Redbridge Air Quality Annual Status Report for 2017
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This report provides a detailed overview of air quality in the London Borough of Redbridge during 2017. 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 2017

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
CM7	Redbridge 7 Ley Street	544454.8	187681.9	Urban background	Y	70	50m	2.7	NO_2,PM_{10}, $PM_{2.5}$, O_3	Chemiluminescent; BAM
CM4	Redbridge 4 Gardner Close	540828.3	188367.9	Urban traffic	Y	12	12m	2.	NO_2,PM_{10}, $PM_{2.5}$,	Chemiluminescent; BAM

Table C. Details of Non-Automatic Monitoring Sites for 2017

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)	Site height (m)	Pollutants monitored	Tube co-located with an automatic monitor? (Y/N)
DT A	*Mayfield School*	*547022.3*	*187232.3*	*Urban Background*	*Y*	*<5m*	*>100*	*1.5*	*NO_2*	*N*
DT B	*Ilford Lane*	*543688.0*	*186139.6*	*Roadside*	*Y*	*<5m*	*2.3*	*3.1*	*NO_2*	*N*

DT C	*Ilford Lane BP*	*544132.4*	*184945.6*	*Roadside*	*Y*	*<5m*	*3.0*	*2.7*	*NO_2*	*N*
DT D	*Ley Street*	*544454.8*	*187681.9*	*Urban Background*	*Y*	*>5m*	*50m*	*2.7*	*NO_2*	*Y*
DT E	*Gardner Close*	*540828.3*	*188367.9*	*Roadside*	*Y*	*<5m*	*4.2*	*2.6*	*NO_2*	*Y*
DT F	*Fullwell Cross*	*544560.7*	*190400.8*	*Roadside*	*Y*	*<5m*	*1.2*	*1.7*	*NO_2*	*N*
DT G	*Perth Road*	*543421.7*	*188322.6*	*Roadside*	*Y*	*<5m*	*1.5*	*2.8*	*NO_2*	*N*
DT H	*Westbound Eastern Ave*	*543450.6*	*188371.1*	*Roadside*	*Y*	*<5m*	*1.3*	*2.4*	*NO_2*	*N*
DT I	*CentralRes Eastern Ave*	*543453.7*	*188384.4*	*Roadside*	*Y*	*<5m*	*2.0*	*2.5*	*NO_2*	*N*
DT J	*Eastbound Eastern Ave*	*543442.0*	*1888400.2*	*Kerbside*	*Y*	*<5m*	*0.9*	*2.7*	*NO_2*	*N*
DT K	*Parham Dr*	*543498.3*	*188427.6*	*Near Road*	*Y*	*<5m*	*40m from Eastern Ave*	*2.6*	*NO_2*	*N*
DT L	*North Circ. Rd, Northbound Royston Gd*	*541816.3*	*188161.3*	*Roadside*	*Y*	*<5m*	*2.1*	*2.8*	*NO_2*	*N*
DT M	*North Circ. Rd, Southbound Wanstead Pk*	*541887.8*	*188136.2*	*Roadside*	*Y*	*<5m*	*3.0*	*3.0*	*NO_2*	*N*
DT N	*Ethel Davis School*	*546675.6*	*188886.1*	*Near Road*	*Y*	*<5m*	*15*	*2.8*	*NO_2*	*N*
DT O	*Grove Road*	*540025.7*	*190494.3*	*Roadside*	*Y*	*<5m*	*8.0 horizontal*	*2.7*	*NO_2*	*N*
DT P	*High Road Woodford*	*540076.0*	*190682.6*	*Roadside*	*Y*	*<5m*	*2.7*	*2.6*	*NO_2*	*N*
DT Q	*M11*	*541992.1*	*191799.9*	*Near Road*	*Y*	*>10m*	*35*	*2.4*	*NO_2*	*N*
DT R	*Winston Way Primary Sch.*	*544364.1*	*186597.4*	*Roadside*	*Y*	*<5m*	*3.2*	*2.8*	*NO_2*	*N*
DT S	*Winston Way Gyratory*	*544360.4*	*186615.3*	*Kerbside*	*Y*	*>10m*	*0.9*	*2.6*	*NO_2*	*N*
DT T	*Chadwell Heath Primary School*	*547158.3*	*187699.4*	*Kerbside*	*Y*	*<5m*	*0.6*	*2.8*	*NO_2*	*N*

DT U	*Goodmayes Primary School*	*546665.3*	*187046.3*	*Roadside*	*Y*	*<5m*	*9.0*	*2.6*	*NO_2*	*N*
DT V	*Isaac Newton Academy*	*545030.2*	*186919.8*	*Near Road*	*Y*	*<5m*	*15*	*2.6*	*NO_2*	*N*
DT W	*Inside Winston Way Prim.Sch*	*544332.3*	*186571.3*	*Near Road*	*Y*	*<5m*	*17*	*3.0*	*NO_2*	*N*

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 Appendix A.

