	yes	0	yes
Lewisham - Catford	U	77	29	n/a	0	n/a
Lewisham - Deptford	U	96	19	yes	0	yes
Lewisham - Honor Oak Park	U	99	16	yes	0	yes
Lewisham - Loampit Vale	R	98	36	yes	0	yes
Lewisham - New Cross	R	99	29	yes	0	yes
Merton - Morden Civic Centre 2	R	74	41	n/a	0	n/a
Newham - Britannia Gate	R	8	26	n/a	0	n/a
Newham - Cam Road	R	80	24	n/a	0	n/a
Newham - Wren Close	U	95	20	yes	0	yes
Redbridge - Gardner Close	R	99	27	yes	0	yes
Redbridge - Ley Street	U	96	21	yes	0	yes
Reigate and Banstead - A23 Hooley	R	91	38	yes	0	yes
Reigate and Banstead - Horley ^{AA}	S	99	13	yes	0	yes
Reigate and Banstead - Horley South East	S	99	15	yes	0	yes
Reigate and Banstead - Poles Lane	RU	98	10	yes	0	yes
Richmond Upon Thames - Barnes Wetlands	S	83	15	n/a	0	n/a
Richmond Upon Thames - Castelnau	R	100	20	yes	0	yes
Richmond Upon Thames - Chertsey Road (high level)	R	29	29	n/a	0	n/a
Richmond Upon Thames - Chertsey Road (low level)	R	47	23	n/a	0	n/a
Sevenoaks - Bat and Ball	R	97	18	yes	0	yes
Sevenoaks - Greatness Park	U	86	12	n/a	0	n/a
Southwark - A2 Old Kent Road ^{AA}	R	68	28	n/a	0	n/a
Southwark - Elephant and Castle	U	87	21	n/a	0	n/a
Southwark - Lower Road	R	9	39	n/a	0	n/a
Southwark - Tower Bridge Road	R	95	30	yes	0	yes
Sutton - Beddington Lane	I	55	18	n/a	0	n/a

Site Name	Type	Capture Rate (%)	Annual Mean $\leq 40 \mu\text{g m}^{-3}$	Annual Mean Achieved?	No more than 18 occurrences of hourly mean $> 200 \mu\text{g m}^{-3}$ (104.7ppb)	Hourly Mean Achieved?
Sutton - Beddington Lane north	I	99	23	yes	0	yes
Sutton - Beddington Village	R	13	30	n/a	0	n/a
Sutton - Wallington	K	92	41	no	0	yes
Sutton - Worcester Park	K	91	39	yes	0	yes
Thurrock - Dock Road Tilbury	R	6	32	n/a	0	n/a
Thurrock - London Road (Grays) ^A	U	99	19	yes	0	yes
Thurrock - London Road (Purfleet)	R	93	42	no	0	yes
Thurrock - Stanford-le-Hope ^{AA}	R	99	21	yes	0	yes
Tower Hamlets – Blackwall ^T	R	99	39	yes	0	yes
Tower Hamlets - Mile End Road ^{AA}	R	100	25	yes	0	yes
Wandsworth - Battersea	R	97	27	yes	8	yes
Wandsworth - Lavender Hill (Clapham Jct)	R	97	31	yes	0	yes
Wandsworth - Putney	U	94	26	yes	0	yes
Wandsworth - Putney High Street	K	97	58	no	4	yes
Wandsworth - Putney High Street Facade	R	87	53	n/a	1	n/a
Wandsworth - Tooting High Street	R	72	35	n/a	0	n/a
Wandsworth - Wandsworth Town Hall	U	99	30	yes	0	yes
Westminster - Buckingham Palace Road	R	32	39	n/a	0	n/a
Westminster - Cavendish Square	R	92	32	yes	0	yes
Westminster - Covent Garden	U	95	24	yes	0	yes
Westminster - Duke Street (Grosvenor) ^O	R	98	28	yes	0	yes
Westminster - Ebury Street (Grosvenor) ^O	R	99	22	yes	0	yes
Westminster - Elizabeth Bridge	R	40	25	n/a	0	n/a
Westminster - Horseferry Road ^A	U	100	26	yes	0	yes
Westminster - Marylebone Road ^{AA}	K	97	44	no	0	yes
Westminster - Oxford Street	K	98	34	yes	0	yes
Westminster - Oxford Street East	R	97	35	yes	0	yes
Westminster - Strand (Northbank BID) ^O	R	97	44	no	0	yes

Table 3: AQS Objective results for NO₂

NO₂ ppbV measurements have been converted to $\mu\text{g m}^{-3}$ by multiplying by 1.9125 as recommended in Defra's Local Air Quality Management Technical Guidance (Defra, 2016).

