London Borough of Waltham Forest Air Quality Annual Status Report for 2018
Date of publication: May 2019

This report provides a detailed overview of air quality in the London Borough of Waltham Forest during 2018. It has been produced to meet the requirements of the London Local Air Quality Management statutory process[1].

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[1] LLAQM Policy and Technical Guidance 2016 (LLAQM.TG(16)). https://www.london.gov.uk/what-we-do/environment/pollution-and-air-quality/working-boroughs

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Abbreviations

AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
BEB	Buildings Emission Benchmark
CAB	Cleaner Air Borough
CAZ	Central Activity Zone
EV	Electric Vehicle
GLA	Greater London Authority
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LLAQM	London Local Air Quality Management
NRMM	Non-Road Mobile Machinery
PM_{10}	Particulate matter less than 10 micron in diameter
$PM_{2.5}$	Particulate matter less than 2.5 micron in diameter
TEB	Transport Emissions Benchmark
TfL	Transport for London

Table A.   Summary of National Air Quality Standards and Objectives

Pollutant	Objective (UK)	Averaging Period	Date[1]
Nitrogen dioxide - NO_2	200 µg m^{-3} not to be exceeded more than 18 times a year	1-hour mean	31 Dec 2005
	40 µg m^{-3}	Annual mean	31 Dec 2005
Particles - PM_{10}	50 µg m^{-3} not to be exceeded more than 35 times a year	24-hour mean	31 Dec 2004
	40 µg m^{-3}	Annual mean	31 Dec 2004
Particles - $PM_{2.5}$	25 µg m^{-3}	Annual mean	2020
	Target of 15% reduction in concentration at urban background locations	3 year mean	Between 2010 and 2020
Sulphur Dioxide (SO_2)	266 µg m^{-3} not to be exceeded more than 35 times a year	15 minute mean	31 Dec 2005
	350 µg m^{-3} not to be exceeded more than 24 times a year	1 hour mean	31 Dec 2004
	125 µg m^{-3} mot to be exceeded more than 3 times a year	24 hour mean	31 Dec 2004

Note: [1]by which to be achieved by and maintained thereafter

1.   Air Quality Monitoring

1.1   Locations

Table B.   Details of Automatic Monitoring Sites for 2018

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA?	Distance from monitoring site to relevant exposure (m)	Distance to kerb of nearest road (N/A if not applicable) (m)	Inlet height (m)	Pollutants monitored	Monitoring technique
WL1	Dawlish Rd	538380	186717	Urban Background	Y	5.5m	15m	3.5m	NO_2, PM_{10}	Chemiluminescent; NOx analyser
WL4	Billet Roundabout	537468	191071	Kerbside	Y	11m	0.5m	2m	NO_2, PM_{10}	Chemiluminescent; NOx analyser
WL5	Ruckholt Close	537804	186025	Roadside	Y	8m	1.5m	3.5m	NO_2, PM_{10}	Chemiluminescent; FDMS; NOx analyser

Table C.   Details of Non-Automatic Monitoring Sites for 2018

Tube ID	Site Name	Location	X (m)	Y (m)	Site Type[2]	No. tubes	Distance from monitoring site to relevant exposure (m)	Distance to kerb of nearest road	Inlet height (m)	Tube co-located with an automatic monitor?	Operating dates	Address	Receptor
1	Chingford	Chingford Assembly	538699	194426		1	4	2.2	2	N	From 2012	2 Mornington Rd, London E4 7DS	Roadside Urban background

		Hall											
2	Dawlish Rd	Dawlish Rd (playground area next to 195 Dawlish Rd)	538400	186734		3	0	6	2	Y	From 2012	175-189 Dawlish Rd, London E10 6QN	Roadside Urban background *No longer Nursery School, commercial use
3	Leyton	Leyton Library	538243	186286		1	4.5	3.8	2	N	From 2012	265B High Road, Leyton, London E10 5QH	Roadside Urban Background
4	Connaught School	Connaught School	539024	186945		1	0	0m playground 9m from A12	2	N	From 2012	42 Dyers Hall Rd, London E11 4AE	School playground, raised from A12
5	Selbourne 1 South Grove	Lamp post Park entrance	536732	188811		3	0	0.4	2	N	From Sept 2013	16 South Grove, London E17 7NJ	Roadside Urban background park
6	Selbourne 2	Lamp post outside Sainsburys blue hatch	536791	188897		3	0	0	2.2	N	From Sept 2013	112 High St, London E17 7JY	Kerbside Urban Centre
8	Selbourne 3	Lamp post next to crossing near bike rack	536999	188939		3	0	0.4	2.5	N	From Sept 2013	21 Selborne Rd, London E17 7JR	Kerbside Urban Centre
9	Selbourne 4		537142	188976		3	0	2.5	2.5	N	From Sept 2013	10 Selborne Rd, London E17 7LT	Roadside Urban Centre

10	Ruckholt Close		537937	186109		3	13	0	2	N	From Jan 2016	3 Ruckholt Cl, London E10 5NX	Roadside Urban background
11	Oliver Rd and Ruckholt Rd		538022	186126		3	0.5	2	2	N	From Jan 2016	78 Ruckholt Rd, London E10 5NP	Roadside Urban background
12	Vicarage Rd near St Josephs Junior		537620	187387		3	9.8	1	2	N	From Jan 2016	133 Vicarage Rd, London E10 5DR	Roadside Urban background
13	Radlix Rd and Church Rd		537251	187156		3	5.5	0.2	2.5	N	From Jan 2016	48 Radlix Rd, London E10 7BQ	Kerbside Urban background
14	Gloucester Rd & Lea Bridge Rd		537088	187632		3	3.5	0	2	N	From Jan 2016	30 Gloucester Rd, London E10 7HT	Roadside Urban background
15	Francis Rd & High Rd Leyton		538022	187162		3	13	2	2	N	From Jan 2016	299 Francis Rd, London E10 6NW	Roadside Urban background
16	Chestnuts House on Hoe St		537498	188436		3	0	9	2	N	From Jan 2016	398 Hoe St, London E17 9BE	Roadside Urban background School yard
17	Kings Rd & Kingswood Rd		539259	187567		3	1.8	2.5	2	N	From Jan 2016	87 Kings Rd, London E11 1AU	Roadside Urban background

18	Lea Bridge Rd and Perth Rd		536457	187238		3	2	1	2	N	From Jan 2016	7 Perth Rd, London E10 7PN	Roadside Urban background
19	Lea Bridge Rd (entrance of Lea Valley Riding School)		535928	186914		3	0	2	2	N	From Jan 2016	71 Lea Bridge Rd, London E10 7QL	Roadside Urban background
20	Pembroke Rd & Grosvenor Park Rd		537719	188685		3	1.75	0.2	2	N	From Jan 2016	Windmill Court, 20 Grosvenor Park Rd, London E17 9PG	Kerbside Urban background
21	Howard Rd & Church Rd		537583	189310		3	3.5	2.2	2	N	From Jan 2016	73C Church Hill, London E17 3BD (Howard Road)	Roadside Urban background
22	Boundary Rd & Hoe St		537600	188251		3	0	0.2	2	N	From Jan 2016	1 Boundary Rd, London E17 8NL	Roadside Urban background, billboard in front of house!
23	Queens Rd near the Cemetery		536951	188436		3	10.5	2.7	2	N	From Jan 2016	126 Queens Rd, London E17 8QP	Roadside Urban background
24	Blackhorse		536048	189159		3	0.2	2.2	2	N	From Jan 2016	1 Longfield Avenue,	Roadside Urban

	Rd in front of St Patricks Catholic School											London E17 7DP Opp 133 Blackhorse Road	background School
25	Forest Rd and Melville Rd		536938	189753		3	0.5	4.5	2	N	From Jan 2016	80 Greenleaf Road, London E17 6QW	Roadside Urban background School
26	Shernhall St & Greville Rd		538359	188999		3	?	?	2	N	From Jan 2016	V G R Electrical, 179 Shernhall St, London E17 9HX	Roadside Urban background new road layout
27	Ascham Homes property near Whipps Cross round about		538716	188888		3	5	5	2	N	From Jan 2016	900 Lea Bridge Rd, London E17 9DW	Roadside Urban background new road layout
28	Station Rd junct with Buxton Rd E4	On Controlled Parking sign	538933	194478		3	12	0.2	2	N	From Sept 17	99 Station Road, London E4 7BU	Kerbside Urban background residential 1st floor
29	Old Church Rd o/s Mansfield	lamp-post 43 o/s 243 Old Church	537671	193848		3	11	0.2	2	N	From Sept 17	243 Old Church Road, London E4 6RB	Kerbside Urban background