Table D. Annual Mean NO_2 Ratified and Bias-adjusted Monitoring Results (μg m^{-3}) (Non-automatic co-located tube date included for data trend comparisons) (DT D Perth Terrace was relocated to DT D Ley Street in 2014 with CM7)

Site ID	Site type	Valid data capture for monitoring period % [a]	Valid data capture 2017 % [b]	Annual Mean Concentration (μg m^{-3})						
				2011 [c]	2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]
CM1	*Automatic Background (Perth Terrace)*			33.3	36.8	35.4	32.8			
CM7	*Automatic Background (Ley Street)*	*(99)*	*(99)*				34.6	33.1	33	30.4
CM3	*Urban Traffic*			**52.0**						
CM4	*Urban Traffic (Gardner Close)*	*(91)*	*(91)*	**49.2**	**48.3**	**45.0**	**48.3**	**41.0**	**42.3**	38.8
CM5	*Urban Traffic*			**54.2**						

Site ID	Site type	Valid data capture for monitoring period % [a]	Valid data capture 2017 % [b]	Annual Mean Concentration (µg m^{-3})						
				2011 [c]	2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]
DT D	*Non-Automatic Background (Ley Street)*	99	99					29.6	30.4	28.4
DT D	*Non-Automatic Background (Perth Terrace)*			33.1	37.2	33.7	31.7			
DT E	*Non-Automatic Background (Gardner Close)*	91	91	**45.6**	**48.6**	**46.8**	**48.6**	**42.9**	**42.3**	**42.4**

Notes: Exceedance of the NO_2 annual mean AQO of 40 µg m^{-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%

Table D2: Results of Non-Automatic Nitrogen Dioxide Diffusion Tubes (2011 to 2017)

		Year	2011	2012	2013	2014	2015	2016	2017
		Bias adjustment factor	0.87	0.86	0.80	0.76	0.95	1.03	0.97
Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for bias [a]						
DT A	Background	Y	26.2	28.7	24.1	24.2	25.8	28.8	27.4
DT B	Roadside	Y	**58.5**	**60.8**	**52.5**	**51.7**	**52.0**	**55.9**	**52.8**
DT C	Roadside	Y	**54.3**	**57.8**	**47.5**	**49.2**	**53.1**	**57.0**	**52.6**
DT D	Background	Y	31.9	37.2	33.7	31.7	29.6	29.0	28.4
DT E	Roadside	Y	**45.9**	**48.6**	**46.8**	**48.6**	**42.9**	**43.4**	**42.4**
DT F	Roadside	Y	**49.0**	**52.5**	**44.0**	**42.3**	**44.7**	**46.0**	**43.2**
DT G	Roadside	Y	**40.6**	**45.4**	**43.9**	39.2	**46.9**	**59.1**	**55.0**
DT H	Roadside	Y	**58.1**	**65.0**	**58.1**	**64.6**	**53.1**	**50.3**	**52.7**
DT I	Roadside	Y	**92.0**	**82.3**	**56.7**	**64.3**	**51.8**	**54.4**	**52.5**
DT J	Kerbside	Y	**46.0**	**50.5**	**45.1**	**45.6**	**48.0**	**55.3**	**50.3**
DT K	Near Road	Y	38.0	38.3	**43.1**	36.8	**44.8**	**52.9**	**55.3**

DT L	Roadside	Y	**42.6**	**48.4**	**46.2**	**42.4**	**45.7**	**47.6**	**42.6**
DT M	Roadside	Y	**68.3**	**77.3**	**66.7**	**71.6**	**73.0**	**80.5**	**78.9**
DT N	Near Road	Y	28.5	31.9	32.9	25.8	25.8	28.1	26.8
DT O	Roadside	Y	**54.7**	**58.2**	**45.2**	**52**	**45.7**	**49.5**	**47.4**
DT P	Roadside	Y	**42.5**	**45.6**	**40.7**	39.8	38.0	38.8	37.6
DT Q	Near Road	Y	**47.5**	**49.5**	**41.4**	**42.6**	**46.8**	**42.1**	**43.9**
DT R	Roadside	Y			**53.6**	**50.3**	**50.2**	**57.3**	**54.5**
DT S	Kerbside	Y			**53.2**	**49.4**	**52.6**	**58.3**	**55.5**
DT T	Kerbside	Y			**47.2**	**41.4**	**42.0**	**47.8**	**43.3**
DT U	Roadside	Y			35.6	34.3	34.8	37.6	36.1
DT V	Near Road	Y			34.7	36	31.4	34.0	32.8
DT W	Near Road	Y				36.4	34.8	38.1	35.8

Trends in Annual Mean NO_2 Concentrations

The data above shows the annual mean NO_2 concentrations 7 year trend from 2011 to 2017. The results indicate that the annual mean objective was exceeded for all years monitored at the CM3 (Fullwell Cross) and CM5 (Grove Road) roadside monitoring sites until their closure in 2012. The annual mean objective was also exceeded for 6 years at the roadside site CM4 (Gardner Close) with the exception of 2017 where CM4 recorded an annual mean concentration of 38.8. The results at CM4 show a unsteady downward trend over the 7 period. The background site CM1 at Perth Terrace has shown steady concentrations until its closure in 2014. Similarly the background site CM7 at Ley Street has shown steady concentrations since opening in 2014. Both background sites CM1 and CM7 have continually met the annual mean objective concentration. 7 years of non-automatic data at monitoring site DT E (Gardner Close) has been included for data trend comparisons. Similarly data from background sites DT D (Perth Terrace) and DT D (Ley Street) have been included for trend comparison purposes. Site DT D (Perth Terrace) was relocated to DT D Ley Street in 2014 therefore the 7 years of data is split between the two sites. Site DT E in comparison to CM4 shows a similar unsteady concentration decrease and increase trend in the data over the 7 year period. However it is notable that in 2017 CM4 has recorded an annual average just below the Air Quality Objective for the first time over the 7 year period in contrast to DT E which recorded an annual average concentration just above the objective. It is possible that DT E has presented a slight over read in its data. We will observe the concentration trend at CM4 and DT E in future years to see how it progresses. The comparison of site DT D to sites CM1 and CM7 show that background concentration trends have remained relatively steady over the 7 year period.

