London Borough of Sutton Air Quality Annual Status Report for 2023

Date of publication: August 2024

This report provides a detailed overview of air quality in London Borough of Sutton during 2023. It has been produced to meet the requirements of the London Local Air Quality Management (LLAQM) statutory process[1].

Contact details:

Nicole Asante
Air Quality Officer

Regulatory Services
Kingston & Sutton Shared Environment Service

London Borough of Sutton,
Civic Centre.
St Nicholas Way,
Sutton SM1 1EA

Email: environmentalhealth@sutton.gov.uk
Telephone - 020 8770 5000

[1] LLAQM Policy and Technical Guidance 2019 (LLAQM.TG(19))

Contents

Tables

Figures

Abbreviations

Abbreviation	Description
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQN	Air Quality Neutral
AQO	Air Quality Objective
AQP	Air Quality Positive
BEB	Buildings Emission Benchmark
CAB	Cleaner Air Borough
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 and International Standards, Objectives and Guidelines

Pollutant	Standard / Objective / Guideline	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
Nitrogen dioxide (NO_2)	40 µg m^{-3}	Annual mean	31 Dec 2005
Nitrogen dioxide (NO_2)	WHO AQG[2]: 10 µg m^{-3}	Annual mean	
Particles (PM_{10})	50 µg m^{-3} not to be exceeded more than 35 times a year	24-hour mean	31 Dec 2004
Particles (PM_{10})	WHO AQG[2]: 45 µg m^{-3} not to be exceeded more than 3-4 times a year	24-hour mean	
Particles (PM_{10})	40 µg m^{-3}	Annual mean	31 Dec 2004
Particles (PM_{10})	WHO AQG[2]: 15 µg m^{-3}	Annual mean	
Particles ($PM_{2.5}$)	20 µg m^{-3}	Annual mean	2020
Particles ($PM_{2.5}$)	London Mayoral Objective[3]: 10 µg m^{-3}	Annual mean	2030
Particles ($PM_{2.5}$)	WHO AQG[2]: 5 µg m^{-3}	Annual mean	
Particles ($PM_{2.5}$)	Target of 15% reduction in concentration at urban background locations	3-year mean	Between 2010 and 2021
Particles ($PM_{2.5}$)	WHO AQG[2]: 15 µg m^{-3}	24-hour mean	
Sulphur dioxide (SO_2)	266 µg m^{-3} not to be exceeded more than 35 times a year	15-minute mean	31 Dec 2005
Sulphur dioxide (SO_2)	350 µg m^{-3} not to be exceeded more than 24 times a year	1-hour mean	31 Dec 2004
Sulphur dioxide (SO_2)	125 µg m^{-3} mot to be exceeded more than 3 times a year	24-hour mean	31 Dec 2004
Sulphur dioxide (SO_2)	WHO AQG[2]: 40 µg m^{-3} not to be exceeded more than 3-4 times a year	24-hour mean	

Notes:

(1) Date by which to be achieved by and maintained thereafter

(2) 2021 World Health Organisation Air Quality Guidelines

(3) London Mayoral Objective

1. Air Quality Monitoring

1.1 Locations

Table B. Details of Automatic Monitoring Sites for 2023

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
ST4	Wallington	Kerbside	528925	163804	NO_2, PM_{10}	Yes	Chemiluminescent; FDMS	5	0.8	1.5
ST5	Beddington Lane North	Industrial	529400	167224	NO_2, PM_{10}, $PM_{2.5}$	Yes	Chemiluminescent; FDMS	6	4	1.5
ST6	Worcester Park	Kerbside	522557	165787	NO_2, PM_{10}	Yes	Chemiluminescent; FDMS	2	1.3	1.5
ST8 (3)	Beddington Lane	Industrial	529781	166597	NO_2, PM_{10}	Yes	Chemiluminescent; FDMS	330	N/A	1.5
ST9 (4)	Beddington Village	Roadside	530124	165223	NO_2, PM_{10}	Yes	Chemiluminescent; FDMS	15	5	1.5

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable

(3) Site ST8 was decommissioned and relocated 16th October 2020

(4) Site ST9 was relocated and installed 16th October 2020

Table C. Details of Non-Automatic Monitoring Sites for 2023

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube Co-located with a Continuous Analyser	Tube Height (m)
ST21	Glastonbury Road	Urban Background	525567	166291	NO_2	In AQMA	6.0	2.0	No	2.0
ST22	Dorset Road, Belmont	Roadside	525063	162474	NO_2	In AQMA	12.0	2.0	No	2.0
ST23	Sandy Lane South	Roadside	529734	163868	NO_2	In AQMA	5.0	2.0	No	2.0
ST24	Derry Road	Roadside	530130	165404	NO_2	In AQMA	7.0	2.0	No	2.0
ST25	Staines Avenue	Roadside	523874	165683	NO_2	In AQMA	15.0	2.0	No	2.0
ST26	West Street	Roadside	527683	164663	NO_2	In AQMA	2.0	2.0	No	2.0
ST07	Hackbridge Primary	Urban Background	528401	166038	NO_2	In AQMA	0.0	56.0	No	2.0
ST08	Victor Seymour	Urban Background	527786	165021	NO_2	In AQMA	0.0	33.0	No	2.0
ST29	Park Lane	Roadside	528339	164615	NO_2	In AQMA	2.0	6.0	No	2.0
ST10	Muschamp Priory	Urban Background	527284	165778	NO_2	In AQMA	0.0	20.0	No	2.0

ST11	Sherwood Park School	Urban Background	529835	165041	NO_2	In AQMA	0.0	35.0	No	2.0
ST32	Alcorn Close	Urban Background	525184	165845	NO_2	In AQMA	40.0	25.0	No	2.0
ST33	Carshalton Road	Roadside	526021	164025	NO_2	In AQMA	3.0	1.0	No	2.0
ST34	Oakhill Road	Roadside	525772	165118	NO_2	In AQMA	10.0	1.0	No	2.0
ST35	Gander Green Lane	Roadside	524782	165167	NO_2	In AQMA	10.0	1.0	No	2.0
ST36	Croydon Road Beddington	Roadside	530645	164839	NO_2	In AQMA	0.0	11.0	No	2.0
ST27	Haddon Road St Nicholas Way	Roadside	525691	164599	NO_2	In AQMA	11.0	2.0	No	2.0
ST38	Brighton Road Sutton	Roadside	526046	163636	NO_2	In AQMA	2.0	10.0	No	2.0
ST39	Rose Hill Roundabout	Roadside	526019	166469	NO_2	In AQMA	6.0	2.0	No	2.0
ST40	38 High Street Cheam	Roadside	524357	163599	NO_2	In AQMA	2.0	1.0	No	2.0
ST42	Royston Park	Urban Background	526605	165364	NO_2	In AQMA	20.0	95.0	No	2.0
ST43	Chiltern Road	Roadside	525883	162518	NO_2	In AQMA	13.0	1.0	No	2.0

H1	Hackbridge Road	Roadside	528359	166067	NO_2	In AQMA	0.5	17.0	No	2.0
H2	Clover Way	Urban Background	528437	166275	NO_2	In AQMA	0.0	25.0	No	2.0
H3	57 London Road	Roadside	528637	166021	NO_2	In AQMA	0.0	5.0	No	2.0
BL	Beddington Lane	Roadside	529400	167235	NO_2	In AQMA	15.0	2.0	No	2.0

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

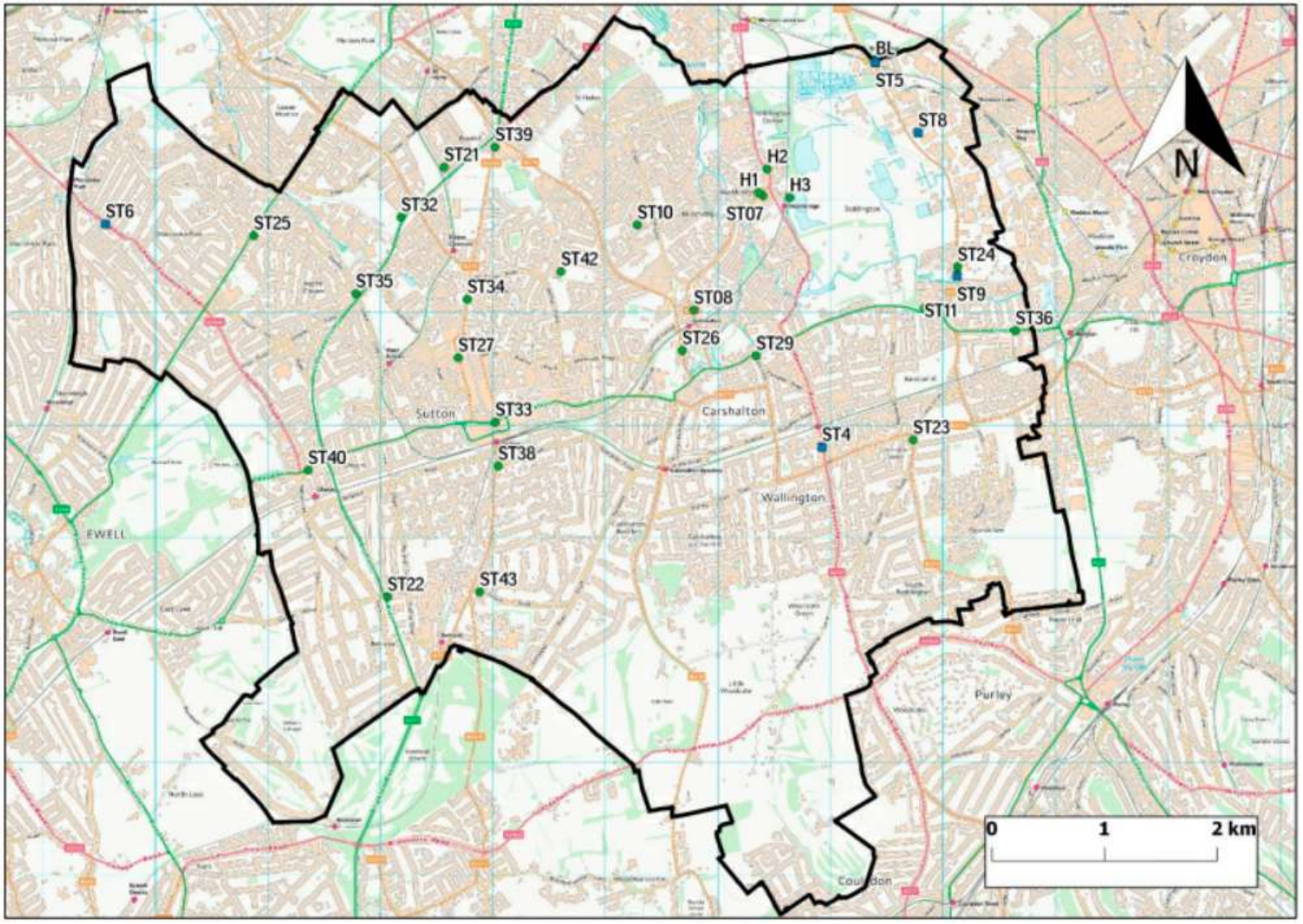

Figure 1. Air Quality Monitoring Locations in the London Borough of Sutton

1.2 Comparison of Monitoring Results with AQOs

Concentration values are those at the location of the monitoring site (bias adjusted and annualised, as required), not those following any fall-off with distance correction.