Summary

- 76 sites out of 86 that achieved the 90% data capture requirement met the annual mean objective for nitrogen dioxide (NO₂) of not exceeding $40 \mu\text{g m}^{-3}$.
- All sites achieved the hourly mean objective of no more than 18 occurrences of an hourly mean greater than $200 \mu\text{g m}^{-3}$.
- A smaller proportion of sites (12%) failed to achieve the annual mean objective in 2020 compared to 35% in 2019 and 37% in 2018.
- No sites failed to achieve the hourly mean objective for NO₂ compared to 2 sites in 2019 and 6 sites in 2018.

- The number of hourly exceedences fell at many sites, the highest being 8 exceedences, in comparison with 21 in 2019. This is the continuation of a trend which has seen the number of hourly exceedences fall from over 1500 at three London sites in 2014.
- These results must also be considered in the context of the Covid-19 pandemic which is likely to have reduced annual NO₂ concentrations.
- New guidelines announced by the WHO in 2021 (WHO, 2021) suggest a reduction of the NO₂ annual mean limit to 10 µg^m⁻³. No sites achieved this target in 2020.
- The main source of NO₂ in London is diesel traffic emissions.

3.3 Nitrogen Oxides

Site Name	Type	Capture Rate (%)	Annual Mean NO _x as NO ₂ ug m ⁻³
Barking and Dagenham - Rush Green	S	99	25
Barking and Dagenham - Scrattons Farm	S	99	31
Bexley - Belvedere	S	94	25
Bexley - Belvedere West	U	100	23
Bexley - Slade Green ^{AA}	S	97	27
Brent - ARK Franklin Primary Academy	R	100	57
Brent - Ikea	R	91	112
Brent - John Keble Primary School	R	99	47
Brent - Neasden Lane	I	100	54
Bromley - Harwood Avenue	R	95	33
Camden - Bloomsbury ^A	U	78	41
Camden - Euston Road	R	50	107
Camden - Holborn (Bee Midtown) ^O	K	72	61
Camden - Swiss Cottage ^{AA}	K	93	60
Castle Point - Hadleigh	R	17	25
City of London - Beech Street	R	99	45
City of London - The Aldgate School	U	95	30
City of London - Walbrook Wharf	R	87	91
Croydon - Norbury	K	99	79
Croydon - Park Lane	R	9	72
Croydon - Purley Way A23	R	99	50
Ealing - Acton Vale	U	56	26
Ealing - Hanger Lane Gyratory	R	100	160
Ealing - Horn Lane	I	97	60
Ealing - Western Avenue	R	98	71
Enfield - Bowes Primary School	R	99	58
Enfield - Bush Hill Park	S	100	26
Enfield - Derby Road	R	98	49
Enfield - Prince of Wales School	U	100	32
Greenwich - A206 Burrage Grove	R	99	40
Greenwich - Blackheath	R	94	51
Greenwich - Eltham ^{AA}	S	94	20
Greenwich - Falconwood	R	100	48
Greenwich - Fiveways Sidcup Rd A20	R	79	57
Greenwich - John Harrison Way	R	100	39
Greenwich - Plumstead High Street	R	100	50
Greenwich - Trafalgar Road (Hoskins St)	R	99	67
Greenwich - Tunnel Avenue	R	8	61
Greenwich - Westthorne Avenue	R	100	46
Greenwich - Woolwich Flyover	R	98	118
Hackney - Old Street ^O	R	97	67
Haringey - Priory Park South ^{AA}	U	100	22
Haringey - Haringey Town Hall ^{AA}	R	98	56
Harrow - Pinner Road	R	50	49
Harrow - Stanmore	U	99	20