	Park	Rd											
30	Larkshall Rd junct Dale View Cres E4	lamp-post o/s horticultural Soc	538585	193228		3	6	2.4	2	N	From Sept 17	114 Larkshall Road, London E4 6NH	Roadside Urban background in front of a disused hall!
31	Friday Hill junct Normanton Pk	lamp-post 19 by pedestrian crossing – Opposite 56 Friday Hill	539172	193281		3	25	0.2	2	N	From Sept 17	56 Friday Hill, London E4 6JT	Kerbside Urban background
32	Old Church Rd junct Chingford Mount Rd	lamp-post os Shoe Zone	537337	192759		3	0	0.5	1.80	N	From Sept 17	275 Chingford Mount Road, London E4 8LP	Kerbside Urban background 1st floor residential
33	Hale End Road junct The Avenue	lamp-post o/s denstist & hair saloon	538637	191998		3	2.8	0.2	2	N	From Sept 17	1 The Avenue, London E4 9LB	Kerbside Urban background 1st floor residential
34	Fulbourne Rd	lamp-post 26 o/s 319	538124	190790		3	5	0.2	2	N	From Sept 17	319 Fulbourne Road, London E17 4EU	Kerbside Urban background
35	Chingford Road junct Penhryn	20 mph sign	537512	190734		3	5	0.2	2	N	From Sept 17	409 Chingford Road, London E17 5AF	Kerbside Urban background

	Cres												
36	Higham Hill Rd junctClaremont Road	lamp-post o/s 225	536234	190272		3	5.6	2	2	N	From Sept 17	225 Higham Hill Road, London E17 5RQ	Roadside Urban background
37	Higham Hill junct Forest Road	lamp-post by traffic light (Opposite Lord Palmerston pub)	536550	189647		3	3	0.2	2	N	From Sept 17	1 Higham Hill Road, London E17 6EA	Kerbside Urban background 1st floor residential 3m
38	Winns Ave junct Mersey Rd	lamp-post o/s120	536871	190009		3	8.8	0.2	2	N	From Sept 17	120 Winns Avenue, London E17 5HA	Kerbside Urban background
39	Forest Rd Bell Corner	lamp-post adj. to 8 hoe st	537418	189776		3	3	0.2	2	N	From Sept 17	8 Hoe Street, London E17 4PH	Roadside 1st floor residential
40	Forest Road junct Wood St	Lamp post by wall on the o/s road	538243	189974		3	2	2	1.8	N	From Sept 17	865 Forest Road, London E17 4AT	Urban Centre Roadside
41	86 Palmerston Road	lamp-post o/s 13 opposite	536638	189322		3	4.5	2.5	2.2	N	From Sept 17	86 Palmerston Road, London E17 6PZ	Roadside Urban Background Residential

42	Lea Bridge Rd Bakers Arms	lamp-post o/s Paddy Power	537795	188145		3	0	2	2.2	N	From Sept 17	575 – 577 Lea Bridge Road, London E10 7EQ	Roadside Urban Centre 7.5m 1st floor residential
43	High Rd E10 junct Buckingham Rd	Street sign o/s park entrance	538062	186474		3	0	3.5	2	N	From Sept 17	1 Buckingham Road, London E10 5NG	Roadside Urban background Park
44	High Rd E10 junct Etchingham Rd	lamp post 20-137 o/s	538388	185795		3	3	2.7	2.2	N	From Sept 17	1 Etchingham Road, London E15 2DF	Roadside Urban background 3m 1st floor residential
45	High Rd E11 junct West St	street sign o/s Crystal off licence	539227	186343		3	1.8	0.8	2.2	N	From Sept 17	1 West street, E11 4LJ	Kerbside Urban background 1.8m 1st floor residential

1.2 Comparison of Monitoring Results with AQOs

The results presented are after adjustments for "annualisation" and for distance to a location of relevant public exposure, the details of which are described in section 3.1.

Table D. Annual Mean NO$_2$ Ratified and Bias-adjusted Monitoring Results (µg m^{-3})

Site Name	Site type	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean Concentration (µgm^{-3})								
				2010 [c]	2011 [c]	2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]	2018 [c]
WL1 Dawlish Rd	Automatic	99.51	99.51	38	37	37	36	28 (data capture 73.22%)	26	30	28	23
WL4 Crooked Billet	Automatic	96.26	96.26	74.3	71	73	68	74	66	62	61	58
WL5 Ruckholt Close	Automatic	99.51	99.51	46	40	24	28	36	31	35	33	30
Chingford Assembly Hall	Diffusion	NA	100	30.6	28.8	26.9	26.3	26.9	24.7	27.2	25.3	31.0
Dawlish Rd	Diffusion	NA	92	34.3	31.5	31.4	28.4	27.6	25.3	28.9	27.3	25.1
Leyton	Diffusion	NA	75	67.9	61.9	52.0	52.4	49.4	46.5	51.7	50.6	36.7
Connaught School	Diffusion	NA	67	47.6	41.8	41.2	41.5	39.3	33.6	42.8	33.5	38.7
Selbourne 1 South Grove	Diffusion	NA	100					40.9	38.0	42.9	39.9	42.5
Selbourne 2	Diffusion	NA	100					52.2	52.8	61.4	57.3	62.2

Selbourne 3	**Diffusion**	**NA**	**100**					**52.4**	**53.1**	**61.0**	**61.0**	**59.6**
Selbourne 4	**Diffusion**	**NA**	**100**					**44.5**	38.9	**44.3**	**45.8**	**44.5**
Ruckholt Close	**Diffusion**	**NA**	**100**							**41.8**	**40.6**	36.1
Oliver Rd and Ruckholt Rd	**Diffusion**	**NA**	**100**							**53.8**	**49.3**	**47.3**
Vicarage Rd near St Josephs Junior	**Diffusion**	**NA**	**83**							33.8	30.0	28.1
Radlix Rd and Church Rd	**Diffusion**	**NA**	**100**							39.1	38.7	**41.3**
Gloucester Rd & Lea Bridge Rd	**Diffusion**	**NA**	**100**							**43.1**	**40.9**	**40.3**
Francis Rd & High Rd Leyton	**Diffusion**	**NA**	**100**							37.8	35.1	32.6
Chestnuts House on Hoe St	**Diffusion**	**NA**	**100**							**43.2**	**40.2**	34.4
Kings Rd & Kingswood Rd	**Diffusion**	**NA**	**100**							38.5	36.9	33.5
Lea Bridge Rd and Perth Rd	**Diffusion**	**NA**	**100**							38.6	37.8	33.1
Lea Bridge Rd (entrance of Lea Valley Riding School)	**Diffusion**	**NA**	**100**							30.6	29.2	28.6

Pembroke Rd & Grosvenor Park Rd	Diffusion	NA	100								33.8	32.8	30.1
Howard Rd & Church Rd	Diffusion	NA	100								36.5	35.4	32.4
Boundary Rd & Hoe St	Diffusion	NA	100								**46.4**	**43.1**	**43.7**
Queens Rd near the Cemetery	Diffusion	NA	100								34.8	31.8	29.2
Blackhorse Rd in front of St Patricks Catholic School	Diffusion	NA	92								**52.6**	**49.4**	**46.6**
Forest Rd and Melville Rd	Diffusion	NA	100								37.0	33.6	34.0
Shernhall St & Greville Rd	Diffusion	NA	67								35.6	32.7	29.6
Ascham Homes property near Whipps Cross round about	Diffusion	NA	100								**40.8**	38.1	39.1
Station Rd junct with Buxton Rd E4	Diffusion	NA	100										35.7
Old Church Rd o/s Mansfield Park	Diffusion	NA	100										**40.1**