Table D. Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg m^{-3})

Site ID	Site type	Valid data capture for monitoring period % [a]	Valid data capture 2023 % [b]	2017	2018	2019	2020	2021	2022	2023
ST4 Wallington	Kerbside	99	99	**53.0**	**47.0**	**45.9**	**40.8**	**43.3**	**44.2 (32.7)**	**44.8 (32.9)**
ST5 Beddington Lane North	Industrial	99	99	32.0	29.0	29.4	22.8	21.9	24.4	20.5
ST6 Worcester Park	Kerbside	100	100	**52.0**	**52.0**	**51.1**	39.4 (34.9)	**43.4**	39.9	30.8
ST8 [1] Beddington Lane	Industrial	-	-	25.0	25.0	25.1	19.1 *Ann	-	-	-
ST9 [2] Beddington Village	Roadside	99	99	-	-	-	21.6 **	24.3	22.7	19.8

Notes:

The annual mean concentrations are presented as µg m^{-3}.

Exceedances 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**.

NO_2 annual data has been distance adjusted for data within 10% of the NO_2 annual mean objective. The adjusted results are shown in brackets.

All means have been “annualised” in accordance with LLAQM Technical Guidance if valid data capture for the calendar year is less than 75% and greater than 25%. The unadjusted results are shown in asterisk and brackets. Where data capture was too low for annualisation, double asterisks were used.

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(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%).

(1) Site ST8 was decommissioned and relocated 16th October 2020

(2) Site ST9 was relocated and installed 16th October 2020

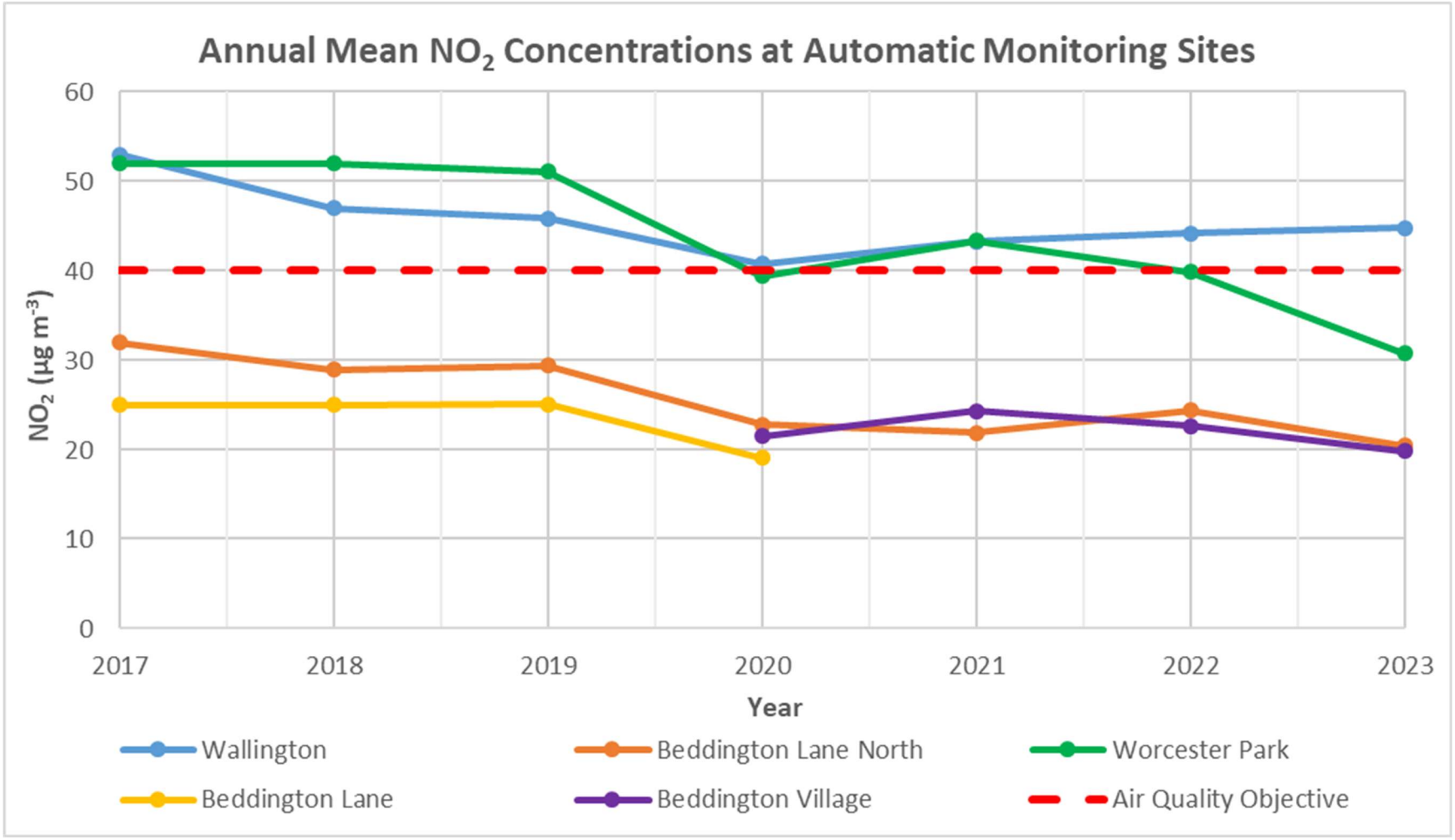

Figure 2. Annual Mean NO_2 Concentration at Automatic Monitoring Sites

Discussion

In 2023, the annual mean NO_2 concentrations at automatic monitoring sites in the London Borough of Sutton have fallen, with the exception of site Wallington (ST4). The NO_2 concentration at ST4 has shown a slight increase, from 44.2 µg m^{-3} (2022) to 44.8 µg m^{-3} (2023) meaning site ST4 was the only site in the borough to exceed the air quality objective.

Over the last 7 years, all monitoring sites have shown a fall in annual mean NO_2 concentrations. Initially, between 2017 and 2019, NO_2 concentrations were gradually falling. In 2020, there were significant concentration falls, followed by slight concentration increases in 2021. Since 2021, automatic monitoring sites have once again shown the gradual fall in annual mean NO_2 concentration. This trend is predicted to be affected by COVID restrictions, however, the annual mean NO_2 concentrations for all sites have never reached their pre-2020 levels. The general fall in NO_2 concentrations post-2020 may be attributed to many factors including the decreased use of high emission vehicles, improved traffic systems, and post-COVID hybrid working.

In late August 2023, the Ultra-Low Emission Zone (ULEZ) was expanded to include most of the Sutton borough. The effects of this expansion cannot be accurately predicted or examined in this report, given the relatively short length of time the new zone has been in place, however impacts will likely be shown in the 2024 Annual Status Report. The sites Wallington (ST4) and Worcester Park (ST6) have consistently had the highest annual mean NO_2 concentrations in the London Borough of Sutton, the difference is likely due to both sites being located on congested roads.

The site Wallington (ST4) had also shown a large fall in NO_2 concentrations in 2020, however, since then, concentrations have only increased. One of the predicted reasons for this increase is the site's close proximity to Wallington Town Centre bus stop (Stop K) and options for the relocation of this site to a more representative location are being considered.

The site ST4 was distance adjusted as the NO_2 annual mean objective was exceeded. The monitored (unadjusted) concentration was 44.8 µg m^{-3} and the distance adjusted concentration was 32.9 µg m^{-3}. This showed that the predicted concentration at receptor was 10% below of the NO_2 annual mean objective. The calculations for this can be found in the Appendix under A.3 and Table Q.