Site Name	Type	Capture Rate (%)	Annual Mean NO _x as NO ₂ ug _m ⁻³
Havering - Rainham	R	100	42
Havering - Romford	R	98	57
Hillingdon - Harlington	U	99	30
Hillingdon - Keats Way	S	98	47
Islington - Arsenal	U	98	26
Islington - Holloway Road	R	98	55
Kensington and Chelsea - North Ken ^{AA}	U	99	28
Kingston Upon Thames - Cromwell Road	R	92	102
Kingston Upon Thames - Kingston Vale	R	99	48
Kingston Upon Thames - Tolworth Broadway	R	73	73
Lambeth - Bondway Interchange	I	98	69
Lambeth - Brixton Road	K	96	148
Lambeth - Streatham Green	U	100	44
Lewisham - Catford	U	77	48
Lewisham - Deptford	U	96	26
Lewisham - Loampit Vale	R	98	69
Lewisham - New Cross	R	99	55
Merton - Morden Civic Centre 2	R	74	96
Newham - Britannia Gate	R	8	42
Newham - Cam Road	R	80	38
Newham - Wren Close	U	95	28
Redbridge - Gardner Close	R	99	46
Redbridge - Ley Street	U	96	38
Reigate and Banstead - A23 Hooley	R	91	85
Reigate and Banstead - Horley ^{AA}	S	99	21
Reigate and Banstead - Horley South East	S	99	22
Reigate and Banstead - Poles Lane	RU	98	12
Richmond Upon Thames - Barnes Wetlands	S	83	20
Richmond Upon Thames - Castelnau	R	100	31
Richmond Upon Thames - Chertsey Road (high level)	R	47	43
Richmond Upon Thames - Chertsey Road (low level)	R	29	50
Sevenoaks - Bat and Ball	R	97	36
Sevenoaks - Greatness Park	U	86	17
Southwark - A2 Old Kent Road ^{AA}	R	68	55
Southwark - Elephant and Castle	U	87	29
Southwark - Lower Road	R	9	61
Southwark - Tower Bridge Road	R	95	57
Sutton - Beddington Lane	I	55	29
Sutton - Beddington Lane north	I	99	40
Sutton - Beddington Village	R	13	57
Sutton - Wallington	K	92	88
Sutton - Worcester Park	K	91	83
Thurrock - Dock Road Tilbury	R	6	58
Thurrock - London Road (Grays) ^A	U	99	31

Site Name	Type	Capture Rate (%)	Annual Mean NO _x as NO ₂ µg _m ⁻³
Thurrock - London Road (Purfleet)	R	93	107
Thurrock - Stanford-le-Hope ^{AA}	R	99	39
Tower Hamlets – Blackwall ^T	R	99	79
Tower Hamlets - Mile End Road ^{AA}	R	100	44
Wandsworth - Battersea	R	97	45
Wandsworth - Lavender Hill (Clapham Jct)	R	97	56
Wandsworth - Putney	U	94	39
Wandsworth - Putney High Street	K	97	142
Wandsworth - Putney High Street Facade	R	87	115
Wandsworth - Tooting High Street	R	72	74
Wandsworth - Wandsworth Town Hall	U	99	46
Westminster - Buckingham Palace Road	R	32	76
Westminster - Cavendish Square	R	92	58
Westminster - Covent Garden	U	95	31
Westminster - Duke Street (Grosvenor) ^O	R	98	45
Westminster - Ebury Street (Grosvenor) ^O	R	99	32
Westminster - Elizabeth Bridge	R	40	39
Westminster - Horseferry Road ^A	U	100	35
Westminster - Marylebone Road ^{AA}	K	97	101
Westminster - Oxford Street	K	98	68

Table 4: Annual Mean values for NO_x

NO_x ppbV measurements have been converted to µg_m⁻³ by multiplying by 1.9125 as recommended in Defra's Local Air Quality Management Technical Guidance (Defra, 2016). There are no AQS Objectives for NO_x.