Table D2 shows a significant number of non-automatic diffusion tube sites still showing pollution levels above the level of 40 μgm^{-3},as prescribed in the Air Quality Objectives. There is a small downward trend across Redbridge's diffusion tube sites, however roadside sites are persistently above levels set in the Air Quality Objectives.

Table E. NO_2 Automatic Monitor Results: Comparison with 1-hour Mean Objective

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2017 % [b]	Number of Hourly Means > 200 µg m^{-3}						
			2011 [c]	2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]
CM1			*0*	*0*	*1*	*0*			
CM7	99	99				*0*	*0*	*0*	0
CM3									
CM4	91	91						*3*	0
CM5									

Notes: Exceedance of the NO_2 short term AQO of 200 µg m^{-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 F. Annual Mean PM_{10} Automatic Monitoring Results (µg m^{-3})

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2017 % [b]	Annual Mean Concentration (µg m^{-3})						
			2011 [c]	2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]
CM1(Background)			*16.3*	*14.9*	*17.7*	*16.9*			
CM7(Background)	*97*	*97*				*22.9*	*18.8*	*16.9*	15.7
CM3(Roadside)			*28.9*						

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2017 % [b]	Annual Mean Concentration (µg m^{-3})						
			2011 [c]	2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]
CM4(Roadside)	*90*	*90*	*25.9*	*27.0*	*30.3*	*25.4*	*17.0*	*18.8*	17.3
CM5(Roadside)			*27.6*						

Notes: Exceedance of the PM_{10} annual mean AQO of 40 µg m^{-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%

Table G. PM_{10} Automatic Monitor Results: Comparison with 24-Hour Mean Objective

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2017 % [b]	Number of Daily Means > 50 µg m^{-3}						
			2011 [c]	2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]
CM1(Background)			*5*	*2(35)*	*2*	*5(35)*			
CM7(Background)	*97*	*97*				*7(36)*	*3(30)*	*3(28)*	2
CM3(Roadside)			*29*	*6(52)*					
CM4(Roadside)	*90*	*90*	*11*	*18*	*23*	*9(43)*	*1*	*6*	2

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 85% 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%

Table H. Annual Mean $PM_{2.5}$ Automatic Monitoring Results (µg m^{-3})

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2017 % [b]	Annual Mean Concentration (µg m^{-3})						
			2011 [c]	2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]
CM7(Background)	*95*	*95*							*13.6*

Notes: Exceedance of the $PM_{2.5}$ annual mean AQO of 25 µg m^{-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%

2. Action to Improve Air Quality

2.1 Air Quality Action Plan Progress

Table J provides a brief summary of Redbridge Council's new draft Air Quality Action Plan 2018-2023. This plan is currently undergoing cabinet approval and will be published in summer this year. We are focussing our actions on reducing emissions in our air quality focus areas and pollution hotspots. Some actions are currently progressing.

Table J. Delivery of Air Quality Action Plan Measures (From the new Draft Redbridge Air Quality Action Plan 2018-2023)

Action category	Action ID	Action description	Responsibility	Cost	Expected emissions/ concentrations benefit	Timescale	Monitoring	Further information
Emissions from developments and buildings	1	Ensuring emissions from construction and operation of new developments are minimised by requiring developers to adhere to current and any superseding best practice guidance and supplementary planning	Environmental Health and Planning	Low-Medium (in-house staff resource).	Significant emissions reduction in the AQMA	Ongoing	Update in Annual Status Report	

		guidance.						
Emissions from developments and buildings	2	Educate, raise awareness and enforce Non Road Mobile Machinery (NRMM) air quality policies.	Environmental Health and Planning	Medium Apply for funding from MAQF	emissions reductions in the AQMA	Ongoing	Update in Annual Status Report	
Emissions from developments and buildings	3	Enforcing CHP and biomass air quality policies	Environmental Health and Planning	In-house	emissions reductions in the AQMA	Ongoing	Update in Annual Status Report	
Emissions from developments and buildings	4	Enforcing Air Quality Neutral policies and require Air Quality Assessments where necessary	Environmental Health and Planning	In-house	emissions reductions in the AQMA	Ongoing	Update in Annual Status Report	
Emissions from developments and buildings	5	Ensuring adequate, appropriate, and well located green space and infrastructure is included in new developments	Environmental Health and Planning	In-house	Green infrastructure can play a contributory role in reducing exposure to particulate	Ongoing	Update in Annual Status Report	

					pollution			
Emissions from developments and buildings	6	Ensuring that the restrictions applying in the Smoke Control Areas are enforced and that information about the restrictions is readily available to the public.	Environmental Health	In-house	emissions reductions in the AQMA	Ongoing	Is fully explained on the council website. Enforcement activity is fully documented in the council's Flare database.	
Emissions from developments and buildings	7	Promoting and delivering energy efficiency retrofitting projects in in public buildings using the GLA RE: NEW and RE: FIT programmes to replace old boilers / in combination with other energy conservation measures.	Building Services	Medium requires support from GLA funding streams	emissions reductions in the AQMA	Ongoing	Update in Annual Status Report	Will continue working in partnership with the GLA on upcoming projects.
Public health and awareness	8	Directors of Public Health (DsPHs) have been fully			Help ensure Air Quality is	Ongoing		