Table E. Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg m^{-3})

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [(a)]	Valid Data Capture 2023 (%) [(b)]	2017	2018	2019	2020	2021	2022	2023
ST21	525567	166291	Urban Background	92	92	27.2	29.4	26.8	20.6	21.5	20.2	17.7
ST22	525063	162474	Roadside	92	92	38.5	36.1	33.5	26.7	24.0	25.0	20.4
ST23	529734	163868	Roadside	100	100	33.6	37.0	34.9	27.0	28.1	27.1	22.3
ST24	530130	165404	Roadside	85	85	26.3	28.9	25.7	19.2	21.9	20.3	17.0
ST25	523874	165683	Roadside	92	92	32.6	31.6	29.7	23.9	25.2	22.6	19.1
ST26	527683	164663	Roadside	100	100	38.5	38.4	36.0	25.6	29.6	26.1	23.3
ST07	528401	166038	Urban Background	100	100	22.0	22.4	20.5	17.1	16.6	16.1	15.2
ST08	527786	165021	Urban Background	100	100	26.3	24.0	23.2	17.4	12.3	17.4	15.1
ST29	528339	164615	Roadside	100	100	39.5	38.9	35.7	29.6	33.5	34.6	32.9
ST10	527284	165778	Urban Background	100	100	21.8	22.7	20.1	14.6	16.2	14.6	12.5
ST11	529835	165041	Urban Background	90	90	24.5	24.5	22.6	18.6	19.5	19.5	16.6

ST32	525184	165845	Urban Background	100	100	22.4	24.3	20.0	16.7	19.3	18.2	14.8
ST33	526021	164025	Roadside	100	100	33.2	34.5	34.2	27.7	30.2	30.4	26.5
ST34	525772	165118	Roadside	100	100	**42.3**	38.9	**40.7**	32.9	33.3	32.1	29.1
ST35	524782	165167	Roadside	100	100	30.5	31.1	28.7	22.0	24.0	22.0	18.2
ST36	530645	164839	Roadside	100	100	28.8	29.3	27.4	22.7	25.5	23.1	20.0
ST27	525691	164599	Roadside	83	83	36.1	35.6	34.7	28.1	29.1	30.0	21.3
ST38	526046	163636	Roadside	100	100	34.6	35.1	33.2	24.7	29.1	27.5	23.1
ST39	526019	166469	Roadside	100	100	38.9	**40.7**	**41.8**	**49.5**	**41.1**	**40.7 (33.0)**	34.0
ST40	524357	163599	Roadside	65	65	39.9	**41.1**	**42.1**	31.0	33.0	34.3 (34.86) *Ann	29.4 (29.2) *Ann
ST42	526605	165364	Urban Background	85	85	23.1	19.9	17.4	14.1	17.1	15.1	11.5
ST43	525883	162518	Roadside	100	100			28.4	22.2	23.9	23.9	20.0
H1	528359	166067	Roadside	100	100	29.9	30.0	32.6	24.2	27.0	27.5	24.7

H2	528437	166275	Urban Background	100	100	25.4	26.8	24.3	18.1	21.9	19.1	16.2
H3	528637	166021	Roadside	100	100	**40.3**	**44.1**	**44.5**	36.1	33.0	33.6	31.4
BL	529400	167235	Roadside	85	85	32.2	29.0	29.1	26.8	24.6	31.1	26.3

Notes:

The annual mean concentrations are presented as µg m^{-3}.

Exceedances of the NO_2 annual mean objective of 40 µg m^{-3} are shown in **bold**.

NO_2 annual means exceeding 60 µg m^{-3}, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

NO_2 annual data has been distance adjusted for data within 10% of the NO_2 annual mean objective. The adjusted results are shown in brackets.

All means have been "annualised" in accordance with LLAQM Technical Guidance if valid data capture for the calendar year is less than 75% and greater than 25%. The unadjusted results are shown in asterisk and brackets. Where data capture was too low for annualisation, double asterisks were used.

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(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 6 months, the maximum data capture for the full calendar year is 50%)

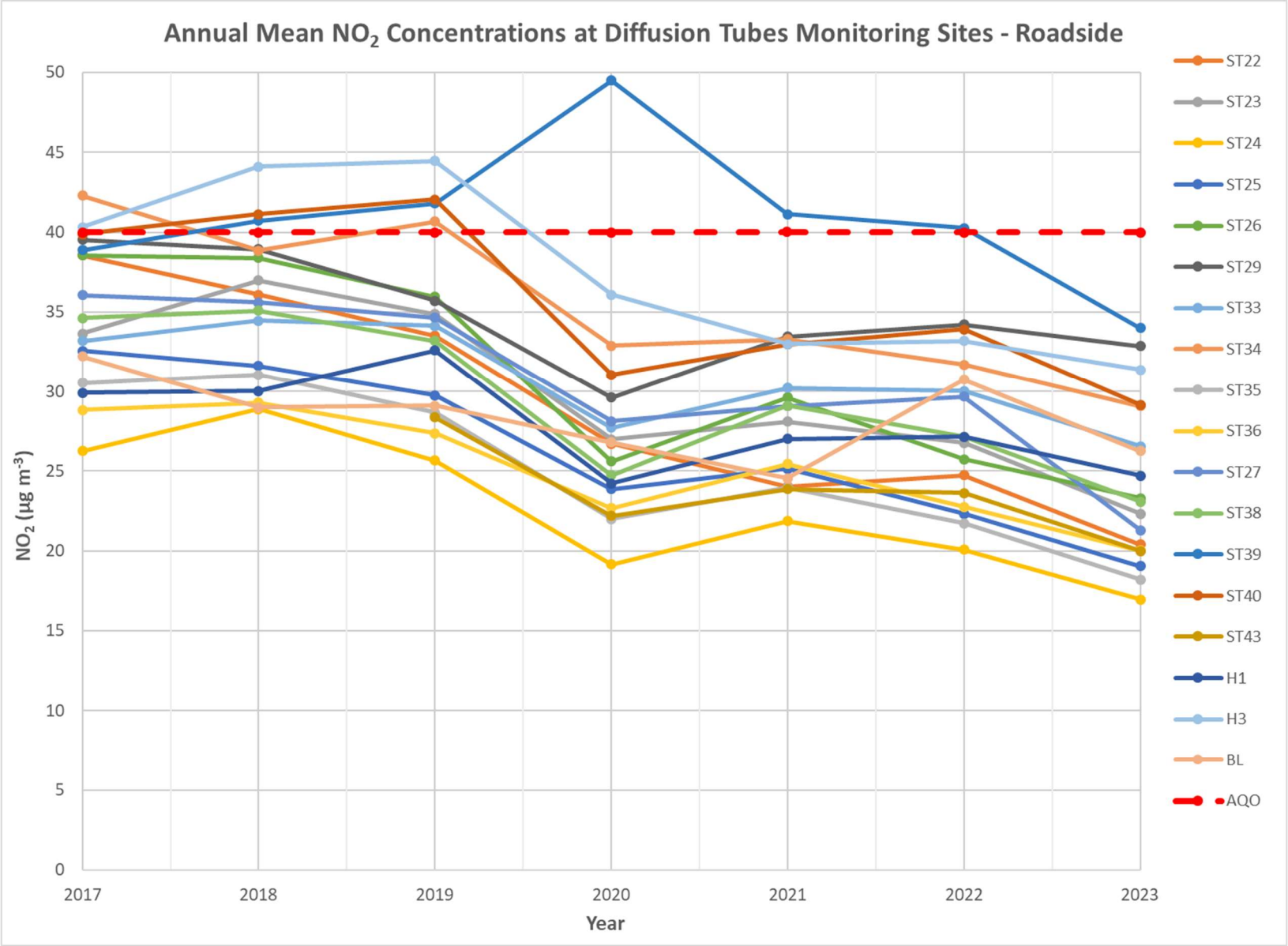

Figure 3. Annual Mean NO_2 Concentration at Diffusion Tube Monitoring Sites at Roadside Sites

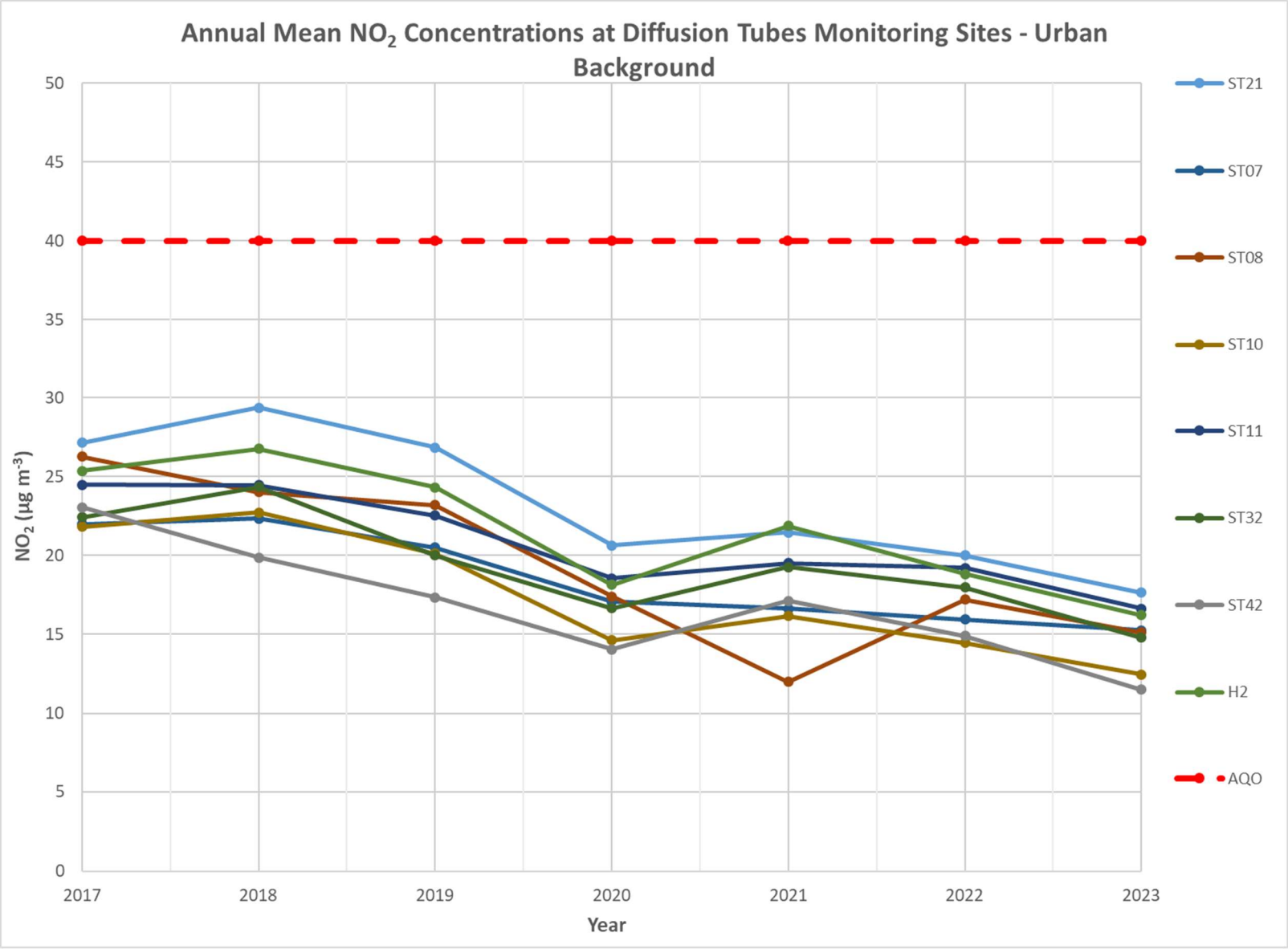

Figure 4. Annual Mean NO_2 Concentration at Diffusion Tube Monitoring Sites at Urban Background Sites

Discussion

General Overview

In 2023, the NO_2 annual mean air quality objective was met across all diffusion tube sites in the London Borough of Sutton as all NO_2 concentrations were under 40 µg m^{-3}. In 2018, three diffusion tube sites in the borough exceeded the NO_2 annual mean air quality objective, these were ST39 (Rosehill Roundabout), ST40 (High Street Cheam), and H3 (London Road Hackbridge). In 2020, ST39 was the only exceeding site, and remained the only one until 2023.