3.4 Ozone

Site Name	Type	Capture Rate (%)	No more than 10 days where maximum rolling 8hr mean $\geq 100 \mu\text{g m}^{-3}$ (50ppb)	Achieved?
Bexley - Belvedere West	U	100	29	no
Bexley - Slade Green	S	98	20	no
Brent – Ikea ^T	R	89	4	n/a
Camden - Bloomsbury ^A	U	95	18	no
Greenwich - Eltham ^{AA}	S	76	13	no
Greenwich - Falconwood	R	100	1	yes
Greenwich - Plumstead High Street	R	100	4	yes
Greenwich - Westthorne Avenue ^T	R	87	8	n/a
Greenwich - Woolwich Flyover ^T	R	98	3	yes
Hackney - Old Street ^T	R	99	10	yes
Haringey - Priory Park South ^{AA}	U	92	36	no
Hillingdon - Harlington ^A	U	98	21	no
Hillingdon - Keats Way ^A	S	99	16	no
Kensington and Chelsea - North Ken ^{AA}	U	86	39	no
Lewisham - Honor Oak Park ^{AA}	U	97	32	no
Redbridge - Ley Street	U	98	18	no
Reigate and Banstead - Poles Lane	RU	98	40	no
Richmond Upon Thames - Barnes Wetlands	S	81	18	no
Sevenoaks - Greatness Park	U	87	36	no
Southwark - Elephant and Castle	U	70	16	no
Thurrock - London Road (Grays) ^A	U	97	28	no
Tower Hamlets – Blackwall ^T	R	99	10	yes
Wandsworth - Wandsworth Town Hall	U	98	45	no
Westminster - Marylebone Road ^{AA}	K	92	9	yes

Table 5: AQS Objective results for O₃

O₃ ppbV measurements have been converted to $\mu\text{g m}^{-3}$ by multiplying by 1.9957.

Summary

- 6 sites out of 17 which achieved the 90% data capture requirement met the 8 hourly mean AQS objective for O₃ of no more than ten days measuring a daily mean greater than or equal to $100\mu\text{g m}^{-3}$.
- 11 sites exceeded the objective, including nine in urban background or suburban locations in London, one urban background site in Essex, and one rural site in Surrey. The same number of sites exceeded the objective in 2019. There were fewer exceedance days at most sites compared to 2018, the maximum number being 22, compared to the maximum of 52 exceedance days at one site in 2018.
- O₃ is a regional pollutant. It is greater away from busy roads as it is scavenged by NO_x from traffic. There were more exceedance days in 2020 compared to 2019 across London and the south-east with four sites having over 30 exceedance days. No sites had more than 30 exceedance days in 2019. This is likely to be due to reduced NO_x concentrations, partly due to the Covid-19 pandemic, a warm and sunny spring and heatwave conditions in August. O₃ generation is higher in hot sunny conditions.

3.5 Sulphur Dioxide

Site Name	Type	Capture Rate (%)	No more than 35 occurrences of 15min mean $\geq 350 \mu\text{g m}^{-3}$ (100ppb)	Achieved?
Barking and Dagenham - Rush Green	S	92	0	yes
Bexley - Slade Green ^{AA}	S	100	0	yes
Camden - Bloomsbury ^A	U	73	0	n/a
Kensington and Chelsea - North Ken ^{AA}	U	91	0	yes
Lambeth - Bondway Interchange	I	99	0	yes
Thurrock - London Road (Grays) ^A	U	97	0	yes
Westminster - Marylebone Road ^{AA}	K	96	0	yes

Table 6: AQS Objective results for SO₂

SO₂ ppbV measurements have been converted to $\mu\text{g m}^{-3}$ by multiplying by 2.6609 as recommended in Defra's Local Air Quality Management Technical Guidance (Defra, 2016).

Summary

- All six sites that achieved the 90% data capture requirement achieved the AQS objective of no more than 35 occurrences of 15 minute mean greater than $350 \mu\text{g m}^{-3}$ for SO₂.
- No 15 minute mean SO₂ measurements greater than $350 \mu\text{g m}^{-3}$ were recorded at any LAQN site.
- The 15 minute mean objective is the most stringent of the current AQS objectives for SO₂.