raising		briefed on the AQ problem in the local authority area; what is being done, and what is needed.			prioritised within public health.			
Public health and awareness raising	9	Public Health and Environmental Health Teams are supporting engagement with local stakeholders (businesses, schools, community groups and healthcare providers).	Public Health and Environmental Health	In-house	Co-ordinated approach will benefit Air Quality Initiatives	By April 2020		
Public health and awareness raising	10	Joint Strategic Needs Assessment (JSNA) has up to date information on air quality impacts on the population. Revised Health & Well Being Strategy to integrate air quality objectives.	Public Health and Environmental Health	In-house	Help ensure Air Quality is prioritised within public health.	Ongoing		
Public health and awareness raising	11	Strengthening co-ordination with Public Health by ensuring that at least one Consultant-grade public health specialist within the	Public Health	In-house	Help ensure Air Quality is prioritised within public health.	Throughout the plan		

		borough has air quality responsibilities outlined in their job profile						
Public health and awareness raising	12	Engagement with businesses: disseminate information to GP surgeries and pharmacies on how to help improve air quality and reduce exposure for patients and employees	Public Health and Environmental Health	In-house	Citizens have opportunity to learn how to limit exposure to poor air quality and play their part in reducing air pollution.	By April 2020		
Public health and awareness raising	13	Promotion of availability of airTEXT						
Public health and awareness raising	14	Encourage schools to join the TfL STARS accredited travel planning programme through the MAQF school projects	Environmental Health and Smarter Travel teams	In-house	Reduction of Car use and NOx emissions in AQMA. Pollution reduction and Exposure reduction strategies disseminate to wide range of	Ongoing	Update in Annual Status Report	
Public health and awareness raising	15	Air quality at schools	Environmental Health and Smarter Travel team	In-house				

					different groups.			
Delivery servicing and freight	16	Seek to update local authority Procurement policies to include a requirement for suppliers with large fleets to have attained Bronze Fleet Operator Recognition Scheme (FORS) accreditation	Procurement	In-house	Efficient driving and the use of fleet tracker tool contributes to reduction in emissions and fleet operators awareness of air quality issues	Ongoing	Update in Annual Status Report	
Delivery servicing and freight	17	Update Procurement policies to bidders delivering goods and services with zero or low emission vehicles.	Procurement	In-house	The council is leading by example to encourage reductions in emissions.	Ongoing	Update in Annual Status Report	
Delivery servicing and freight	18	**Consolidation:** Redbridge is currently looking at freight consolidation for deliveries to council buildings in partnership	Procurement	TBC	Freight consolidation can lead to a reduction in NO2 and	Ongoing	Update in Annual Status Report	

		with the London Borough Consolidation Centre and Camden Council			PM10/2.5 emissions as less delivery vehicles are on the road.			
Borough fleet actions	19	Redbridge's own fleet is a member of the Freight Transport Association with Truck Excellence accreditation; equivalent to bronze (FORS) accreditation. The council will explore the possibility of obtaining (FORS) Gold accreditation for its own fleet.	Engineering Services	TBC (possible staff resource implications)	TBC			Redbridge staff already undertakes smarter driving training and implement fuel saving fleet measures. Will investigate if this can be improved upon.
Borough fleet actions	20	Increasing the number of electric, hybrid and cleaner vehicles in the boroughs' fleet. Redbridge are seeking to comply with the ULEZ standard with funding	Engineering Services	High: Requires support from Defra and GLA funding streams.	NOx and PM emission reductions in the AQMA	Ongoing	Update in Annual Status Report	

		from Defra.						
Borough fleet actions	21	Accelerate uptake of new Euro VI vehicles in borough fleet.	Engineering Services	High	NOx emission and PM reductions in the AQMA	Ongoing	Update in Annual Status Report	
Borough fleet actions	22	Smarter Driver Training for drivers of vehicles in Borough Own Fleet i.e. through training of fuel efficient driving and providing regular re-training of staff	Engineering Services	In-house	NOx emission and PM reductions in the AQMA	Ongoing		
Localised solutions	23	Green Infrastructure	Environmental Health, Transportation and Planning	Medium: support MAQF and Section 106 funding	PM reductions in the AQMA	Ongoing	Update in Annual Status Report	
Localised solutions	24	Low Emission Neighbourhoods (LENs)	Transportation	High: match funded support from the GLA	Modal shifts will lead to emission reductions in the AQMA	Ongoing	Update in Annual Status Report	
Cleaner	25	Discouraging unnecessary	Environmental Health	In-house	Will lead to	Ongoing	Update in	