Larkshall Rd junct Dale View Cres E4	**Diffusion**	**NA**	**100**										28.6
Friday Hill junct Normanton Pk	**Diffusion**	**NA**	**100**										31.2
Old Church Rd junct Chingford Mount Rd	**Diffusion**	**NA**	**100**										**45.5**
Hale End Road junct The Avenue	**Diffusion**	**NA**	**100**										36.0
Fulbourne Rd	**Diffusion**	**NA**	**100**										**40.0**
Chingford Road junct Penhryn Cres	**Diffusion**	**NA**	**100**										35.8
Higham Hill Rd junct Claremont Road	**Diffusion**	**NA**	**100**										31.6
Higham Hill junct Forest Road	**Diffusion**	**NA**	**100**										**48.4**
Winns Ave junct Mersey Rd	**Diffusion**	**NA**	**100**										30.9
Forest Rd Bell Corner	**Diffusion**	**NA**	**100**										**50.7**
Forest Road junct Wood St	**Diffusion**	**NA**	**92**										**47.0**
86 Palmerston Road	**Diffusion**	**NA**	**100**										**40.2**

Lea Bridge Rd Bakers Arms	Diffusion	NA	100										53.8
High Rd E10 junct Buckingham Rd	Diffusion	NA	100										41.1
High Rd E10 junct Etchingham Rd	Diffusion	NA	100										52.5
High Rd E11 junct West St	Diffusion	NA	92										45.4

Notes: Exceedance of the NO$_2$ annual mean AQO of 40 μgm^{-3} are shown in **bold**.

NO$_2$ annual means in excess of 60 μg m^{-3}, indicating a potential exceedance of the NO^2 hourly mean AQS objective are shown in bold and underlined.

[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

[b] data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

[c] Means should be "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75%

Figure 1.1 shows the trends in nitrogen dioxide concentrations at the seven monitoring locations in the LBWF where there are more than four years of data. It shows that there has been a gradual improvement in air quality, albeit that the concentrations in two of the locations still exceed the annual mean average Air Quality Objective of 40μg/m3 as compared to four of the seven locations in 2010.
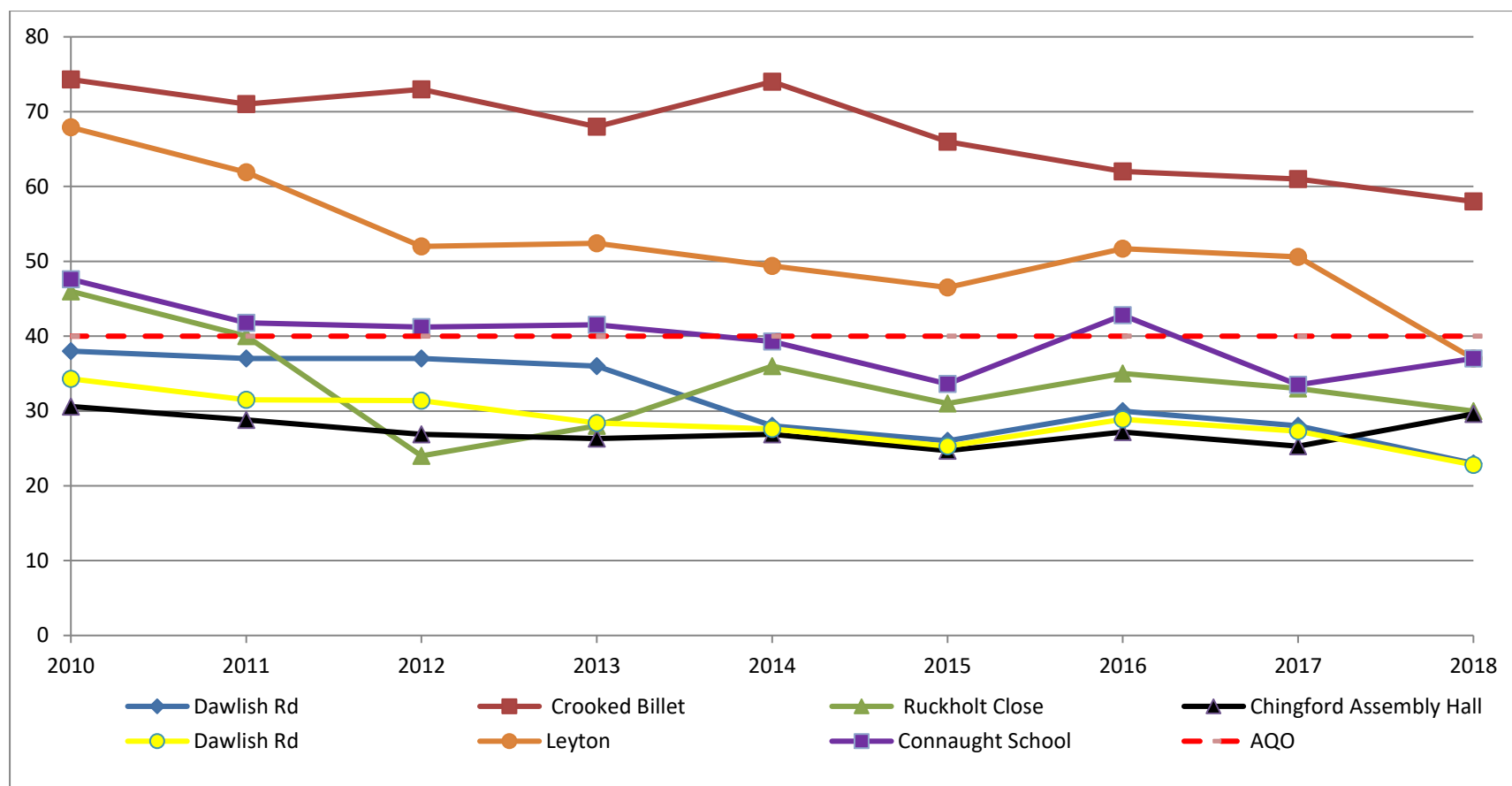
Figure 1.1 Trends in Nitrogen Dioxide Concentrations within the London Borough of Waltham Forest 2010-2018

Figure 1.2 shows the trends in nitrogen dioxide concentrations at one specific location, Selborne Road, within the London Borough of Waltham Forest. This area of the borough was subject to a significant development scheme which included the following measures:

- Installing a green Wall.
- Constructing a green vegetative buffer between the road and footway.
- Improving pedestrian and cycling facilities.

- Traffic calming at main pedestrian/cycle crossing points.
- Upgrading of traffic signals.
- Installation of oxides of nitrogen (NO_x) absorbing pavement for the segregated cycle paths.