3.6 Particulate Matter PM₁₀

Site Name	Type	Capture Rate (%)	Annual Mean <= 40 $\mu\text{g m}^{-3}$	Annual Mean Achieved?	No more than 35 occurrences of daily mean >= 50 $\mu\text{g m}^{-3}$	Daily Mean Achieved?
Barking and Dagenham - Scrattons Farm	S	99	18	yes	3	yes
Bexley - Belvedere	S	99	18	yes	8	yes
Bexley - Belvedere FDMS	S	90	18	yes	7	yes
Bexley - Belvedere West	U	98	18	yes	6	yes
Bexley - Belvedere West FDMS	U	74	14	n/a	3	n/a
Bexley - Slade Green	S	75	17	n/a	1	n/a
Bexley - Slade Green FIDAS	S	25	13	n/a	1	n/a
Brent - ARK Franklin Primary Academy	R	91	16	yes	1	yes
Brent - Ikea	R	90	25	yes	17	yes
Brent - John Keble Primary School	R	99	18	yes	1	yes
Brent - Neasden Lane	I	98	21	yes	3	yes
Bromley - Harwood Avenue	R	98	16	yes	1	yes
Camden - Bloomsbury ^A	U	88	16	n/a	3	n/a
Camden - Coopers Lane	I	40	14	n/a	0	n/a
Camden - Euston Road	R	49	18	n/a	0	n/a
Camden - Swiss Cottage ^{AA}	K	98	16	yes	4	yes
City of London - Beech Street	R	96	18	yes	2	yes
City of London - The Aldgate School	U	92	16	yes	1	yes
City of London - Upper Thames Street	R	91	24	yes	9	yes
Croydon - Park Lane	R	9	15	n/a	0	n/a
Ealing - Acton Vale	U	49	16	n/a	2	n/a
Ealing - Hanger Lane Gyrotory	R	100	22	yes	6	yes
Ealing - Horn Lane ^{AA}	I	88	24	n/a	9	n/a
Ealing - Horn Lane TEOM	I	90	21	yes	5	yes
Ealing - Western Avenue	R	92	22	yes	10	yes
Enfield - Bowes Primary School	R	89	15	n/a	2	n/a
Greenwich - A206 Burrage Grove	R	93	14	yes	1	yes
Greenwich - Blackheath	R	62	17	n/a	4	n/a
Greenwich - Eltham	S	99	14	yes	1	yes
Greenwich - Falconwood	R	100	18	yes	6	yes
Greenwich - Fiveways Sidcup Rd A20	R	83	23	n/a	8	n/a
Greenwich - John Harrison Way	R	88	19	n/a	3	n/a
Greenwich - Plumstead High Street	R	71	15	n/a	3	n/a
Greenwich - Trafalgar Road (Hoskins St)	R	99	19	yes	6	yes
Greenwich - Westhorpe Avenue	R	81	19	n/a	5	n/a
Greenwich - Woolwich Flyover	R	99	21	yes	4	yes
Hackney - Old Street ^T	R	96	19	yes	3	yes
Harrow - Pinner Road	R	98	16	yes	1	yes
Harrow - Stanmore	U	93	14	yes	0	yes
Havering - Rainham	R	100	15	yes	1	yes
Havering - Romford	R	87	20	n/a	4	n/a
Hillingdon - Harlington ^A	U	98	14	yes	1	yes