transport		idling by taxis, coaches and other vehicles (e.g. through anti-idling campaigns or enforcement activity)	and Redbridge Enforcement Team		emissions reductions in the AQMA		Annual Status Report	
Cleaner transport	26	Increasing the proportion of electric, and ultra-low emission vehicles in Car Clubs and promote uptake amongst the public	Transportation	In-house	Will lead to emissions reductions in the AQMA	Ongoing	Update in Annual Status Report	
Cleaner transport	27	Free or discounted residential parking permits for electric vehicles (EV)	Parking Services	In-house	Increased EV take up leads to emission reductions	Ongoing	Update in Annual Status Report	
Cleaner transport	28	Installation of (EV) residential electric charge points	Transportation and Planning	LIP, GULCS and OLEV funding support available	Increased EV take up by infrastructure support will lead to emissions reductions	Ongoing	Update in Annual Status Report	
Cleaner transport	29	Installation of rapid chargers to help enable the take up of electric	Transportation	High	Increased EV take up by providing	Ongoing	Update in Annual Status	

		taxis, cabs and commercial vehicles (in partnership with TfL and/or OLEV)			infrastructure will lead to emissions reductions		Report	
Cleaner transport	30	Reprioritisation of road space; reducing parking at some destinations and or restricting parking on congested high streets and A roads to improve bus journey times, cycling experience, and reduce emissions caused by congested traffic	Transportation and Planning	High	Potential reduced car use and increased modal shifts will lead to emissions reductions	Ongoing	Update in Annual Status Report	
Cleaner transport	31	Provision of infrastructure to support walking and cycling	Transportation	High LIP and LEN Funding Streams. Section 106 funding streams.	Increased walking and cycling by providing infrastructure will lead to emissions reductions from reduced car usage.	Ongoing	Update in Annual Status Report	

Cleaner transport	32	Surcharge on diesel vehicles below Euro 6 standards for Resident and Controlled Parking Zone permits	Parking Services	In-house	Replacing diesel cars with petrol cars or more sustainable transport options will reduce emissions	Ongoing	Update in Annual Status Report	
Cleaner transport	33	**Reallocation or restriction of road space around schools located in areas of high pollution.**	Transportation and Planning	High	Reduced car usage around schools will reduce emissions and pollution exposure/	Ongoing	Update in Annual Status Report	
Cleaner transport	34	**Traffic flow measures**	Transportation	High	improving traffic flow can reduce emissions	Ongoing	Update in Annual Status Report	

3. Planning Update and Other New Sources of Emissions

Table K. Planning requirements met by planning applications in Redbridge2017

Condition	Number
Number of planning applications where an air quality impact assessment was reviewed for air quality impacts	52
Number of planning applications required to monitor for construction dust	11
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	3
Number of developments required to install Ultra-Low NO_x boilers	4
Number of developments where an AQ Neutral building and/or transport assessments undertaken	4
Number of developments where the AQ Neutral building and/or transport assessments not meeting the benchmark and so required to include additional mitigation	2
Number of planning applications with S106 agreements including other requirements to improve air quality	0
Number of planning applications with CIL payments that include a contribution to improve air quality	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.	
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.	

3.1 New or significantly changed industrial or other sources

London Borough of Redbridge confirms that there are no new or significantly changed industrial or other sources identified.

Appendix A Details of Monitoring Site QA/QC

A.1 Automatic Monitoring Sites

Air quality monitoring data provides a measure of actual concentrations and therefore exceedences of air quality objectives. Data also provides information on trends in air pollution and can provide the basis for verifying the various models used to predict future pollution levels.

In 2017 London Borough of Redbridge undertook automatic monitoring at the following two sites:

- **CM7 - Redbridge 7** (Ley Street) located northeast of Ilford – an urban background site within the Ley Street Depot that is sited on Ley Street. The site monitored nitrogen dioxide, PM10 (by BAM), and ozone. Since 2016 this site began monitoring PM2.5 (by BAM). Redbridge 7 (Ley Street) was set up in 2014, and is also identified in this report as CM7.

- **CM4 - Redbridge 4** (Wanstead) – an urban traffic site close to the A12 towards the southwest of the Borough. The site started operating in November 1999. The site monitors nitrogen dioxide, PM10 and PM2.5 (both by BAM). Until March 2012 it also monitored carbon monoxide and sulphur dioxide.

The sites represent relevant exposure within the Borough. The sites are part of the London Air Quality Network and therefore the standards of QA/QC are similar to those of the government's AURN sites. Fortnightly local site operator (LSO) zero/span calibrations of the gas analysers are carried out by the local authority, with subsequent data collection, validation and ratification undertaken by the ERG at King's College London. In all cases the data are fully ratified unless reported otherwise. Details of the sites can be found at www.londonair.org.uk

UKCAS accredited independent site audits are carried out every 6 months by the National Physics Laboratory (NPL). Additional six monthly equipment service visits by Enviro Technology Services Plc.

The Council previously operated three other automatic monitoring stations in the Borough: **Redbridge 2** - a roadside site on Ilford Broadway closed in 2003, **Redbridge 3** – a kerbside site at Fulwell Cross closed in 2012, and **Redbridge 5** – a roadside site in South Woodford closed in 2012.

PM_{10} Monitoring Adjustment

The LLAQM.TG16 guidance highlights that Met-One PM_{10} Unheated BAM 1020 instruments conform to the equivalence criteria relating to the gravimetric European reference method. A correction using a factor of 1.2 is automatically applied to adjust for slope.

A.2 Diffusion Tube Quality Assurance / Quality Control

- Diffusion Tubes are prepared and analysed by UKAS accredited Gradko International Ltd
- Diffusion Tubes are prepared using 50% triethanolamine with acetone method and analysed using UV spectrophotometry
- The lab follows the procedures set out in the Defra Technical Guidance for LAQM TG(16).