There are only five years of monitoring data available and in two of the locations nitrogen dioxide concentrations have increased in comparison to 2014 and two have seen concentrations remain largely unchanged. Such a short period of monitoring means that considerable caution must be attributed to any conclusions drawn from the trends illustrated in Figure 1.2. Furthermore, Selborne Road is an arterial road used by buses, other vehicles and pedestrians and is not a location where there is relevant exposure in relation to the annual air quality objective for nitrogen dioxide.
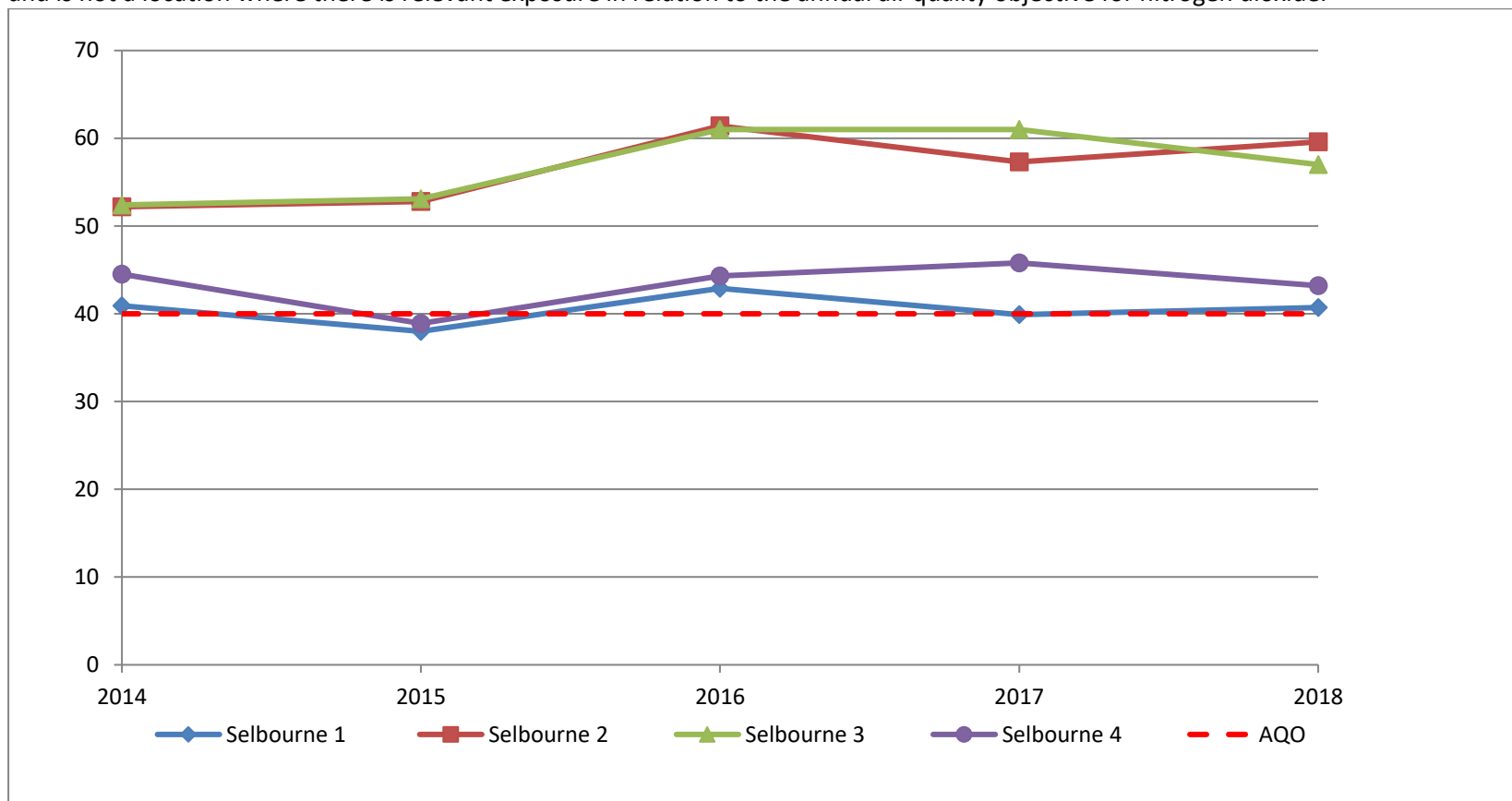

Figure 1.2 Trends in Nitrogen Dioxide Concentrations at Selborne Road locations 2014-2018

In summary, of the forty-four nitrogen dioxide monitoring locations within the London Borough of Waltham Forest a total of twenty-two recorded concentrations of nitrogen dioxide that exceeded the annual Air Quality Objective for nitrogen dioxide of 40μg/m3.

Of those twenty-one locations none were positioned at a point of relevant exposure, the locations listed below showed an exceedance of the Air Quality Objective at the monitoring site.

Table E. Summary of Reduction in NO2 Concentrations between Monitoring Location and Nearest Relevant Receptor Monitoring Location

	Measured Concentration 2018 (μg/m3)	Calculated Concentration at Nearest Relevant Receptor 2018 (μg/m3)	Breach of annual Air Quality Objective of 40μg/m3
Oliver Rd and Ruckholt Rd	46.7	**40.9**	**YES**
Radlix Rd and Church Rd	41.3	32.2	NO
Gloucester Rd & Lea Bridge Rd	40.3	31.9	NO
Boundary Rd & Hoe St	43.5	35.1	NO
Blackhorse Rd in front of St Patricks Catholic School	46.6	**46.1**	**YES**
Old Church Rd o/s Mansfield Park	40.7	29.1	NO
Old Church Rd junct Chingford Mount Rd	45.5	**44.4**	**YES**
Fulbourne Rd o/s 319	40.0	32.1	NO
Higham Hill junct Forest Road	48.4	*36.1*	NO
Blackhorse Rd in front of St Patricks Catholic School	51.2	*39.7*	NO
Forest Rd Bell Corner	50.9	*37.9*	NO

Forest Road junct Wood St	46.9	31.2	NO
86 Palmerston Road	40.2	*37.7*	NO
Lea Bridge Rd Bakers Arms	53.2	**42.0**	**YES**
High Rd E10 junct Buckingham Rd	41.1	34.8	NO
High Rd E10 junct Etchingham Rd	52.5	*39.1*	NO
High Rd E11 junct West St	45.7	*37.0*	NO
Selborne 1	42.5	27.0	NO
Seborne 2	62.2	28.9	NO
Selborne 3	59.6	30.3	NO
Selborne 4	45.1	N/A	N/A

Therefore, it has been necessary to carry out 'fall-off in nitrogen dioxide concentrations with distance from the road' calculations in line with Sections 4.81-4.83 of the London Local Air Quality Management Technical Guidance (TG16) and using the nitrogen dioxide fall-off with distance calculator that was obtained from https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html . The application of the calculator to eight of the nine monitoring locations is included in Table M in Appendix A.3 and the outcome is summarised in Table E. As a result of the distance from the Selborne 4 diffusion tube to the nearest relevant receptor being greater than 50m it is not appropriate to apply the calculation to that diffusion tube reading.

Table E, lists the reduction in nitrogen dioxide concentrations with the distance to the nearest relevant receptor for those monitoring locations and identifies where the annual Air Quality Objective is still exceeded.

Table F.   NO$_2$ Automatic Monitor Results: Comparison with 1-hour Mean Objective

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Number of Hourly Means > 200 µgm^{-3}								
			2010 [c]	2011 [c]	2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]	2018 [c]
WL1 Dawlish Road	N/A	99.4%	0	3	2	2	1	0 (99.8th percentile is 88; less than 200 therefore unlikely to experience exceedance)	0	0	0
WL4 Crooked Billet	N/A	99.7%	20	14	**19**	11	**116**	**37 (99.8th percentile is 243 suggesting an exceedance of the hourly mean objective)**	15	0	0
WL5 Ruckholt Close	N/A	99.7%	5	0	0	0	7	0	0	0	0

Notes: Exceedance of the NO$_2$ short term AQO of 200 µgm^{-3} over the permitted 18 days per year are shown in **bold**.
[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

[b] data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

[c] Means should be "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75%

Table G.   Annual Mean PM$_{10}$ Automatic Monitoring Results (µg m^{-3})

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean Concentration (µgm^{-3})								
			2010 [c]	2011[c]	2012 [c]	2013[c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]	2018 [c]
WL1 Dawlish Road	N/A	95.9%	21.7	25	18	21	19	16	18	18	17
WL4 Crooked Billet	N/A	99.6%	29.7	29	32	31	**40**	32	29	29	28
WL5 Ruckholt Close	N/A	97.1%	24.5	25	19	21	20	18	19	19	18

Notes: Exceedance of the PM$_{10}$ annual mean AQO of 40 µgm^{-3} are shown in **bold**.