In 2023, the data for site ST40 (High Street Cheam) was annualised as the valid data capture was 65.4%, the annualised annual mean was 29.4 µg m^{-3}, while the raw unadjusted annual mean was 29.2 µg m^{-3}, the calculations for this can be found in the Appendix under A.3 and Table P.

The annual mean NO_2 concentration at diffusion tube sites over the 7 years showed a general fall in concentrations. For most, the annual mean NO_2 concentrations initially showed stability between 2017 and 2019. In 2020, all sites except ST39 (Rosehill Roundabout) showed a sharp fall in concentrations, as expected with COVID restrictions. Most sites then showed slight annual mean concentration recoveries in 2021, followed by a concentrations stability in 2022. Finally, in 2023, all diffusion tube sites showed a fall in annual mean NO_2 concentration. For most sites, following the sharp fall in annual mean concentrations in 2020, pre-2020 NO_2 concentration levels have not been reached. There are various likely causes for the continued fall in NO_2 concentrations since 2020, including, the decreased use of high emission vehicles by the general public, traffic improvements, ULEZ expansion, and post-COVID hybrid working.

In late August 2023, the London Ultra Low Emission Zone (ULEZ) was expanded to include the majority of the London Borough of Sutton. The effects of this expansion cannot be accurately predicted or examined in this report, given the relatively short length of time the new zone has been in place, however impacts will likely be shown in the 2024 Annual Status Report.

Rosehill Roundabout

The site ST39 (Rosehill Roundabout) in 2017, had an annual mean NO_2 concentration of 38.9 µg m^{-3}, below the air quality objective. This was followed by slight increases in concentration between 2018 (40.7 µg m^{-3}) and 2019 (41.8 µg m^{-3}), during which the objective was exceeded. In 2020, the site reached its highest annual mean NO_2 concentration at 49.5 µg m^{-3}, followed by a sharp fall to 41.1 µg m^{-3} in 2021. Then, a slight fall to 40.3 µg m^{-3} in 2022, and finally, another sharp fall in 2023 to 34.0 µg m^{-3}.

Rosehill Roundabout connects to the highly congested A297 road linking many parts of the Sutton borough (and other more southern boroughs) to central London. The roundabout is near to St Helier's Hospital and shops on Wrythe Lane. This may be an explanation for the high annual mean NO_2 concentrations. In 2020, while other sites across the borough experienced sharp falls in NO_2 concentrations due to COVID restrictions, site ST39 showed the opposite. This may be due to its proximity to the hospital where many key workers would commute to, its proximity to essential shops, as well as the sites being located on a road connecting south London to central London. The rise in annual mean NO_2 concentrations in 2021 showed the return to usual levels with the ease of some COVID restrictions. The second concentration fall in 2023 is in line with the rest of the borough could be attributed factors including the decreased use of high emission vehicles, post-COVID hybrid working, traffic improvements, and ULEZ expansion. However, it should be noted that the fall in annual mean NO_2 concentrations for ST39 in 2023 was the most significant in the borough, the reason for such a difference in fall remains unclear.

Hackbridge

The Hackbridge site H3 (London Road) had previously had the highest annual mean NO_2 concentrations in the London Borough of Sutton between the years 2017 and 2019, and in 2023 had the third highest concentration. Between 2017 and 2019, site H3 had

shown increasing NO_2 concentrations, reaching its highest in 2019 at 44.5 µg m^{-3}. In 2020, the site had shown a sharp fall in annual mean concentrations to 36.1 µg m^{-3}, and has since shown a gradual increase in NO_2 concentration.

Other Hackbridge sites, H1 (Hackbridge Road) and H2 (Clover Way) had lower annual mean NO_2 concentrations, in the range of 24.7 µg m^{-3} - 32.6 µg m^{-3} (H1) and 16.2 µg m^{-3} - 26.8 µg m^{-3} (H2). The changes in NO_2 concentrations at these sites were similar to other diffusion tube sites in the borough.

Cheam

The Cheam High Street site ST40 had previously had the second highest annual mean NO_2 concentrations in the borough between 2018 and 2019, and in 2023 had the fourth highest concentration. Similar to site H3, between 2017 and 2019, site ST40 also had increasing NO_2 concentrations, reaching its highest level in 2019 at 42.1 µg m^{-3}. Additionally, ST40 had exceeded the NO_2 annual mean air quality objective in 2018 and 2019. In 2020, the site had shown a sharp fall in concentration to 31.0 µg m^{-3}, before making minor increases in 2021 and 2022 to reach 33.9 µg m^{-3} (2022). In 2023, the site had shown another fall in annual mean NO_2 concentrations to 29.4 µg m^{-3}.

The site ST40 is a roadside diffusion tube located on the congested A232 that connects highly populated areas across south London and high traffic volumes is likely the reason for the high annual mean NO_2 concentration. The sharp fall in concentration in 2020 is likely attributed to COVID restrictions, and this fall was in line with other roadside diffusion tube sites. The site has never again reached its pre-2020 annual mean NO_2 concentrations even with the slight increases, once again, this is in line with other diffusion tube sites in the borough.

It is important to note that site ST40 has had low data capture over 2022 and 2023, and both data sets were annualised. This may affect the accuracy of the data. The unadjusted data for both years is shown in brackets in Table E above. Options are being explored on how to improve securing the diffusion tube to ensure higher data capture rates.

Table F. NO_2 Automatic Monitoring Results: Comparison with 1-hour Mean Objective, Number of 1-Hour Means > 200 µg m^{-3}

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2023 % [b]	2017	2018	2019	2020	2021	2022	2023
ST4 Wallington	99	99	1	0	0	0	1	0	3
ST5 Beddington Lane North	99	99	0	0	0	0	0	0	0
ST6 Worcester Park	100	100	11	7	9	0	0	0	0
ST9 Beddington Village	99	99	-	-	-	0 (72.1)	0	0	0

Notes:

Results are presented as the number of 1-hour periods where concentrations greater than 200 µg m^{-3} have been recorded.

Exceedance of the NO_2 short term AQO of 200 µg m^{-3} over the permitted 18 hours per year are shown in **bold**.

If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

(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%)

Discussion

The NO_2 1-hour mean objective was met across all automatic monitoring sites in London Borough of Sutton, with Beddington Lane North (ST5), Worcester Park (ST6), and Beddington Village (ST9) showing that an exceedance of 200 µg m^{-3} was never reached. However, the Wallington (ST4) site showed 3 exceedances across in 2023, the highest number for this site across 7 years. As discussed in the automatic annual mean NO_2 concentration section, the predicted cause of such high annual mean NO_2 and 1-hour mean NO_2 at site ST4 is the location of a bus stop.

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

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2023 % [b]	2017	2018	2019	2020	2021	2022	2023
ST4 Wallington	97	97	25	23	21	18.7	18.0	20.2	18.9
ST5 Beddington Lane North	99	99	31	22	22	21.4	17.6	20.2	17.9
ST6 Worcester Park	90	90	20	20	21 *Ann	15.3 *Ann	14.8	18.2	14.7
ST8 [1] Beddington Lane	-	-	23	22	17	14.5 *Ann	-	-	-
ST9 [2] Beddington Village	55	55	-	-	-	14.5 **	17.3	19.4	18.2 (17.6) *Ann

Notes:

The annual mean concentrations are presented as µg m^{-3}.

Exceedances of the PM_{10} annual mean AQO of 40 µg m^{-3} are shown in **bold**.

All means have been "annualised" in accordance with LLAQM Technical Guidance if valid data capture for the calendar year is less than 75% and greater than 33%. The unadjusted results are shown in asterisk and brackets. Where data capture was too low for annualisation, double asterisks were used.

(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%).

(1) Site ST8 was decommissioned and relocated 16th October 2020 (2) Site ST9 was relocated and installed 16th October 2020