Site Name	Type	Capture Rate (%)	Annual Mean <= 40 ug ^m - ³	Annual Mean Achieved?	No more than 35 occurrences of daily mean >= 50ug ^m - ³	Daily Mean Achieved?
Islington - Arsenal	U	100	17	yes	2	yes
Islington - Holloway Road	R	93	18	yes	2	yes
Kensington and Chelsea - North Ken FDMS ^{AA}	U	99	13	yes	2	yes
Kensington and Chelsea - North Ken FIDAS ^{AA}	U	99	13	yes	0	yes
Kingston Upon Thames - Cromwell Road	R	99	24	yes	9	yes
Kingston Upon Thames - Kingston Vale	R	96	18	yes	2	yes
Kingston Upon Thames - Tolworth Broadway	R	85	22	n/a	6	n/a
Lambeth - Bondway Interchange	I	98	46	no	140	no
Lambeth - Brixton Road	K	99	24	yes	9	yes
Lambeth - Streatham Green	U	98	18	yes	4	yes
Lewisham - Honor Oak Park ^{AA}	U	100	14	yes	3	yes
Lewisham - Loampit Vale	R	98	19	yes	8	yes
Lewisham - New Cross	R	75	18	n/a	5	n/a
London Teddington Bushy Park	S	87	13	n/a	2	n/a
Merton - Merton Road	R	89	26	n/a	11	n/a
Newham - Cam Road	R	92	18	yes	6	yes
Newham - Wren Close	U	97	20	yes	6	yes
Redbridge - Gardner Close	R	88	17	n/a	1	n/a
Redbridge - Ley Street	U	81	15	n/a	0	n/a
Reigate and Banstead - Horley	S	94	15	yes	0	yes
Reigate and Banstead 1 FDMS	S	99	13	yes	0	yes
Reigate and Banstead- Earlswood Depot	I	72	16	n/a	1	n/a
Richmond Upon Thames - Barnes Wetlands	S	94	14	yes	0	yes
Richmond Upon Thames - Castelnau	R	99	15	yes	0	yes
Richmond Upon Thames - Chertsey Road	R	45	20	n/a	1	n/a
Sevenoaks - Bat and Ball	R	99	17	yes	2	yes
Sevenoaks - Greatness Park	U	100	16	yes	2	yes
Southwark - A2 Old Kent Road ^{AA}	R	75	22	n/a	11	n/a
Southwark - A2 Old Kent Road FIDAS	R	33	16	n/a	3	n/a
Southwark - Elephant and Castle	U	100	16	yes	3	yes
Southwark - Tower Bridge Road	R	46	13	n/a	2	n/a
Sutton - Beddington Lane	I	36	14	n/a	0	n/a
Sutton - Beddington Lane north	I	95	21	yes	6	yes
Sutton - Beddington Village	R	20	15	n/a	1	n/a
Sutton - Wallington	K	86	19	n/a	0	n/a
Sutton - Worcester Park	K	65	15	n/a	1	n/a
Thurrock - London Road (Grays) ^A	U	93	19	yes	9	yes
Thurrock - London Road (Purfleet)	R	91	23	yes	8	yes
Thurrock - Stanford-le-Hope ^{AA}	R	80	17	n/a	5	n/a
Tower Hamlets – Blackwall ^T	R	95	17	yes	4	yes
Wandsworth - Battersea	R	100	25	yes	24	yes
Wandsworth - Lavender Hill (Clapham Jct)	R	90	19	yes	4	yes

Site Name	Type	Capture Rate (%)	Annual Mean \leq 40 $\mu\text{g m}^{-3}$	Annual Mean Achieved?	No more than 35 occurrences of daily mean \geq 50 $\mu\text{g m}^{-3}$	Daily Mean Achieved?
Wandsworth - Putney	U	97	16	yes	3	yes
Wandsworth - Putney High Street	K	92	19	yes	3	yes
Wandsworth - Tooting High Street	R	91	21	yes	4	yes
Westminster - Cavendish Square	R	90	17	yes	0	yes
Westminster - Horseferry Road ^A	U	97	15	yes	2	yes
Westminster - Marylebone Road FDMS ^{AA}	K	74	16	n/a	1	n/a
Westminster - Marylebone Road Fidas ^{AA}	K	93	17	yes	5	yes
Westminster - Oxford Street	K	76	22	n/a	6	n/a
Westminster - Oxford Street East	R	98	22	yes	6	yes
Windsor and Maidenhead - Frascati Way	R	98	19	yes	3	yes

Table 7: AQS Objective results for PM₁₀.

All PM₁₀ measurements have been converted to reference equivalent by the methods recommended in Defra's Local Air Quality Management Technical Guidance (Defra, 2016), i.e. TEOM measurements have been corrected using the Volatile Correction Model (VCM) and heated and unheated BAM measurements have been corrected using the divisors 1.2 and 1.035 respectively.

Summary

- 56 of the 57 sites that achieved the 90% data capture requirement met the annual mean AQS objective of 40 $\mu\text{g m}^{-3}$ for PM₁₀.
- One site did not meet the annual mean AQS objective of 40 $\mu\text{g m}^{-3}$ for PM₁₀. This site is thought to be affected by a local source of particulate emissions and is classified as an industrial site.
- The same site did not meet the daily mean objective of no more than 35 days with a daily mean greater than 50 $\mu\text{g m}^{-3}$.
- 41 of the sites that achieved the 90% data capture requirement achieved the 2006 WHO guideline value of 20 $\mu\text{g m}^{-3}$ as an annual mean (WHO, 2006). This is a higher proportion of sites than achieved this target in 2019 (72% in 2020 compared to 50% in 2019).
- However, in 2021, the WHO announced new guidelines (WHO, 2021) which cut the PM₁₀ recommended annual mean limit to 15 $\mu\text{g m}^{-3}$. Only eight sites achieved this.
- These results should be considered in the context of the Covid-19 pandemic which may have reduced annual PM₁₀ concentrations.