[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

[b] data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

[c] Means should be "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75%

Figure 1.3 shows the trends in PM10 concentrations over the past 8 years at the three automatic monitoring locations in the LBWF. It shows that there has been a gradual improvement in air quality at these sites and that the annual mean average Air Quality Objective of 40µg/m3 is not being exceeded. The data displayed in Table G also shows that the 24 hour mean average Air Quality Objective is not being exceeded in the London Borough of Waltham Forest.
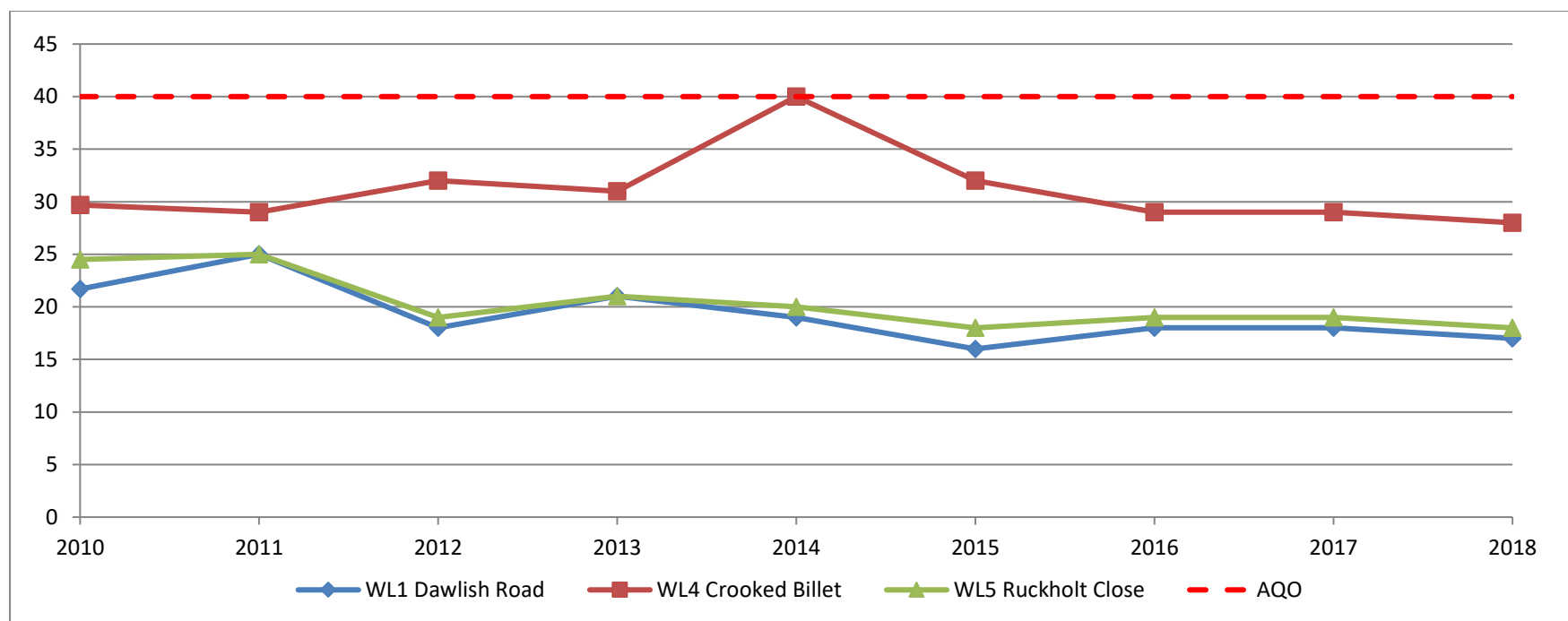
Figure 1.3 Trends in PM$_{10}$ Concentrations within the London Borough of Waltham Forest.

Table H. PM$_{10}$ Automatic Monitor Results: Comparison with 24-Hour Mean Objective

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Number of Daily Means > 50 μgm^{-3}								
			2010 [c]	2011 [c]	2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]	2018 [c]
WL1 Dawlish Road	N/A	95.9%	1	8	0	3	1	0 (90th percentile is 24)	4	4	1
WL4 Crooked Billet	N/A	99.6%	16	14	21	22	**60**	23 (90th percentile is 48)	22	17	10
WL5 Ruckholt Close	N/A	97.1%	11	20	13	8	9	3 (90th percentile is 28)	6	6	1

Notes: Exceedance of the PM$_{10}$ short term AQO of 50 μg m^{-3} over the permitted 35 days per year or where the 90.4th percentile exceeds 50 μg m^{-3} are shown in **bold**. Where the period of valid data is less than 90% of a full year, the 90.4th percentile is shown in brackets after the number of exceedances.
[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
[b] data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
[c] Means should be "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75%

2.   Action to Improve Air Quality

2.1   Air Quality Action Plan Progress

Table K provides a brief summary of the Council's progress against our draft Air Quality Action Plan, showing progress made this year. New projects which commenced in 2018 are shown at the bottom of the table.

Table K.   Delivery of Air Quality Action Plan Measures

REF	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints	Further information
**Ensuring emissions from construction are minimised**			
1	**Action1: Every major development will have a construction management condition.**	• **Please see planning update (Table X).** • **As part of the GLA project in partnership with LBWF, Barnet, Enfield and Haringey 45 sites in Waltham Forest were audited. All audited sites either had no NRMM on site at the time or all NRMM on site was compliant.**	**Additionally all major developments are now required to have discrete conditions for:** • **Air Quality Dust Management Plan (AQDMP)** • **Non Road Mobile Machinery (NRMM)**
2	**Action 2: Every major development will have a Non Road Mobile Machinery condition, and compliance will be checked via spot checks at development sites.**		**From 1st September 2020 NRMM on all sites within Greater London will be required to meet Stage IIIB of EU Directive 97/68/EC as a minimum.** **In preparation this minor developments that involve significant construction and/or demolition works are conditioned for NRMM and required to submit an AQDMP.**

			This will allow us to monitor ongoing sites once the new requirements are introduced.
	Action 6a: To improve information relating to the Smoke Control Areas on the council's web site.	• **The Smoke Control Area (SCA) tab on the AQ page of the council's website had been updated to include information and guidance on Open fires in the home; Grills and log burning ovens in restaurants; Chimney heights.**	**A leaflet with up to date advice has been published. A digital copy is available on the council's website. This leaflet will be distributed at point of sale locations for fuel and wood burners in 2019.**
	Action 6b: To prepare an advice leaflet for residents on authorised fuels and exempt appliances, which will be distributed at point of sale locations for fuel and wood burners.	• **In December 2018 / January 2019 the council delivered a SCA awareness campaign through regular tweets around indoor burning, DEFRA approved fuels and appliances.**	
7	**Action 7: Promoting and delivering energy efficiency retrofitting projects in workplaces and homes using the GLA RE:NEW and RE-FIT programmes to replace old boilers / top up loft insulation in combination with**	**Waltham Forest's efficiency retrofitting projects are now primarily through the Council's Salix fund. In 2018/19, SALIX funded 4 corporate projects with a total costs of £420,738 with annual CO2 savings of 205.76 tonnes and cost savings of £43,843.**	

Public health and awareness raising			
9	**Action 9a: Improve the council website with air quality information including the "Living Streets" map, developed as part of the "Enjoy Waltham Forest" project. The map suggests alternative, better AQ walking and cycling routes. Action 9b: Improve local communication with at least one post annually in Waltham Forest News, all projects being tweeted, and all major projects show cased on Council TV screens** **Action 9c: Joint anti-idling project on national Clean Air Day 21st June 2018**	**The AQ page on the council's website has a section on the Walkit.com. This is a web based urban walking route planner that allows you to plan your journeys via less polluted routes.** **The living streets map on the Enjoy website has been updated with AQ related infrastructure.** **Car free messages were displayed on screens in the town hall on the days leading up to and including car free day.** **The anti-idling operation on Clean Air Day targeted taxis and those drivers picking up passengers from Walthamstow Central Station.** **More than 30 children were trained to be air quality ambassadors for their schools.** **Councillors and council staff made personal pledges today for how they would help improve air quality.**	
10	**Action 10: Refresh the Waltham Forest's Joint Strategic Needs Assessment which has air quality as a key theme.**	**In December 2018 the council published its Joint Strategic Needs Assessment on Air Quality and Health. This was published by Public Health with input from Air Quality & Environmental Protection.**	

11	Action 11: Strengthening coordination with Public Health by ensuring that at least one consultant grade public health specialist within the borough has air quality responsibilities outlined in their job profile (as part of a wider role, not a dedicated air quality post)	The Public Health team are working collaboratively on a number of projects including: • The School Super Zone Pilot. • Cleaner Air Hospital Project (Please see action 41 for further details).	The School Super Zone Pilot: Mayville Primary School. This is a public health initiative which involves creating a 400m health and wellbeing radius around the school. This includes several interventions around air quality including an anti-idling campaign around the school.
16	Action 16: To run a campaign to promote the Transport for London STARS programme in Waltham Forest Action 16a: Working to deliver the recommendations of the audits from the audited schools in this programme	For 2018 there are: 9 gold 17 silver 26 bronze STARS accredited schools in WF. No Schools in WF were audited in The Mayor's school air quality audit programme.	
17	Action 17a: Run "School Streets" trial Action17b: School Air Quality Ambassadors initiative alongside national Clean Air Day	On national Clean Air Day 21st June, all schools were invited to contact us if they would like assistance with trialling "School Streets" initiatives. Several suitable school have been identified, we have and will continue to support the school to deliver this action. As we are at the initialisation stage of this action, the outcome of our consultation with schools will be published in the annual update 2019	Several schools have been engaged but none made it to public consultation in 2018. We will continue to identify suitable schools and support them to deliver this action.