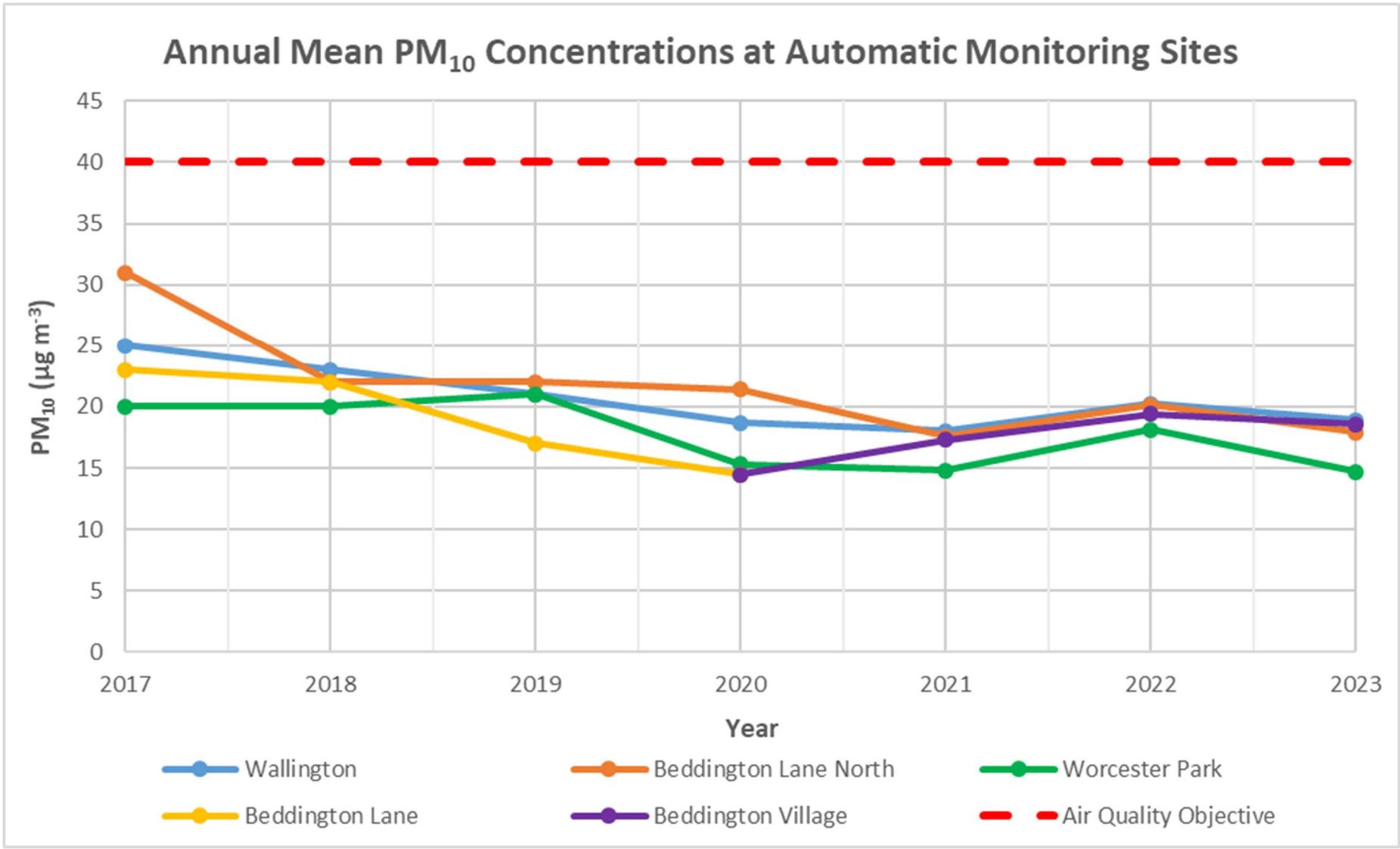

Figure 5. Annual Mean PM_{10} Concentration at Automatic Monitoring Sites

Discussion

The main source of PM_{10} is dust from construction sites, wood burning, car tyres, brake and road wear, dust resuspension and various other activities in industrial sites. In 2023, the annual mean PM_{10} air quality objective was met across all four monitoring sites. Though, this was expected as the objective had always been met across the 7 year trend.

Between 2017 and 2019, annual mean PM_{10} concentrations for most sites were stable between 20 and 25 µg m^{-3}. In 2020, all sites showed some fall in PM_{10} concentrations, with Worcester Park and Beddington Lane showing more significant falls. In 2021, the annual mean concentrations were generally uniform, followed by increased PM_{10} concentrations across all sites in 2022. Finally, in 2023, most sites showed falls in annual mean PM_{10} concentrations.

The fall in annual mean PM_{10} concentrations between 2020 and 2021 may be attributed to COVID-restrictions. However, even as PM_{10} concentrations made slight recoveries in 2022, concentrations have never quite reached their pre-2020 levels. This may be a result of post-COVID hybrid working, and changes in industrial work carried out in the borough. It should also be noted that overall, this drop in annual mean PM_{10} concentrations is small.

The Beddington industrial area has two nearby automatic PM_{10} monitoring sites, Beddington Lane North and Beddington Village. Beddington Lane North had initially shown a significant fall in annual mean PM_{10} concentrations in 2018, from 31 µg m^{-3} (2017) to 22 µg m^{-3} (2018), since then, concentration remained between 17.6 to 22 µg m^{-3}. The site Beddington Village was set up in late 2020, and since 2021 the annual mean PM_{10} concentrations are between 17.3 to 19.4 µg m^{-3}. Both sites have consistently met the annual mean PM_{10} air quality objective and show PM_{10} levels similar to other (non-industrial) sites in the borough.

Site ST9 had annual mean PM_{10} data capture of 55%, and was annualised using urban background sites Honor Oak (Lewisham), Streatham Green (Lambeth), and Putney (Wandsworth). Persistent technical failures in the monitor caused the loss of data for four

periods each of several weeks over the course of the year. The annualised annual mean PM_{10} concentration was 18.2 µg m^{-3} and the unadjusted was 17.6 µg m^{-3}. The calculations can be found in the Appendix under section A.3 and Table P.

Table H. PM_{10} Automatic Monitoring Results: Comparison with 24-Hour Mean Objective, Number of PM_{10} 24-Hour Means > 50 µg m^{-3}

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2023 % [b]	2017	2018	2019	2020	2021	2022	2023
ST4 Wallington	97	97	6	4	7	1	0	1	2
ST5 Beddington Lane North	99	99	21	2	13	8	1	1	2
ST6 Worcester Park	90	90	2	7	10 (44)	1 (22.6)	0	2	2
ST8 [1] Beddington Lane	-	-	5	2	4	0 (23.3)	-	-	-
ST9 [2] Beddington Village	55	55	-	-	-	1 (26.2)	0 (28)	1	2 (30)

Notes:

Exceedances of the PM_{10} 24-hour mean objective (50 µg m^{-3} over the permitted 35 days per year) are shown in **bold.**

Where the period of valid data is less than 85% of a full year, the 90.4th percentile is provided in brackets.

(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%).

(1) Site ST8 was decommissioned and relocated 16th October 2020

(2) Site ST9 was relocated and installed 16th October 2020

Discussion

In 2023, all automatic monitoring sites in London Borough of Sutton met the PM_{10} 24-hour mean objective as no site had an exceeded 50 µg m^{-3} for over 35 days. Over the last 7 years, the number of exceedances have fallen, with the greatest fall occurring in 2020, as predicted with COVID restrictions. However, since 2020, the number of exceedances have never again reached their pre-2020 numbers.

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

Site ID	Valid data capture for monitoring period % [(a)]	Valid data capture 2023 % [(b)]	2017	2018	2019	2020	2021	2022	2023
ST5 Beddington Lane North	99	99	15.2 *Ann	12	11.7	9.4	10	10.2	8.7

Notes:

The annual mean concentrations are presented as µg m^{-3}.

Exceedances of the $PM_{2.5}$ annual mean AQO of 20 µg m^{-3} are shown in **bold**.

All means have been "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75% and more than 25%. The unadjusted results are shown in asterisk and brackets. Where data capture was too low for annualisation, double asterisks were used.

(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%).

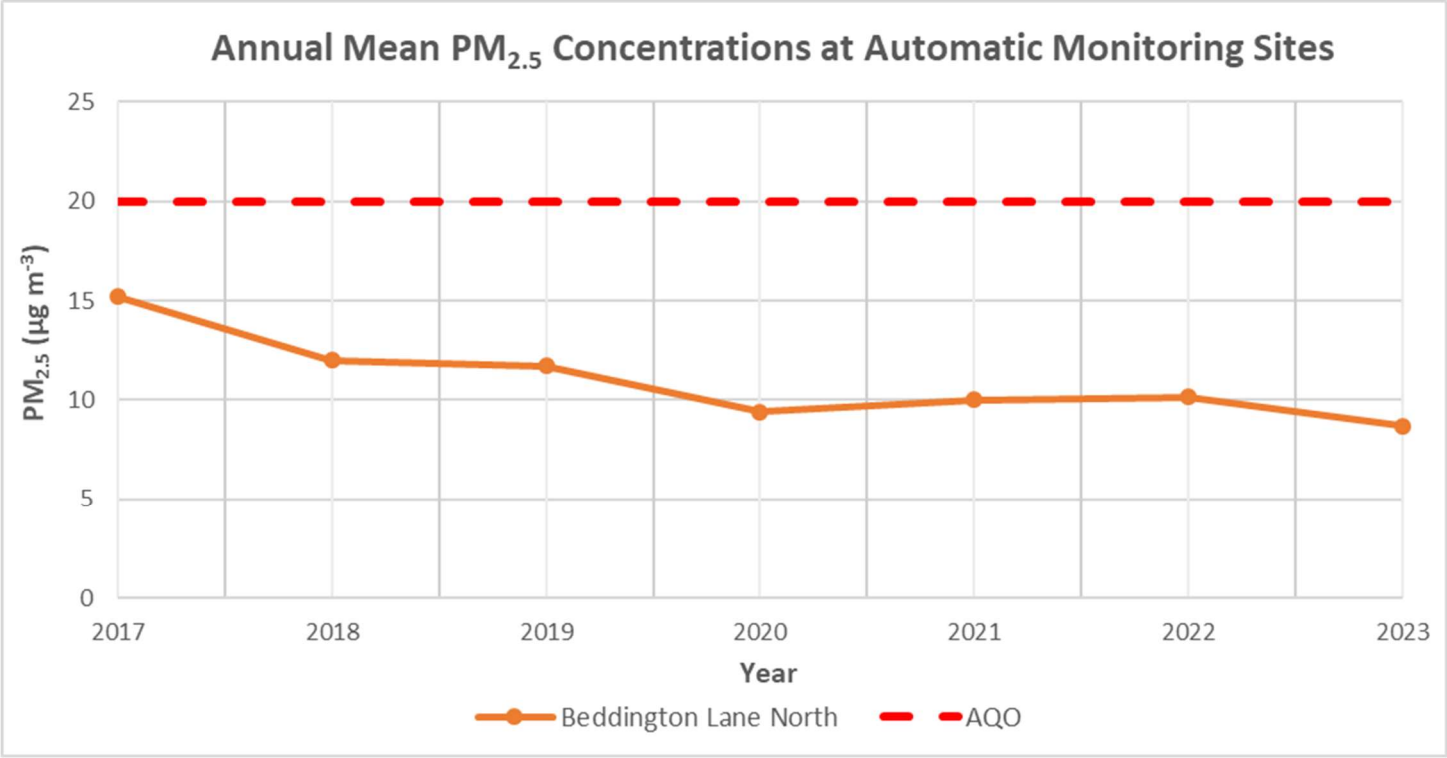

Figure 6. Annual Mean $PM_{2.5}$ Concentration at Automatic Monitoring Site

Discussion

In 2023, the site ST5 (Beddington Lane North) had met the annual mean $PM_{2.5}$ air quality objective as it has done for the last 7 years. Over years, the annual mean $PM_{2.5}$ concentrations have shown gradual falls, with the greatest fall occurring in 2020. This was followed by consistent concentration between 2020 and 2022. In 2023, the annual mean $PM_{2.5}$ concentration fell to its lowest level at 8.7 µg m^{-3}.