- For details attaining to 'results' – precision, bias adjustment factors; and reference methods are as follows:

  Results of laboratory precision (tube precision and WASP results):

  The LAQM website gives the following precision results for Gradko 50% TEA in acetone:

  2017 Good (22 studies)

  The laboratory performance of Gradko International was tested in April to November 2017 under AIR NO2 PT Rounds AR018, AR019, AR021 and AR022. The performance was 100% in all rounds.

  The version of the bias adjustment factor database used is: 03/18

The bias adjustment factor has been applied to the monthly and annual means as follows:

			Monthly means [µg/m^3] (not bias adjusted)											
Tube nos.	Site ID	Site name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,2,3	DT A	Mayfield School	45.1	34.8	31.2	20.4	20.4	22.5	21.1	21.9	24.7	19.9	41.4	35.4
4,5,6	DT B	Ilford Lane	70.0	58.4	59.7	51.7	51.9	49.4	45.8	53.5	46.9	41.9	67.7	56.3
7,8,9	DT C	Ilford Lane BP	69.5	59.7	56.3	52.0	50.8	51.6	45.7	54.2	46.8	42.8	64.9	56.8
10,11,12	DT D	Ley Street	47.3	36.0	29.3	23.7	22.4	22.0	22.7	22.2	27.1	21.5	40.3	36.4
13,14,15	DT E	Gardner Close	65.7	49.9	45.6	31.2	32.2	42.5	33.9	43.0	42.6	37.9	58.1	42.2
16,17,18	DT F	Fulwell Cross	57.3	48.4	42.9	42.4	37.1	37.7	38.9	38.5	44.7	41.4	60.5	44.7
19,20,21	DT G	Perth Road	80.4	50.0	46.2	54.2	44.6	69.6	57.5	56.2	42.7	32.4	73.6	73.4
22,23,24	DT H	WestB Eastern Ave	88.2	59.5	54.4	65.6	50.9	48.8	54.2	44.9	36.7	39.9	65.3	43.3
25,26,27	DT I	Central Res	65.1	47.8	60.6	50.9	51.9	42.7	47.7	35.4	66.8	72.2	60.0	48.8
28,29,30	DT J	EastB Eastern Ave	63.3	53.7	42.9	46.1	36.8	45.4	47.0	43.6	52.8	57.1	72.0	61.1
31,32,33	DT K	Parham Drive	57.8	71.4	44.4	60.7	52.4	54.7	43.8	77.3	83.2	32.4	50.5	55.1
34,35,36	DT L	NCR Nth Royston Gdns	67.7	48.1	42.2	47.3	48.0	36.2	38.3	36.2	41.0	29.8	54.8	37.6
37,38,39	DT M	NCR Sth Wanstead Park	104.4	80.1	81.2	94.7	73.2	72.5	75.1	76.8	71.4	66.8	103.0	77.4
40,41,42	DT N	Ethal Davis School	40.7	33.8	25.6	24.8	21.1	20.1	21.7	20.9	28.7	22.4	34.5	37.3
43,44,45	DT O	Grove Road	63.3	60.8	49.2	42.9	38.6	48.4	43.1	49.2	49.1	50.3	43.2	
46,47,48	DT P	High Road Woodford	57.3	44.0	38.3	35.2	31.3	34.7	32.7	35.4	37.1	34.9	46.5	38.0
49,50,51	DT Q	Chigwell Rd M11	56.6	51.7	45.0	46.1	24.9	45.9	43.0	45.3	43.9	38.8	56.0	
52,53,54	DT R	Winston Way Primary	58.6	59.2	51.1	65.1	50.8	53.6	50.8	56.3	48.2	52.2	68.5	59.1
55,56,57	DT S	Winston Way Gyratory	67.2	60.3	51.6	70.0	48.9	57.0	53.2	53.8	51.8	55.2	59.5	57.9
58,59,60	DT T	Chadwell Heath Primary	61.8	51.5	45.0	42.6	38.5	38.4	40.8	38.6	46.7	31.3	58.7	41.3
61,62,63	DT U	Goodmayes Primary	51.6	42.7	35.4	34.7	32.6	33.2	30.6	29.6	39.0	27.8	45.0	44.3
64,65,66	DT V	Isaac Newton Academy	48.8	39.2	23.2	50.1	27.1	26.4	24.9	25.3	33.3	21.9	47.9	37.9
67,68,69	DT W	Inside Winston Way Prim.	60.0	40.1	34.8	38.2	28.2	29.7	26.2	31.2	38.3	34.2	45.1	37.3