		All TfL STARS registered schools were invited to the council on 8th June to take part in an "Air Quality Lesson" using the GAP key stage 2 toolkits.	
20	Action 20a: Monitor the use and mileage of the Zero Emission Delivery Service and Cargo Bikes Action 20b: Promote the Zero Emission Delivery Service and Cargo Bikes through the website and Waltham Forest News. Action 20c: The Waltham Forest Construction	Number of businesses using the service: 37 Number of deliveries made: 13,160 Number of miles travelled: 7,361.5 Estimated number of CO_2 equivalent emissions saved: 3,500kg	

	Consolidation Pilot is being developed by the Asset Management Team Action 20d: Monitor the Waltham Forest Sustainable freight initiative, and convert this to NOx emissions and report annually.		
26	**Action 25a: To monitor and report the annual emissions for the staff car club Action 25b: To submit bid to OLEV for workplace EV chargers**	**From February 18 – August 18 the Car Pool fleet was using low emission vehicles (Fiat 500). During this time period 5863 staff miles were driven as part of the scheme.** **In September for charging points were installed at the Town Hall and the vehicles were switched to fully electric cars (Nissan Leaf). Since that time over 13,000 electric miles have been driven by the staff and public. The public can book the vehicles out of office hours and at the weekends. Attached is a breakdown.** **Between September and January 5259 petrol miles (staff 4378 miles) were driven at the vehicles at Willow House and Low Hall**	

		Depot	
		We now have 279 members of staff signed up to the scheme, with about 55 staff members booking vehicles each month.	
27	Action 27: Complete the implementation of the Lea Bridge Road Cycle Route by Autumn 2018	Construction work on Lea Bridge Road has begun and will continue until spring 2019	
28	Action 28: To continue to run regular anti-idling campaigns throughout 2018 and 2019	Anti-idling dates are regularly shared with volunteer groups such as HPPG & WFCFCA as well as residents who have expressed interest.	
29	Action 29: Lowering the legal speed limit to 20mph in built up residential areas	Completed in all residential areas	
31	Action 31: To hold a "Pedestrian Day" on World Car Free Day on 22nd September to promote the improvement of mass transit, cycling, and walking and give communities a chance to see	Residents were invited to close their roads and host street parties to mark world car free day. The council also closed the town hall roundabout to cars.	

	what their town could be like car free		
35	**Action 35: To have the 17 new residential EV charging points fully operational by 2019**	**24 new charge points at 10 locations were installed in summer 2018 – more info on the webpage: https://walthamforest.gov.uk/content/electric-vehicle-charging-points**	
36	**Action 36: Installation of rapid chargers to help enable the take up of electric taxis, cabs and commercial vehicles (in partnership with TfL and/or OLEV)**	**A rapid charger has been installed by TfL at Leytonstone station.**	
37	**Action 37: Install eight bespoke secure cycle hubs at stations across the borough by the end of 2019**	**Seven bespoke secure cycle hubs have been installed. The hub by Blackhorse Road station is to be completed by end of 2019.**	**In response to demand in 2017, the council accelerated bike hangar delivery installing 135 units from September 2017 to July 2018. Currently the council has over 3,000 outstanding requests for Bike hangar spaces and receives on average 250 new requests a month. If you have any other stats around this for 2018 they would be much appreciated.**
38	**Action 38a: Launch fleet of free to hire modified bikes by Autumn 2018 Action 38b: Run**	**In December 2018 the council launched a pilot project for fleet of electric pool bikes.**	

		Between 18 February 2019 and 16 March 2019.	
	taster sessions	• 34 different staff members used Freebike • Number of registered users has increased to 105 • 246 total rentals, cycling for 96 hours 3 minutes and 7 seconds, over 536.77km (This is an increase in duration and total rentals from last month) • 68169.79 grams of CO2 have been saved this month by using Freebike over using a car	
39	Action 39: Research Project with King's College London to be published in July 2018	In 2018 Waltham Forest Council commissioned King's College London's Environmental Research Group to model the impacts of recent road interventions in the borough, particularly the Enjoy Waltham Forest scheme, on air quality. This report has been published on the council website. The report found that that measures to prioritise pedestrians and cyclists such as segregated cycle lanes, increased pocket parks and timed road closures had made a marked contribution to improving air quality and health in the borough	Featured in several news outlets including the evening standard: https://www.standard.co.uk/news/london/children-will-live-longer-thanks-to-waltham-forests-mini-holland-cycle-scheme-a3903256.html
Additional Actions added since publication of AQAP			
40	Action 40: Develop a Clean Air Hospital Framework for Whipps Cross University Hospital, in partnership with Barts Health	Waltham Forest Council and Global Action Plan are working together to help hospitals become Clean Air Hospitals, playing their part in helping to reduce air pollution in London and	

	NHS Trustand Global Action Plan.	protecting the health of the most vulnerable.	
		• understand what it means to be a Clean Air Hospital	
		• assess progress against 7 elements	
		• develop a Clean Air Action Plan to improve air quality	
		• assign ownership within the hospital to implement the plan	
		• track and report progress towards becoming a Clean Air Hospital	
		Impact:	
		Improve the health of people in Waltham Forest by reducing air pollution levels.	
		Outcomes:	
		We will support hospitals in Waltham Forest to achieve the following outcomes:	
		• cut NO2 emissions by 5% and PMs by 5%	
		• protect the health of vulnerable patients in Waltham Forest by encouraging them to change their behaviour to benefit their health and reduce air pollution.	
41	Action 41: Identify schools that could benefit from green infrastructure and implement greening projects to improve air	A green screen was installed at Wood Street Primary in January 2019. A list of schools has been compiled and a further two green screens have been planned for instillation by summer 2019.	

	quality in suitable schools.		
42	Action 42: Start Monitoring PM 2.5 in the borough.	In January 2019 a PM2.5 BAM monitor was installed at the Dawlish Road Air Quality monitoring station.	
43	Action 43: Launch a pedometer challenge to encourage children to walk to school	To celebrate the start of Waltham Forest's year as the first London Borough of Culture, WF contacted all schools in the borough and distributed over 7000 pedometers to schools so pupils can log their steps.	

3. Planning Update and Other New Sources of Emissions

Table L. Planning requirements met by planning applications in London Borough of Waltham Forest in 2018

Condition	Number
Number of planning applications reviewed for air quality impacts	636♦
Number of planning applications required to monitor for construction dust	6♦♦
Number of CHPs/Biomass boilers refused on air quality grounds	0
Number of CHPs/Biomass boilers subject to GLA emissions limits and/or other restrictions to reduce emissions	0 biomass and 0 CHP/energy centres/decentralised heating networks
Number of AQ Neutral building and/or transport assessments undertaken	5♦♦♦
Number of AQ Neutral building and/or transport assessments not meeting the benchmark and so required to include additional mitigation	0♦♦♦♦
Number of planning applications with S106 agreements including other requirements to improve air quality	7♦♦♦♦♦
Number of planning applications with CIL payments that include a contribution to improve air quality	Number of LCIL planning applications in 2018/19: £0 Total amount of Local CIL received in 2018/19: £0

	Amount of LCIL spent on air quality in 2018/19: **£0**
NRMM: Central Activity Zone and Canary Wharf Number of conditions related to NRMM included. Number of developments registered and compliant. Please include confirmation that you have checked that the development has been registered at www.nrmm.london and that all NRMM used on-site is compliant with Stage IIIB of the Directive and/or exemptions to the policy.	N/A
NRMM: Greater London (excluding Central Activity Zone and Canary Wharf) Number of conditions related to NRMM included. Number of developments registered and compliant. Please include confirmation that you have checked that the development has been registered at www.nrmm.london and that all NRMM used on-site is compliant with Stage IIIA of the Directive and/or exemptions to the policy.	- 68 conditions included 45registered & compliant - 1 unregistered/uncompliant and being chased.

♦*Based on amount of emails received regarding planning matters*
♦♦ *Excludes sites that voluntarily included monitoring as part of their construction management statement*
♦♦♦ *Based on amount of emails received regarding AQ neutral matters. Number likely higher as all developments which provide an AQ assessment also provide an AQ neutral assessment.*
♦♦♦♦ *Based on emails discussing marginal abatement costs*
♦♦♦♦♦ *Based on comments recommended AQ S106 contributions to planning applications.*

3.1 New or significantly changed industrial or other sources

No new sources identified.