2. Action to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) within 12 months. The AQAP should specify how air quality targets will be achieved and maintained, and provide dates by which measures will be carried out.

A summary of AQMAs declared by London Borough of Sutton can be found in

Table J. The table presents a description of the one borough wide AQMA that is currently designated within London Borough of Sutton. Appendix C provides maps of AQMA and also the air quality monitoring locations in relation to the AQMA. The air quality objectives pertinent to the current AQMA designation are as follows:

- Particulate Matter PM_{10} – Annual Mean and 24-Hour Mean
- Nitrogen dioxide NO_2 – Annual Mean and 1-Hour Mean

Table J. Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Number of Years Compliant with Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
Sutton AQMA	01/06/2013	NO_2 (annual mean,1 hour mean) PM_{10} (annual mean, 24 hour mean)	Whole Borough	No	NO_2 - annual mean - 69.6 µg m^{-3} (ST4) NO_2 1 hour mean - 69 exceedances (ST4)	None ST4 NO_2 annual mean was 44.8 µg m^{-3}. The calculated distance	1	London Borough of Sutton AQAP 2019-2023 (2019)	https://www.sutton.gov.uk/documents/20124/218181/Sutton_AQAP_2019__2023.pdf/f4ba890f-4c20-bc95-4bf8-37ed4595a6db

					PM_{10} - annual mean - 27.7 µg m^{-3} (ST6) PM_{10} - 24 hour mean - 20 exceedances (ST6)	adjusted annual mean was 32.9 µg m^{-3}			

2.2 Air Quality Action Plan Progress

Table K provides a brief summary of London Borough of Sutton progress against the Air Quality Action Plan, showing progress made this year.

Table K. Delivery of Air Quality Action Plan Measures

Measure	LLAQM Action Matrix Theme	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
1	Cleaner Transport	Discourage unnecessary engine idling.	We continue to investigate reports of vehicle idling. In 2023, numerous sites were identified for anti-idling signage, over 40 anti-idling signs were installed.
2	Cleaner Transport	Ensure that Transport and air quality policies and projects are integrated.	3 additional permanent school streets were introduced in 2023. Neighbourhood placemaking schemes in Butter Hill and Worcester Park planned for 2023 were delayed and are now planned for delivery in 2024. LIP programme delivered 20mph schemes and cycle improvements in St Helier

Measure	LLAQM Action Matrix Theme	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
3	Cleaner Transport	Implement measures to control speeds and smooth traffic flows in residential areas where pedestrians and cyclists are to be given greater priority.	Delivered a number of 20mph schemes and made preparations for the delivery of 3 School Streets in early 2024. Completion of schemes on the St Helier section of the Morden to Sutton cycle ways scheme. Deliver a number of 20mph area-wide schemes, and initial work undertaken to develop a programme for further schemes in 2024/25.
4	Cleaner Transport	Encourage car sharing by promoting Car Clubs in order to reduce vehicle ownership and increase the proportion of electric, hydrogen and ultra-low emission vehicles within Car Clubs.	Development of new contract documents pending release to the market in 2024. New contract will include targets to introduce EV and hybrid vehicles within a two year time frame
5	Cleaner Transport	Support communities wishing to enact temporary road closures, encourage Play Streets and run campaigns to raise awareness of benefits of not using a private motor vehicle.	No Play Streets were sought in 2023.
6	Cleaner Transport	Offer residents free or discounted parking charges for zero emission vehicles (e.g. electric) within Council-run car parks and free or discounted parking permits for zero emission vehicles	Concessions for Electric Vehicles in car parks remain unchanged. Resident permits for fully Electric Vehicles attract the lowest cost of all resident permits.
7	Cleaner Transport	Use parking policies to help reduce pollution emissions.	CO_2 based pricing for residents permits unchanged. School Streets continue to decrease traffic around schools

Measure	LLAQM Action Matrix Theme	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
9	Cleaner Transport	Review of road space allocation to identify opportunities for improving bus journey times, public transport options and the cycling experience while minimising impacts of emissions caused by congestion.	Working with TfL to investigate options for improved bus reliability in Worcester Park. Further investigations on Stafford Road, Sandy Lane South are being undertaken with TfL.
10	Cleaner Transport	Provision of infrastructure and support to encourage a modal switch to walking and cycling.	Delivered a number of 20mph schemes and made preparations for the delivery of 3 School Streets in early 2024. Completion of schemes on the St Helier section of the Morden to Sutton cycle ways scheme.
11	Cleaner Transport	Work with Transport for London and other relevant providers to improve public transport connections, availability for passengers and a cleaner fleet mix.	The Council lobbies for emission improvements to the bus fleet in and through Sutton at regular meetings with colleagues at TfL and welcomed the introduction of 80 new electric buses to routes serving destinations in Sutton during 2023.
12.1	Cleaner Transport	Promote awareness of Low Emission Zones and creation of local Low Emission Zones.	The expansion of ULEZ negated the need to progress with this action
12.2	Cleaner Transport	Introduce a Dockless electric bike hire scheme to encourage mode-shift amongst residents & commuters.	Concession contract renewed for 12 months from Sept. 2023. Since inception, 67,990 journeys have been made using Forest bikes, covering a total distance of 144,376.62 miles and avoiding 18.87 tons CO_2.
13	Delivery servicing and freight	Encourage existing contractors providing Council services to be members of the Fleet Operator Recognition Scheme and obtain Gold accreditation.	Corporate procurement process mandates that prospective suppliers follow the Council sustainability and social value strategies, which include this action's objective as required on a case-by-case basis.

Measure	LLAQM Action Matrix Theme	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
14	Delivery servicing and freight	Update local authority procurement policies to encourage contractors with fleets of more than 10 vehicles providing Council services to reduce emissions from their fleets and reduce pollution from logistics and servicing.	A new waste contract was awarded in 2023, with a mixed fuel fleet. Street cleansing will be serviced by Electric Vehicles, with refuse collections vehicles initially being diesel with the potential to use a HVO mix to be agreed upon on an annual basis (% of HVO mix used each year). .
15	Delivery servicing and freight	Retiming of freight deliveries to commercial centres.	Due to reduction in resource this action has been deferred until a later date
16	Delivery servicing and freight	Reduce emissions from deliveries through e.g. promotion of consolidation and/or Virtual Loading Bays with priority loading for ultra-low emission delivery vehicles.	Due to reduction in resource this action has been deferred until a later date
17	Borough fleet actions	Procurement policies to be developed to encourage new contractors providing Council services to only use vehicles that meet Euro VI emissions standards.	Updated the procurement advice notes to meet the new PA23 regulations.
18	Borough fleet actions	Increase the number of hydrogen, electric, hybrid, bio-methane and cleaner vehicles in the borough's fleet.	The Council purchased several new vehicles in 2023 including 5 electric vehicles. There was no budget to allow this to include Meals on Wheels fleet, but a shorter contract was issued to allow a review of this position in 2025.
19	Emissions from developments and buildings	Ensure emissions from construction and/or demolition are minimised.	Planning conditions relating to air quality are summarised in Table N. Officers continue to apply relevant air quality conditions when consulted on planning applications.

Measure	LLAQM Action Matrix Theme	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
20	Emissions from developments and buildings	Ensure enforcement of Non-Road Mobile Machinery (NRMM) air quality policies.	The use of our standard NRMM planning condition during 2023 is summarised in Table N. The Council continued taking part in the pan-London NRMM part project, funded by the MAQF.
21	Emissions from developments and buildings	Reduce emissions from Combined Heat & Power (CHP) including through enforcement of air quality policies on energy sources in new developments.	No planning applications were received during 2023 for proposed developments served by biomass boilers, and therefore no planning permissions were granted.
22	Emissions from developments and buildings	Enforce Air Quality Neutral policies.	Quantitative assessment of Sutton Council's performance against this action can be found in Table N of this report. Assessment of a developments performance against Air Quality Neutral policy is expected of any major development in the borough. Our air quality website clarifies this requirement for developers.
23	Emissions from developments and buildings	Ensure that Air Quality Positive and Healthy Streets approaches are incorporated within future master-planning and redevelopment areas.	Healthy streets/ liveable neighbourhood principles have been incorporated throughout two supplementary planning documents (SPD) adopted by the Council - the Sutton Public Realm Design Guide and the Borough Sustainable Transport Strategy. The review of the Local Plan i9s ongoing with further consideration being given to these principles
24	Emissions from developments and buildings	Ensure adequate, appropriate and well located green space and infrastructure is included in new developments.	Consideration of green space and infrastructure forms part of the planning consultation process, considered by the relevant services for all new developments.
25	Emissions from developments and buildings	Ensure that Smoke Control Areas are appropriately identified and fully promoted and enforced.	The consolidation of historic Smoke Control Orders was agreed and sealed in October 2023, there is a 6 month

Measure	LLAQM Action Matrix Theme	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
			delay between approval and implementation so the new orders will come in effect from April 2024. Action now complete.
26	Emissions from developments and buildings	Promote and deliver energy efficiency and energy supply retrofitting projects in workplaces and homes through retrofit programmes such as RE:NEW, RE:FIT and through borough carbon offset funds	Completed delivery of Social Housing Decarbonisation Fund (SHDF) Wave 1 to 49 Sutton Housing Partnership social housing properties. Survey and retrofit design for Sutton Housing Partnership social housing properties selected for delivery of SHDF Wave 2 commenced in 2023 Sutton low income homes also received energy efficiency measures such as external wall insulation, loft and floor insulation, heating controls and solar panels through Green Homes Grant Local Authority Delivery LAD 3 and Home Upgrade Grant 1. Marketing, eligibility and retrofit assessment of private low income properties for the delivery of the Home Upgrade Grant 2 scheme also commenced in 2023. Sutton residents were covered by the Greater London Authority Statement of Intent for Energy Company Obligation Flexible eligibility during 2023.
27	Public health and awareness raising	Director of Public Health to be fully briefed on air quality issues, to sign off Statutory Annual Status Reports and new Air Quality Action Plans and to support joint working across Council departments on tackling air pollution.	Ongoing, initial discussion where held with regard to the development of a new Air Quality Action plan which is due in 2024