2017	Calculation of period adjusted and bias adjusted annual means										
				Calculation of period adjustment factors					bias factor	0.97	
Site ID	Site name	Period mean	Period length if <12 months	period mean	Ratio Am/Pm	period mean	Ratio Am/Pm	Period adjustm'nt factor (R_a)	Annual means before bias adj	Bias adjusted annual means	
DT A	Mayfield School	28.2						1.000	28.2	27.4	
DT B	Ilford Lane	54.4						1.000	54.4	52.8	
DT C	Ilford Lane BP	54.3						1.000	54.3	52.6	
DT D	Perth Terr	29.2						1.000	29.2	28.4	
DT E	Gardner Close	43.7						1.000	43.7	42.4	
DT F	Fulwell Cross	44.5						1.000	44.5	43.2	
DT G	Perth Road	56.7						1.000	56.7	55.0	
DT H	WestB Eastern Ave	54.3						1.000	54.3	52.7	
DT I	Central Res	54.2						1.000	54.2	52.5	
DT J	EastB Eastern Ave	51.8						1.000	51.8	50.3	
DT K	Parham Drive	57.0						1.000	57.0	55.3	
DT L	NCR Nth Royston Gdns	43.9						1.000	43.9	42.6	
DT M	NCR Sth Wanstead Park	81.4						1.000	81.4	78.9	
DT N	Ethal Davis School	27.6						1.000	27.6	26.8	
DT O	Grove Road	48.9	11 months					1.000	48.9	47.4	
DT P	High Road Woodford	38.8						1.000	38.8	37.6	
DT Q	Chigwell Rd M11	45.2	11 months					1.000	45.2	43.9	
DT R	Winston Way Primary	56.1						1.000	56.1	54.5	
DT S	Winston Way Gyratory	57.2						1.000	57.2	55.5	
DT T	Chadwell Heath Primary	44.6						1.000	44.6	43.3	
DT U	Goodmayes Primary	37.2						1.000	37.2	36.1	
DT V	Isaac Newton Academy	33.8						1.000	33.8	32.8	
DT W	Inside Winston Way Prim	36.9						1.000	36.9	35.8	

Factor from Local Co-location Studies (if available)

The local co-location studies at the Redbridge 7, Ley Street, CMT = DT D and Redbridge 4, Gardner Close, CM4 = DT E gave an average local bias factor for 2016 of 1.08. This was derived by averaging the B Values from the Local Bias Adjustment Tool in accordance with the method in paragraph 7.192 of LAQM TG16. The average is then expressed as factor. 1 is added to the value. Finally an inverse is taken to give the bias adjustment factor.

2017	Bias adjustment factor
Background Redbridge local: CM7=DT D Bias A value = 1.04 Bias B value = -3%	
Roadside Redbridge local: CM4=DT E Bias A value = 0.88 Bias B value = 14%	
Average local: CM7=DT D and CM4=DT E As in method in paragraph 7.192 of LAQM (TG16) = **0.95**	
National Default used – (22 studies)	**0.97**

Discussion of Choice of Factor to Use

For each of the two local sites there were 12 months of "Good Precision" data. Whilst overall automatic data capture at CM7 was good with 12 months of "Good data capture", automatic data capture at CM4 was good overall but with only 11 months of "Good data capture". The diffusion tubes are in similar exposure positions to the sampler inlets of the chemiluminescent analysers at the continuous sites. In deciding upon the choice of factor to use, we have applied the National Default of 0.97 in our calculations in preference to the local factor of 0.95 since the former derives from good precision data and twenty two sites.

Bias adjustment factors for previous years:

2016: A national bias factor of 1.03 used (Lab: ESG Glasgow)
2015: A national bias factor of 0.95 used (Lab: ESG Glasgow)

A.3 Adjustments to the Ratified Monitoring Data

Short-term to Long-term Data Adjustment

No short to long term adjustments required this year to the ratified monitoring data.

Appendix B Full Monthly Diffusion Tube Results for 2017

Table M. NO_2 Diffusion Tube Results

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2017 % [b]	Annual Mean NO_2 (Bias Adj Factor =0.97)													
			Jan	Feb	March	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Annual mean – raw data [c]	Annual mean – bias adjusted [c]
DT A	100	100	45.1	34.8	31.2	20.4	20.4	22.5	21.1	21.9	24.7	19.9	41.4	35.4	28.2	27.4
DT B	100	100	70.0	58.4	59.7	51.7	51.9	49.4	45.8	53.5	46.9	41.9	67.7	56.3	54.4	52.8
DT C	100	100	69.5	59.7	56.3	52.0	50.8	51.6	45.7	54.2	46.8	42.8	64.9	56.8	54.3	52.6
DT D	100	100	47.3	36.0	29.3	23.7	22.4	22.0	22.7	22.2	27.1	21.5	40.3	36.4	29.2	28.4
DT E	100	100	65.7	49.9	45.6	31.2	32.2	42.5	33.9	43.0	42.6	37.9	58.1	42.2	43.7	42.4
DT F	100	100	57.3	48.4	42.9	42.4	37.1	37.7	38.9	38.5	44.7	41.4	60.5	44.7	44.5	43.2
DT G	100	100	80.4	50.0	46.2	54.2	44.6	69.6	57.5	56.2	42.7	32.4	73.6	73.4	56.7	55.0
DT H	100	100	88.2	59.5	54.4	65.6	50.9	48.8	54.2	44.9	36.7	39.9	65.3	43.3	54.3	52.7
DT I	100	100	65.1	47.8	60.6	50.9	51.9	42.7	47.7	35.4	66.8	72.2	60.0	48.8	54.2	52.5
DT J	100	100	63.3	53.7	42.9	46.1	36.8	45.4	47.0	43.6	52.8	57.1	72.0	61.1	51.8	50.3
DT K	100	100	57.8	71.4	44.4	60.7	52.4	54.7	43.8	77.3	83.2	32.4	50.5	55.1	57.0	55.3
DT L	100	100	67.7	48.1	42.2	47.3	48.0	36.2	38.3	36.2	41.0	29.8	54.8	37.6	43.9	42.6
DT M	100	100	104.4	80.1	81.2	94.7	73.2	72.5	75.1	76.8	71.4	66.8	103.0	77.4	**81.4**	**78.9**
DT N	100	100	40.7	33.8	25.6	24.8	21.1	20.1	21.7	20.9	28.7	22.4	34.5	37.3	27.6	26.8