Appendix A   Details of Monitoring Site QA/QC

A.1   Automatic Monitoring Sites

The three automatic monitoring sites in the London Borough of Waltham Forest are currently part of the Air Quality England Network operated by Ricardo Energy & Environment. Ricardo Energy & Environment are the current data management providers. The data has traceability to national standards and operational procedures defined for the AURN network. All the monitoring sites are currently audited by Ricardo Energy & Environment. Data from the Council's automatic monitoring data can be found on the following site: http://www.airqualityengland.co.uk/

The sites are serviced every six months and are calibrated every 2 weeks by our current service and maintenance provider, Matts Monitors.

PM_{10} Monitoring Adjustment

Ricardo Energy & Environment add the Volatile Correction Model (VCM) for correction of conventional TEOM PM10 datasets to the Air Quality England web pages. This function automates the VCM process and enables near real time VCM corrected TEOM datasets and statistics to be generated and downloaded. Annually, when AURN FDMS TEOM datasets on which the model is based are ratified, the provisional VCM corrected data will be replaced by ratified VCM corrected datasets.

Ricardo Energy & Environment version of the VCM model follows best practice as advised by Defra and will use available FDMS data as set out within the guidance. For example the model uses the volatile fraction measured by FDMS analysers within a 130 km range where available. This process will correct conventional TEOM measurement to account for the loss of the volatile component of particulate matter due to the high sampling temperatures generated by the TEOM instrument.

A.2   Diffusion Tube Quality Assurance / Quality Control

The Council currently uses Gradko International for the supply and analysis of its diffusion tubes. The tubes are prepared using a 20%TEA/water solution. Gradko International is UKAS accredited and follows the procedures set out in the Practical Guidance.

Refer to https://laqm.defra.gov.uk/assets/tubeprecision2019version0319finalreduced.pdf for the summary of precision results for nitrogen dioxide diffusion tube collocation studies. Table 1 below demonstrates Gradko International's performance summary for WASP/AIR quality scheme from January 2017 to October 2018.

A.3   Adjustments to the Ratified Monitoring Data

Table 1:

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent AIR NO$_2$ PT rounds and the percentage (%) of results submitted which were subsequently determined to be **satisfactory** based upon a z-score of $\leq \pm 2$ as defined above.

AIR PT Round	AIR PT AR018	AIR PT AR019	AIR PT AR021	AIR PT AR022	AIR PT AR024	AIR PT AR025	AIR PT AR027	AIR PT AR028
Round conducted in the period	January – February 2017	April – May 2017	July – August 2017	September – October 2017	January – February 2018	April – May 2018	July – August 2018	September – October 2018
Aberdeen Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Cardiff Scientific Services	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Edinburgh Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Environmental Services Group, Didcot	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]
Exova (formerly Clyde Analytical)	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Glasgow Scientific Services	100 %	50 %	0 %	100 %	100 %	100 %	50 %	100 %
Gradko International [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 %	100 %	100 %
Kent Scientific Services	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Kirklees MBC	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Lambeth Scientific Services	100 %	NR [2]	NR [2]	100 %	NR [2]	NR [2]	NR [2]	25 %
Milton Keynes Council	100 %	75 %	0 %	75 %	100 %	75 %	100 %	100 %
Northampton Borough Council	0 %	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Somerset Scientific Services	100 %	100 %	100 %	75 %	100 %	100 %	100 %	100 %
South Yorkshire Air Quality Samplers	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Staffordshire County Council	100 %	100 %	100 %	100 %	50 %	100 %	100 %	100 %
Tayside Scientific Services (formerly Dundee CC)	100 %	NR [2]	100 %	NR [2]	100 %	NR [2]	100 %	NR [2]
West Yorkshire Analytical Services	100 %	100 %	100 %	100 %	50 %	75 %	100 %	100 %

[1] Participant subscribed to two sets of test results (2 x 4 test samples) in each AIR PT round.
[2] NR No results reported
[3] Northampton Borough Council, Kent Scientific Services, Cardiff Scientific Services, Kirklees MBC and Exova (formerly Clyde Analytical) no longer carry out NO2 diffusion tube monitoring and therefore did not submit results.

Source: https://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html

A bias adjustment factor of 0.93 was used to bias adjust the 2018 diffusion tubes. This figure was obtained from the National Diffusion Tube Bias Adjustment Factor Spreadsheet (spreadsheet version number 03/19) provided by Defra.   Previous adjustment factors were also derived from the National

Diffusion Tube Bias Adjustment Factor Spreadsheet found on the Defra website: https://laqm.defra.gov.uk//bias-adjustment-factors/bias-adjustment.html
Bias adjustment factors used in previous years are as follows:

Bias adjustment factors used for previous annual review and assessment reports are as follows:

Year	Bias adjustment factor used	Lab
2010	.85	Bristol Scientific Services
2011	.82	Bristol Scientific Services
2012	.97	Gradko International
2013	.95	Gradko International
2014	.91	Gradko International
2015	.88	Gradko International
2016	.94	Gradko International
2017	.89	Gradko International
2018	.93	Gradko International

All bias adjustment factors were derived from the National Diffusion Tube Bias Adjustment Factor Spreadsheet on the Defra website.

Factor from Local Co-location Studies / Discussion of Choice of Factor to Use

The Council has decided to use the National diffusion tube bias adjustment factor in line with Box 4.10 of the LLAQM technical guidance. The guidance also states that the national factor is likely to be more reliable which backs our decision to use the national factor.

Appendix B   Full Monthly Diffusion Tube Results for 2018

Table N.   NO$_2$ Diffusion Tube Results

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean NO$_2$												Annual mean – raw data [c]	Annual mean – bias adjusted [c]
			Jan [d]	Feb [d]	March	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec		
Chingford Assembly Hall	N/A	100	31.69	38.73	37.03	37.46	38.67	25.49	32.88	25.26	26.66	32.35	38.05	35.26	33.3	31.0
Dawlish Rd	N/A	92	36.44	32.92	22.42	-	33	14.87	21.48	20.73	24.86	30.57	29.1	30.74	27.0	25.1
Leyton Library	N/A	75	16.84	16.84	-	-	-	36.3	51.29	50.38	54.28	46.4	48.34	53.3	39.4	36.7
Connaught School	N/A	67 [c]	43.9	43.9	-	-	38.67	-	30.86	46.95	-	43.29	48.21	36.84	41.6	38.7
Selbourne 1 South Grove	N/A	100	41.62	41.62	47.05	48.19	67.78	38.04	41.98	38.64	41.53	44.1	49.26	49.16	45.7	42.5
Selbourne 2	N/A	100	61.46	61.46	73.26	66.57	71.9	58.06	75.88	68.23	64.35	68.9	65.37	67.74	66.9	62.2
Selbourne 3	N/A	100	63.02	63.02	70.85	76.71	52.2	43.81	72.19	67.27	58.69	63.04	70.45	67.24	64.0	59.6
Selbourne 4	N/A	100	52	52	59.44	55.67	30.24	40.45	44.63	41.21	42.14	46.03	57.68	52.86	47.9	44.5
Ruckholt Close	N/A	100	35.79	35.79	43.7	38.29	33.68	33.21	38.06	32.25	36.95	45.08	46.94	46.14	38.8	36.1
Oliver Rd and Ruckholt Rd	N/A	100	52.25	52.25	52.72	47.8	49.5	48.55	49.43	48.01	45.25	53.55	55.77	55.86	50.9	47.3
Vicarage Rd near St Josephs Junior	N/A	83	33.05	33.05	34.32	29.03	25.8	18.9	-	-	27.01	35.68	32.58	33.08	30.3	28.1