Measure	LLAQM Action Matrix Theme	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
28	Public health and awareness raising	Work with Public Health Team on stakeholder engagement to raise awareness of health effects of air pollution and reducing exposure.	Superzone (anti-idling scheme) with Wallington Primary Academy for scooter loans for pupils.
29	Public health and awareness raising	Engagement with businesses to reduce emissions from associated activities including employees travel to/from and within work.	We continue to engage with businesses to reduce emissions from associated activities including employees travel to/from and within work.
30	Public health and awareness raising	Promotion of sources of information about air quality and health including LoveCLeanAir, AirTEXT and Walkit.com and ensuring people are advised when an air pollution episode is forecast.	Continued to promote LoveCLeanAir, AirTEXT and https://walkit.com/ as well as recommending ways in which residents can reduce their exposure to, and emissions of, air pollution.
31	Public health and awareness raising	Encourage schools to join the TfL STARS accredited travel planning programme and supporting its implementation.	22 schools achieved accreditation in 2023. 17 schools took part in Walk to School week. 4 schools ran anti-idling initiatives with school banners. 4 schools took part in junior Roadwatch with Sutton Police
32	Public health and awareness raising	Raise awareness of air quality through education within schools.	Four schools ran AQ initiatives with banners outside schools.
33	Localised solutions	Increase use of vegetation and tree planting to help reduce exposure to air pollutants.	4537 planted trees and 412 recorded fells
34	Localised solutions	Target areas for implementing package of measures aimed at reducing emissions: Low Emission Neighbourhoods (LENs).	Preparations for 3 new school street schemes to be launched in early 2024, and identification of 7 schools identified for proposed schemes to launch late next year.

Measure	LLAQM Action Matrix Theme	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
35	Monitoring and other core statutory duties	Collect and publish air quality monitoring data.	Air Quality Monitoring network has been maintained and data published. Due to cost restraints there have been no additional monitors added this year.
36	Monitoring and other core statutory duties	Continue working with Environment Agency on joint approach to regulation of waste management sites including regular inspections and reviewing of monitoring data.	Representatives of the Borough's Pollution Control Team continue to regularly attend the Beddington ERF Community Liason Group which the Environment Agency is invited to.

3. Planning Update and Other New Sources of Emissions

Table L. Planning requirements met by planning applications London Borough of Sutton in 2023

Condition	Number
Number of planning applications where an air quality impact assessment was reviewed for air quality impacts	All Major developments are assessed for air quality; including operational air quality, air quality neutral, and construction impacts. The number so assessed was not recorded in 2023.
Number of planning applications required to monitor for construction dust	All major developments with demolitions and Air Quality Dust Management Plans perform monitoring, visual or otherwise. Out database is not currently set up to record the number of sites
Number of CHPs/Biomass boilers refused on air quality grounds	0 (context: no applications were submitted which included CHP/Biomass)
Number of CHPs/Biomass boilers subject to GLA emissions limits and/or other restrictions to reduce emissions	0 (context: no applications were submitted which included CHP/Biomass)
Number of developments required to install Ultra-Low NO_X boilers	This information is not collected. All developments are required to install boilers with NOx emissions below 40 mg/kWh, in adherence to the London Plan 2021
Number of developments where an AQ Neutral building and/or transport assessments undertaken	331 planning applications were assessed by the pollution control team in 2023 – all applications submitted to the Pollution Control team for consultation was screened for the requirement of an AQN assessment as a minimum.
Number of developments where the AQ Neutral building and/or transport assessments not meeting the benchmark and so required to include additional mitigation	This information is not recorded
Number of planning applications with S106 agreements including other requirements to improve air quality	1
Number of planning applications with CIL payments that include a contribution to improve air quality	Not recorded

Condition	Number
NRMM: Greater London (excluding Central Activity Zone, Canary Wharf and Opportunity Areas)	
Number of conditions related to NRMM included.	9 conditions included
Number of developments registered and compliant.	11 registered and compliant
Number of audits	0 unregistered/uncompliant and being chased.
% of sites unregistered prior to audit	11 audits
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.	55% sites unregistered prior to audit

The London Borough of Sutton Planning Department consults the Pollution Control Team on all major planning applications as well as some non-major applications that are likely to be of interest. Applications are reviewed by officers within the team in respect of contaminated land, noise and air quality. Typically, one officer coordinates the team's response and records data such as the air quality conditions that were recommended.

The enforcement of air quality conditions is largely the responsibility of the Planning Enforcement Team unless environmental nuisance issues arise. However, NRMM enforcement is carried out by the LB Merton-led pan-London NRMM enforcement project, funded by the Mayor's Air Quality Fund with Borough contributions.

3.1 New or significantly changed industrial or other sources

No new sources identified.

4. Additional Activities to Improve Air Quality

4.1 London Borough of Sutton Fleet

There are currently 5 zero emission and zero emission capable vehicles within the borough's fleet.

4.2 NRMM Enforcement Project

London Borough of Sutton will continue to support the NRMM Enforcement project in 2024-25.

4.2 Air Quality Alerts

The Council website promotes the AirTEXT service as well as recommends ways in which residents can reduce their exposure to and emissions of, air pollution. The Council has also shared pollution episode alerts from the GLA forecasting service.

Appendix A Details of Monitoring Site Quality QA/QC

A.1 Automatic Monitoring Sites

The Council's monitoring stations form part of the London Air Quality Network, and QA/QC standards are delivered accordingly. These are considered close, if not equivalent to, the AURN standards. QA/QC is carried out by contractors.

PM_{10} Monitoring Adjustment

The monitoring stations in the London Borough of Sutton are part of the London Air Quality Network, and the data is collected and managed (including ratification) by ERG (Environmental Research Group) at Imperial College, London.

A.2 Diffusion Tubes

The diffusion tubes used by the London Borough of Sutton are supplied and analysed by Gradko utilising the 20% triethanolamine (TEA) in the water preparation method. A bias adjustment factor of 0.81 for the year 2023 has been derived from the national bias adjustment calculator dated June 2024.

London Borough of Sutton did not conduct any co-location studies in 2023, so it was not possible to calculate a local adjustment factor. As a result, the national adjustment factor of **0.81** is applied to diffusion tube monitoring results in this report.

Gradko International Ltd is a UKAS-accredited laboratory and participates in laboratory performance and proficiency testing schemes. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre. The lab follows the procedures set out in the Harmonisation Practical Guidance. Gradko previously participated in the Workplace Analysis Scheme for Proficiency (WASP) for NO_2 diffusion tube analysis Page 38 and the Annual Field Inter Comparison Exercise. In April 2014, a new scheme, AIR PT13, was introduced. This is an independent analytical proficiency-testing (PT) scheme operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT combines two long-running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme.

Laboratory performance in AIR PT is also assessed by the National Physical Laboratory (NPL) alongside laboratory data from the monthly NPL Field Intercomparison Exercise carried out at Marylebone Road, central London. A laboratory is assessed and given a 'z' score. A score of 2 or less indicates satisfactory laboratory performance.

Gradko International Ltd.'s performance for 2023 for 100% of samples submitted by Gradko was deemed satisfactory.

The laboratory has also achieved a "good" precision result for 2023. Tubes are considered to have "good" precision where the coefficient of variation of duplicate or triplicate diffusion tubes for eight or more periods during the year is less than 20%, and the average CV of all monitoring periods is less than 10%.

Table M. Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2023	**National**	**06/24**	**0.81**
2022	National	06/23	0.84
2021	National	03/22	0.84
2020	National	03/21	0.81
2019	National	03/20	0.93
2018	National	03/19	0.93
2017	National	03/18	0.89
2016	National	04/17	0.94

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 06/24

Follow the steps below in the correct order to show the results of relevant co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of September 2024
LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List
If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List
If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List
If a year is not shown, we have no data[2]

Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[2] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in water	2023	R	Nottingham City Council	11	30	21	41.8%	G	**0.71**
Gradko	20% TEA in water	2023	R	Belfast City Council	12	46	35	29.3%	G	**0.77**
Gradko	20% TEA in water	2023	R	Belfast City Council	12	25	21	18.6%	G	**0.84**
Gradko	20% TEA in water	2023	R	Belfast City Council	12	37	28	30.2%	G	**0.77**
Gradko	20% TEA in water	2023		**Overall Factor[3] (27 studies)**				**Use**		**0.81**

A.3 Adjustments to the Ratified Monitoring Data

Short-term to Long-term Data Adjustment

ST9 (PM_{10})

In 2023, automatic monitoring site ST9 (Beddington Village) had a data capture of 55% for annual mean PM_{10} concentration. The site was annualised following the methodology outlined in LLAQM.TG(19) using the annual PM_{10} data from the following urban background sites: Honor Oak Park (Lewisham, AURN site), Streatham Green (Lambeth), and Putney (Wandsworth).

ST9 had an annual mean PM_{10} concentration of 17.58 µg m^{-3}, the average period ratio of Honor Oak Park, Streatham Green, and Putney was 1.03. The annualised annual mean PM_{10} concentration was calculated to be 18.17 µg m^{-3}.

ST40 (NO_2)

The NO_2 diffusion tube site ST40 (High Street Cheam) had a data capture of 65.4% in 2023 and was annualised using NO_2 data from automatic monitoring Honor Oak Park (Lewisham, AURN site) and ST4 (Wallington, urban centre site). The DEFRA Diffusion Tube Data Processing Tool (October 2021) was used to annualise this site.

The ST40 raw data annual mean was 36.0 µg m^{-3}, the average annualisation factor was 1.0083, and the annualised data annual mean was calculated at 36.3 µg m^{-3}. The annualised data annual mean was multiplied by the bias adjustment factor (0.81) to give the adjusted annualised annual mean at 29.4 µg m^{-3}. The bias adjusted non-annualised mean was 29.2 µg m^{-3}.

Distance Adjustment

In 2023, the automatic monitoring site ST4 (Wallington) was distance adjusted as the NO_2 annual mean air quality objective was exceeded. This was calculated using the DEFRA NO_2 Fall Off With Distance Calculator (April 2016) and the procedure specified in LLAQM.TG(19).