3.7 Particulate Matter PM_{2.5}

Site Name	Type	Instrument	Capture Rate (%)	Annual Mean ug ^m - ³
Bexley - Belvedere	S	TEOM	91	7
Bexley - Belvedere West	U	TEOM	98	7
Bexley - Slade Green FDMS ^{AA}	S	FDMS	88	9
Bexley - Slade Green FIDAS ^{AA}	S	FDAS	25	9
Brent - ARK Franklin Primary Academy	R	TEOM	96	8
Brent – Ikea ^T	R	TEOM	65	10
Brent – Ikea ^T	R	BAMH	23	13
Bromley - Harwood Avenue	R	BAMH	58	8
Camden - Bloomsbury ^A	U	FDMS	88	9
Camden - Euston Road	R	FDMS	50	11
Camden - Swiss Cottage ^{AA}	K	FDMS	98	10
City of London - Farringdon Street	K	BAMH	72	12
City of London - The Aldgate School	U	BAMH	87	12
Croydon - Norbury Manor	U	BAMH	94	9
Greenwich - A206 Burrage Grove	R	FDMS	81	12
Greenwich - Eltham ^{AA}	S	FDAS	96	10
Greenwich - Falconwood FDMS	R	FDMS	81	11
Greenwich - John Harrison Way	R	FDMS	86	9
Greenwich - Plumstead High Street	R	FDMS	95	10
Greenwich - Trafalgar Road (Hoskins St)	R	TEOM	99	8
Greenwich - Westhorpe Avenue	R	FDMS	92	8
Greenwich - Woolwich Flyover ^T	R	TEOM	68	9
Hackney - Old Street ^T	R	TEOM	89	8
Havering - Rainham	R	FDMS	100	9
Hillingdon - Harlington ^A	U	FDMS	99	8
Kensington and Chelsea - North Ken ^{AA}	U	FDMS	100	8
Kensington and Chelsea - North Ken FIDAS ^{AA}	U	FDAS	100	8
Lewisham - Deptford	U	BAMH	70	10
Lewisham - Honor Oak Park ^{AA}	U	FDAS	100	9
Lewisham - New Cross	R	FDMS	98	13
London Teddington Bushy Park ^A	S	FDMS	87	8
Redbridge - Gardner Close	R	BAM	63	9
Redbridge - Ley Street	U	BAMH	86	12
Southwark - A2 Old Kent Road FIDAS	R	FDAS	33	11
Southwark - Elephant and Castle	U	FDAS	29	9
Southwark - Tower Bridge Road	R	FDAS	46	9
Sutton - Beddington Lane north	I	BAMH	99	8
Thurrock - Dock Road Tilbury	R	BAMH	6	9
Thurrock - Stanford-le-Hope	R	BAMH	97	9
Tower Hamlets - Blackwall	R	FDMS	93	12
Westminster - Elizabeth Bridge	R	BAMH	68	9
Westminster - Marylebone Rd Partisol ^A	K	GRAV	31	9
Westminster - Marylebone Road FDMS ^{AA}	K	FDMS	79	9

Table 8: Annual mean results for PM_{2.5}

FIDAS measurements have been corrected using the divisor 1.06, as recommended in Defra's Local Air Quality Management Technical Guidance (Defra, 2016). Instruments marked with a * are not considered a reference equivalent measurement method and do not currently have an agreed correction method, so should be interpreted with caution.

Summary

- All 13 sites with data capture of 90% or more that used a reference equivalent measurement method achieved the UK Objective of $25 \mu\text{g m}^{-3}$ as an annual mean.
- Nine sites with a data capture of 90% or more that used a reference equivalent measurement method achieved the 2006 WHO guideline value of $10 \mu\text{g m}^{-3}$ (WHO, 2006) in 2020 which is an improvement compared to 2019 when no sites achieved this value.
- However, in 2021, the WHO recommended this limit be reduced to $5 \mu\text{g m}^{-3}$ (WHO, 2021) as an annual mean based on increased evidence of the harm caused by these very small particles. No sites achieved this target in 2020.
- These results should be considered in the context of the Covid-19 pandemic which may have reduced annual $\text{PM}_{2.5}$ concentrations.

4 References

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