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2017 % [b]	Annual Mean NO_2 (Bias Adj Factor =0.97)													
			Jan	Feb	March	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Annual mean – raw data [c]	Annual mean – bias adjusted [c]
DT O	92	92	63.3	60.8	49.2	42.9	38.6	48.4	43.1	49.2	49.1	50.3	43.2		**48.9**	**47.4**
DT P	100	100	57.3	44.0	38.3	35.2	31.3	34.7	32.7	35.4	37.1	34.9	46.5	38.0	38.8	37.6
DT Q	92	92	56.6	51.7	45.0	46.1	24.9	45.9	43.0	45.3	43.9	38.8	56.0		**45.2**	**43.9**
DT R	100	100	58.6	59.2	51.1	65.1	50.8	53.6	50.8	56.3	48.2	52.2	68.5	59.1	**56.1**	**54.5**
DT S	100	100	67.2	60.3	51.6	70.0	48.9	57.0	53.2	53.8	51.8	55.2	59.5	57.9	**57.2**	**55.5**
DT T	100	100	61.8	51.5	45.0	42.6	38.5	38.4	40.8	38.6	46.7	31.3	58.7	41.3	**44.6**	**43.3**
DT U	100	100	51.6	42.7	35.4	34.7	32.6	33.2	30.6	29.6	39.0	27.8	45.0	44.3	37.2	36.1
DT V	100	100	48.8	39.2	23.2	50.1	27.1	26.4	24.9	25.3	33.3	21.9	47.9	37.9	33.8	32.8
DT W	100	100	60.0	40.1	34.8	38.2	28.2	29.7	26.2	31.2	38.3	34.2	45.1	37.3	36.9	35.8

Exceedance of the NO_2 annual mean AQO of 40 µg m^{-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%

Distance Adjustment

The bias-adjusted NO_2 annual mean diffusion tube concentration exceedances reported at the sites listed in table N (above) have been distance corrected for the nearest location relevant for exposure. These predictions have been done using the NO_2 fall-off with distance calculator available on the LAQM Support website.

The following factors are have been used to predict the annual mean NO2 concentration (in $\mu g/m^3$) at the the receptor/relevant exposure :

- How far from the KERB is the location where the measurement was made (in meters)
- How far from the KERB is the receptor/relevant exposure (in meters)
- The local annual mean background NO2 concentration (in $\mu g/m^3$)
- The measured annual mean NO2 concentration (in $\mu g/m^3$)

The measurement and background concentrations must be for the same year. The background concentration could come from the national maps published at (http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html) or from a nearby monitor in a background location. 2016 National map background concentrations have been in this report. Use of a measured result from nearby background monitor for background concentration will be denoted by *****

Data for the distance of the kerb to the measurement location has been taken from table B in this report.

The calculator follows the procedure set out in paragraphs 7.77 to 7.79 of LAQM TG(16) and Box 2.3 of LAQM TG(09). The results will have greater uncertainty than measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large. Each distance should be greater than 0.1m and less than 50m. The NO_2 fall off with distance correction has only been applied to sites with relevant exposure that exceed the AQ objectives and that also meet the distance requirement.

Table O. NO_2 Distance Corrected Diffusion Tube Results

Site ID	*Annual mean – raw data* [c]	*Annual mean – bias adjusted* [c]	*Local Annual mean – background*	*Distance of measurement from kerb of nearest road (m)*	*Distance of receptor from kerb (m)*	*Annual mean – distance corrected*
DT A	28.2	27.4				
DT B	**54.4**	**52.8**	28.4	2.3	2	**53.6**
DT C	**54.3**	**52.6**	23.4	3.0	4.9	**48.9**
DT D	29.2	28.4				
DT E	**43.7**	**42.4**	26.7	4.2	11.3	38.0
DT F	**44.5**	**43.2**	19.06	1.2	8.7	33.2
DT G	**56.7**	**55.0**	23.8	1.5	6.4	**45.1**
DT H	**54.3**	**52.7**	23.8	1.3	4.3	**45.3**
DT I	**54.2**	**52.5**				
DT J	**51.8**	**50.3**	23.8	0.9	7.5	39.2
DT K	**57.0**	**55.3**	23.8	40	43.9	**53.0**
DT L	**43.9**	**42.6**	30.2	2.1	26.2	35.2
DT M	**81.4**	**78.9**	30.2	3.0	4.8	**73.0**
DT N	27.6	26.8				
DT O	**48.9**	**47.4**	32.1	8.0	12.8	**44.9**
DT P	38.8	37.6				
DT Q	**45.2**	**43.9**				

Site ID	*Annual mean – raw data* [c]	*Annual mean – bias adjusted* [c]	*Local Annual mean – background*	*Distance of measurement from kerb of nearest road (m)*	*Distance of receptor from kerb (m)*	*Annual mean – distance corrected*
DT R	**56.1**	**54.5**	24.7	3.2	16.8	**41.5**
DT S	**57.2**	**55.5**				
DT T	**44.6**	**43.3**	19.8	0.6	6.6	33.0
DT U	37.2	36.1				
DT V	33.8	32.8				
DT W	36.9	35.8				