The monitored concentration was 44.79 µg m^{-3}, the background concentration was 13.73 µg m^{-3}, and the predicted concentration at receptor was calculated to be 32.9

μg m^{-3}. The predicted concentration at receptor was within 10% of the NO_2 annual mean objective. The calculation can be found in Table Q.

Table N. Short-Term to Long-Term Monitoring Data Adjustment

Site ID	Annualisation Factor Honor Oak (Lewisham)	Annualisation Factor ST4	Annualisation Factor	Annualisation Factor	Average Annualisation Factor	Raw Data Annual Mean (µg m^{-3})	Annualised Annual Mean (µg m^{-3})	Comments
ST40	0.9883	1.0284	-	-	1.0083	36.0	36.3	Diffusion Tube – NO_2 – Annual Mean

Site ID	Annualisation Factor Honor Park (Lewisham)	Annualisation Factor Streatham Green (Lambeth)	Annualisation Factor Putney (Wandsworth)	Annualisation Factor -	Average Annualisation Factor	Raw Data Annual Mean (µg m^{-3})	Annualised Annual Mean (µg m^{-3})	Comments
ST9	0.993175783	1.105515	1.002069185	-	1.033586588	17.58162207	18.17212876	Continuous Monitoring Site – PM_{10} – Annual Mean

Table O. NO_2 Fall off With Distance Calculations

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted (µg m^{-3})	Background Concentration (µg m^{-3})	Concentration Predicted at Receptor (µg m^{-3})	Comments
ST4	0.8	5.8	44.79	13.73	32.9	Predicted concentration at Receptor within 10% of the AQO

Appendix B Full Monthly Diffusion Tube Results for 2023

Table P. NO_2 2023 Diffusion Tube Results (µg m^{-3})

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (0.81) and Annualised	Distance Corrected to Nearest Exposure
ST21	525567	166291	30.4	29.2	21.0	20.3	18.2	17.3	-	15.8	20.7	24.1	25.9	16.8	21.8	17.7	-
ST22	525063	162474	32.4	33.3	27.1	25.5	21.1	22.3	-	21.6	20.7	25.6	28.1	19.5	25.2	20.4	-
ST23	529734	163868	36.5	38.2	29.7	32.0	31.1	28.5	18.9	20.6	24.4	24.9	28.3	17.8	27.6	22.3	-
ST24	530130	165404	26.6	29.5	23.0	-	25.6	21.1	12.0	16.6	19.4		21.7	13.8	20.9	17.0	-
ST25	523874	165683	36.5	35.0	24.3	22.9	-	17.4	16.8	18.5	20.9	23.1	25.7	17.7	23.5	19.1	-
ST26	527683	164663	38.1	38.9	28.5	27.7	26.0	25.6	23.4	23.5	28.8	29.3	33.0	22.5	28.8	23.3	-
ST07	528401	166038	24.6	25.2	17.0	18.2	18.9	17.2	9.2	28.0	14.5	18.4	21.7	13.1	18.8	15.2	-
ST08	527786	165021	27.9	27.1	18.4	18.5	16.2	16.3	11.6	14.4	18.0	18.7	22.8	14.1	18.7	15.1	-
ST29	528339	164615	43.9	46.5	37.8	45.4	44.3	43.7	29.9	34.5	44.9	43.3	44.7	28.1	40.6	32.9	-
ST10	527284	165778	24.9	22.9	15.3	15.1	13.6	11.6	7.8	12.1	13.6	16.1	20.0	11.8	15.4	12.5	-
ST11	529835	165041	26.6	27.5	19.5	20.3	16.5		13.1	16.5	21.7	24.0	23.9	16.2	20.5	16.6	-
ST32	525184	165845	25.4	25.8	18.0	20.9	20.0	16.9	10.6	15.1	17.4	18.2	19.3	11.5	18.3	14.8	-
ST33	526021	164025	42.7	40.6	35.0	37.5	35.4	33.0	24.3	27.9	36.5	34.0	32.8	13.6	32.8	26.5	-
ST34	525772	165118	44.0	42.3	34.4	32.5	27.7	27.0	31.0	30.7	41.7	43.8	42.1	33.2	35.9	29.1	-
ST35	524782	165167	31.5	30.3	24.2	23.7	20.2	19.8	15.4	17.8	21.6	23.9	24.7	16.6	22.5	18.2	-
ST36	530645	164839	31.3	30.9	25.2	27.0	26.5	21.9	15.7	21.7	23.5	26.2	27.7	19.0	24.7	20.0	-
ST27	525691	164599	39.8			33.4	16.5	24.2	17.4	22.1	27.2	30.1	31.4	20.8	26.3	21.3	-
ST38	526046	163636	35.3	31.9	28.7	32.6	31.0	31.1	20.4	23.5	27.6	28.8	31.0	19.9	28.5	23.1	-
ST39	526019	166469	56.8	56.9	41.2	43.4	41.1	37.1	32.6	35.6	41.7	43.4	45.2	28.6	42.0	34.0	-

ST40	524357	163599	43.3		32.5	40.6			28.7		40.2	38.6	37.6	26.2	36.0	28.9	-
ST42	526605	165364	25.4		15.6	15.5	12.4	12.0	6.7	11.1	11.4		20.1	11.9	14.2	11.5	-
ST43	525883	162518	32.1	32.1	24.1	22.5	18.8	19.7	19.7	21.5	27.7	26.6	31.4	20.2	24.7	20.0	-
H1	528359	166067	38.6	33.8	30.6	33.5	32.4	30.2	22.2	13.3	34.7	35.0	35.5	26.1	30.5	24.7	-
H2	528437	166275	27.9	25.1	20.9	19.6	18.0	17.5	14.0	15.6	19.1	22.1	25.2	15.4	20.0	16.2	-
H3	528637	166021	46.8	46.1	38.1	36.0	29.3	32.9	34.3	32.3	43.4	44.8	43.9	36.6	38.7	31.4	-
BL	529400	167235	39.4	37.7	35.1		27.9	27.5	28.3	27.5	36.2		35.6	29.0	32.4	26.3	-

Notes:

Exceedances of the NO_2 annual mean objective of 40 µg m^{-3} are shown in **bold**.

NO_2 annual means exceeding 60 µg m^{-3}, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

Appendix C Maps of Monitoring Locations and AQMAs

Figure A. Map of Non-Automatic Monitoring Sites

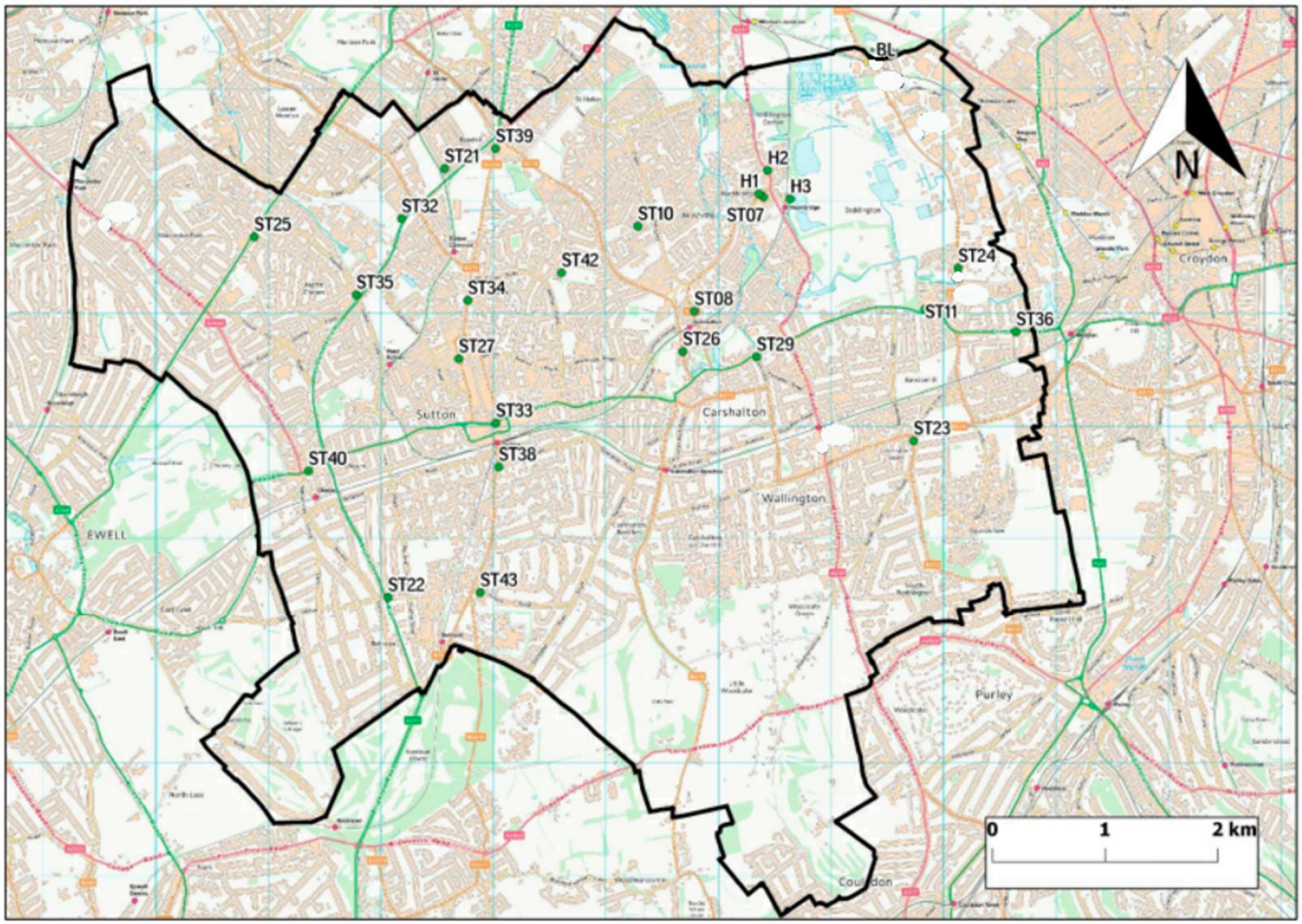

Figure B. Map of Automatic Monitoring Sites