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean NO$_2$												Annual mean – raw data [c]	Annual mean – bias adjusted [c]
			Jan [d]	Feb [d]	March	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec		
Radlix Rd and Church Rd	N/A	100	39.39	39.39	**48.59**	**44.22**	39.92	32.9	**44.22**	**44.08**	**49.9**	**50.7**	**50.06**	**49.59**	**44.4**	**41.3**
Gloucester Rd & Lea Bridge Rd	N/A	100	**42.16**	**42.16**	**43.44**	39.16	36.49	39.93	**44.24**	**43.01**	**51.5**	**45.15**	**47.8**	**45.07**	**43.3**	**40.3**
Francis Rd & High Rd Leyton	N/A	100	33.24	33.24	**40.29**	37.05	32.27	24.38	34.2	30.95	34.05	**42.77**	39.39	39.44	35.1	32.6
Chestnuts House on Hoe St	N/A	100	37.78	37.78	**44.84**	25.4	36.52	36.43	37.66	33.15	32.2	39.59	**42.25**	**40.9**	37.0	34.4
Kings Rd & Kingswood Rd	N/A	100	**40.54**	**40.54**	35.44	39	30.47	26.88	29.84	28.46	36.78	**40.22**	**45.73**	37.83	36.0	33.5
Lea Bridge Rd and Perth Rd	N/A	100	**41.12**	**41.12**	**44.33**	33.72	32.32	29.43	36.03	34.14	32.76	26.7	39.34	36.22	35.6	33.1
Lea Bridge Rd (entrance of Lea Valley Riding School)	N/A	100	35.09	35.09	35.63	31.68	23.41	22.62	27.56	24.9	32.92	31.86	36.69	31.22	30.7	28.6
Pembroke Rd & Grosvenor Park Rd	N/A	100	32.1	32.1	38.06	36.91	27.54	18.7	28.01	26.37	30.55	36.1	**40.56**	**40.93**	32.3	30.1
Howard Rd & Church Rd	N/A	100	**40.71**	**40.71**	**45.08**	35.02	31.01	21.43	30.56	26.49	33.77	36	38.57	38.5	34.8	32.4

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean NO$_2$												Annual mean – raw data [c]	Annual mean – bias adjusted [c]
			Jan [d]	Feb [d]	March	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec		
Boundary Rd & Hoe St	N/A	100	**45.69**	**45.69**	**52.08**	**51.55**	**49.86**	39.43	**53.18**	37.9	39.4	**48.98**	**50.73**	**49.09**	**47.0**	**43.7**
Queens Rd near the Cemetery	N/A	100	37.47	37.47	**41.16**	28.83	27	20.96	25.36	23.58	31.91	33.38	34.32	35.52	31.4	29.2
Blackhorse Rd in front of St Patricks Catholic School	N/A	92	**48.07**	**48.07**	**53.65**	-	**48.53**	38.86	**51.88**	**47.64**	**52.56**	**53.7**	**57.99**	**50.16**	**50.1**	**46.6**
Forest Rd and Melville Rd	N/A	100	**41.39**	**41.39**	**46.26**	38.69	31.19	26.11	31.6	27.23	31.78	37.67	**43.64**	**41.52**	36.5	34.0
Shernhall St & Greville Rd	N/A	67 [c]	37.74	37.74	36.96	20.14	38.3	-	-	26.07	28.27	34.02	-	-	31.8	29.6
Ascham Homes property near Whipps Cross round about	N/A	100	**68.11**	**68.11**	**43.49**	32.39	33.48	32.25	**41.37**	32.87	37.67	37.49	38.13	39.11	**42.0**	39.1
Station Rd junct with Buxton Rd E4	N/A	100	**44.88**	**44.88**	**42.13**	36.36	**42.36**	34.8	38.33	30.07	31.64	34.46	38.75	**42.29**	38.4	35.7
Old Church Rd o/s Mansfield Park	N/A	100	**49.33**	**49.33**	**53.77**	38.84	28.19	38.65	**42.58**	38.01	37.58	**48.04**	45.17	48.4	**43.2**	**40.1**

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean NO$_2$												Annual mean – raw data [c]	Annual mean – bias adjusted [c]
			Jan [d]	Feb [d]	March	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec		
Larkshall Rd junct Dale View Cres E4	N/A	100	31.7	31.7	34.26	29.83	30.52	20.5	25.33	24.79	27.95	33.62	37.81	**40.62**	30.7	28.6
Friday Hill junct Normanton Pk	N/A	100	30.52	30.52	33.81	31.38	**44.26**	22.95	33.17	29.4	29.79	36.96	39.69	**40.13**	33.5	31.2
Old Church Rd junct Chingford Mount Rd	N/A	100	**46.47**	**46.47**	**50.7**	**52.55**	**44.08**	38.23	**51.91**	**41.3**	**45.41**	**51.18**	**58.5**	**59.78**	**48.9**	**45.5**
Hale End Road junct The Avenue	N/A	100	**40.43**	**40.43**	**42.41**	37.12	**44.11**	32.49	35.72	30.51	33.03	39.92	**44.6**	**43.94**	38.7	36.0
Fulbourne Rd	N/A	100	**44.7**	**44.7**	**45.66**	33.68	**45.4**	34	**41.87**	35.3	**41.9**	**48.56**	**48.4**	**52.4**	**43.0**	**40.0**
Chingford Road junct Penhryn Cres	N/A	100	37.43	37.43	**41.97**	27.73	37.25	35.93	**42.02**	31.96	32.68	**42.74**	**51.13**	**43.5**	38.5	35.8
Higham Hill Rd junctClaremont Road	N/A	100	33.95	33.95	39.18	26.06	**42.47**	18.74	28.84	26.14	35.55	38.34	**45.34**	38.9	34.0	31.6
Higham Hill junct Forest Road	N/A	100	**52.73**	**52.73**	**61.53**	**52.9**	32.36	37.09	**53.48**	**51.98**	**54.16**	**54.12**	**67.02**	**54.92**	**52.1**	**48.4**
Winns Ave junct Mersey Rd	N/A	100	32.25	32.25	36.62	39.54	**45.79**	19.3	25.29	24.09	28.77	32.84	**43.16**	38.77	33.2	30.9

Site ID	Valid data capture for monitoring period %[a]	Valid data capture 2018 %[b]	Annual Mean NO$_2$												Annual mean – raw data[c]	Annual mean – bias adjusted[c]
			Jan[d]	Feb[d]	March	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec		
Forest Rd Bell Corner	N/A	100	**52.61**	**52.61**	**55.5**	**58.5**	**52.39**	**43.94**	**60.83**	**50.51**	**54.68**	**52.15**	**60.4**	**60.07**	**54.5**	**50.7**
Forest Road junct Wood St	N/A	92	**50.45**	**50.45**	**54.51**	**53.06**	**47.01**	**42.59**	**51.64**	-	**53.96**	**50.81**	**51.33**	**50.25**	**50.6**	**47.0**
86 Palmerston Road	N/A	100	**42.98**	**42.98**	**44.93**	**48.58**	**57.87**	33.58	**41.95**	33.96	37.19	**42.89**	**50.12**	**41.44**	**43.2**	**40.2**
Lea Bridge Rd Bakers Arms	N/A	100	**56.48**	**56.48**	**60.05**	29.69	**63.97**	**59.37**	**73.44**	**53.42**	**57.35**	**71.67**	**51.15**	**60.6**	**57.8**	**53.8**
High Rd E10 junct Buckingham Rd	N/A	100	**43.54**	**43.54**	**49.24**	**43.41**	**57.98**	**41.43**	**42.68**	33.28	37.67	**47.95**	**44.51**	**44.89**	**44.2**	**41.1**
High Rd E10 junct Etchingham Rd	N/A	100	**55.74**	**55.74**	**58.49**	**59.39**	**51.46**	**53.89**	**64.41**	**50.39**	**48.68**	**59.85**	**58.01**	**61.06**	**56.4**	**52.5**
High Rd E11 junct West St	N/A	92	**50.92**	**50.92**	-	**52.74**	**40.33**	32.97	**48.57**	**43.99**	**50.58**	**55.24**	**58.2**	**52.81**	**48.8**	**45.4**

Exceedance of the NO$_2$ annual mean AQO of 40 μgm^{-3} are shown in **bold**.

[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

[b] data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

[c] Means should be "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75%

[d] due to technical difficulties the diffusion tubes for the Jan-Feb period were exposed for a 2 month period. The results were halved and used for both months.

Appendix C: Map of Monitoring Locations in Waltham Forest for 2018.

Air Quality Monitoring Stations

- ◆ AQ Mesh
- ◆ Diffusion Tube
- ● Automatic Station